EXHIBIT 4.09

formed from the mean shape $\overline{\mathbf{x}}$ using equation (1). The deformed model $\mathbf{x}^U$ is then rotated, scaled and translated into the *posed* model $\mathbf{x}^P$, such that the position $\mathbf{x}_i^P$ of the i^{th} landmark is given by:

$$\mathbf{x}_i^P = s\mathbf{R}x_i^U + \mathbf{u} \quad (2)$$

$\mathbf{x}^P$ is currently projected into the 2D image using an orthographic projection (simply by discarding the z-coordinates). This allows projections and inverse projections to be calculated quickly and, with a sufficiently distant camera, produces negligible distortion. Of course, z-position information is lost but, assuming a fixed-size object and known intrinsic camera properties, z position can be inferred from scaling (this is effectively a *scaled* orthographic projection).

As mentioned above, the idea is to find values for $\mathbf{u}$, s, $\mathbf{R}$ and the b_j which give the best match between model and image. These parameters are updated iteratively using image evidence, specifically by finding the best local movement for individual model landmarks. The result is a collection of suggested landmark movements (in the form of (dx, dy) pairs) which undergo statistical voting to change the overall model pose. When used in this way, PDMs are commonly referred to as Active Shape Models (ASMs) [4].

Because the process is iterative, it extends naturally to tracking an object over a time sequence of images; the model's final position in one image is used as the starting position for the next image.

3.1 Gathering image evidence

The task is to find suggested movements for individual landmarks by examining image data. The evidence that can be gathered from a 2D image with respect to a 3D model is limited.

Firstly, if a hand is to be tracked unmarked, the only reliable position evidence that can be easily extracted is from edge data. Also, only a subset of the model landmarks will lie on the model's boundary in any particular 2D projection; no movement evidence can be collected for any other landmarks as there will be no corresponding edge in the 2D image. (Shen observed this in his work on vehicle model building [15]). The *aperture problem* (see later) is also experienced, whereby even if an edge *is* found, the desired position *along* the edge is uncertain.

Secondly, because a single 2D image is being used for input, no depth information is available i.e. the z-coordinate of any discovered edge is uncertain (this is in fact another instance of the aperture problem).

The data required are a suggested movement $d\mathbf{x}_i^P$ for each model landmark i, along with an associated weighting W_i indicating how strong the evidence is for this movement. Evidence is only collected for landmarks which lie on the projected model boundary. For each landmark i, the unit normal $\mathbf{n}_i$ to the model surface is found, defined as the normal to the plane containing landmark i's three mesh neighbours. If $\mathbf{n}_i$ subtends an angle of less than 30° to the x-y plane, landmark i is deemed to lie on or very near the projected model boundary (this is imprecise, but is much faster than an exact boundary-finding algorithm), and a corresponding image edge is likely. A line of pixels is extracted from the image either side of the landmark and in the direction of the projection of $\mathbf{n}_i$ into the x-y plane. The greatest intensity change (ie. edge) along this line is found and $d\mathbf{x}_i^P$ is set accordingly (its z component is set to zero). W_i is set to the magnitude of the intensity change. If $\mathbf{n}_i$ subtends an angle of greater than 30° to the x-y plane, no image evidence is collected; $d\mathbf{x}_i^P = \mathbf{0}$ and $W_i = 0$ are accordingly set.

Figure 2 shows an enlargement of the feature extraction on part of the hand. The model is shown in white and the suggested movements, where discovered, are shown as black lines. To increase speed, not every pixel is sampled along the normal; this explains why some of the black lines do not quite meet the image edges.

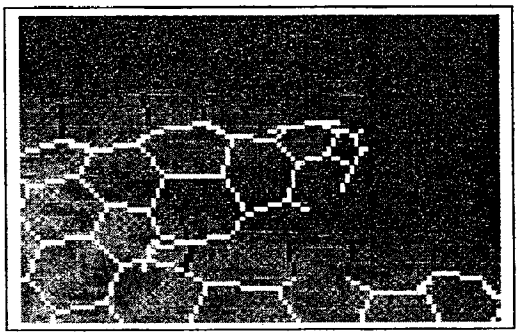

Figure 2. Suggested landmark movements.

3.2 Updating the model position

Given a suggested movement $d\mathbf{x}_i^P = (dx_i, dy_i, 0)$ for each landmark i, and an associated weighting W_i, the task is to update the model parameters u, v, s, $\mathbf{R}$ and the shape parameters b_j. A weighted least-squares solution involves finding values for $\mathbf{u}' = \mathbf{u} + d\mathbf{u}$, $s' = s + ds$, $\mathbf{R}' = d\mathbf{R}\mathbf{R}$ and $b_j' = b_j + db_j$ which minimise ε in:

$$\varepsilon = \sum_{i=0}^{N} W_i \| \mathbf{x}_i^P + d\mathbf{x}_i - (s'\mathbf{R}'(\overline{\mathbf{x}} + \sum_{j=1}^{t} b_j' \mathbf{v}_j)_i + \mathbf{u}') \|^2 \quad (3)$$

The solutions for du, dv, ds, $d\mathbf{R}$ and the db_j are as follows:

$$du = \frac{\sum_{i=1}^{N} W_i dx_i}{\sum_{i=1}^{N} W_i}; \quad dv = \frac{\sum_{i=1}^{N} W_i dy_i}{\sum_{i=1}^{N} W_i} \tag{4}$$

du and dv are then used in the calculation of ds and $d\mathbf{R}$:

$$ds = \sqrt{\frac{\sum_{i=1}^{N} W_i ||\mathbf{x}_i + d\mathbf{x}_i^P - (\mathbf{u} + d\mathbf{u})||^2}{\sum_{i=1}^{N} W_i ||\mathbf{x}_i - \mathbf{u}||^2}} \tag{5}$$

To calculate $d\mathbf{R}$ a weighted version of Arun's singular value decomposition (SVD) method [1] is used. The 3×3 matrix H is first found.

$$H = \sum_{i=1}^{N} W_i (\mathbf{x}_i - \mathbf{u})(\mathbf{x}_i + d\mathbf{x}_i^P - (\mathbf{u} + d\mathbf{u}))^T \tag{6}$$

and then find the SVD of H:

$$H = U \Lambda V^T \tag{7}$$

$d\mathbf{R}$ is then given by:

$$d\mathbf{R} = V U^T \tag{8}$$

Before calculating the db_j, the effects of $d\mathbf{u}$, ds and $d\mathbf{R}$ are removed from each $d\mathbf{x}_i^P$:

$$d\mathbf{x}_i^{P'} = s' \mathbf{R}' \mathbf{x}_i^U + \mathbf{u}' - \mathbf{x}_i^P + d\mathbf{x}_i^P \tag{9}$$

The db_j are calculated independently, assuming all other quantities to be fixed. This does not give an exact solution but it avoids any matrix inversions and so is much faster. Iteration can be used to converge on the best solution, but this is not strictly necessary since the tracker is iterative over frames anyway.

$$db_j = \frac{\mathbf{v}_j^T \mathbf{W} d\mathbf{x}^{P'}}{\mathbf{v}_j^T \mathbf{W} \mathbf{v}_j} \tag{10}$$

where $\mathbf{W} = \text{diag}(W_1, W_1, W_1, \ldots, W_N)$.

Although the weighted least-squares approach does find a suitable solution, it has been noted that convergence can be hampered by the *aperture problem* [10]: if an edge is found along a model normal, the landmark is encouraged towards that point. However the landmark's true resting position might be further along the edge. Also, when tracking from a 2D image, $dz = 0$ must be assumed, because there is no evidence to the contrary. The true resting position of the landmark may require $dz \neq 0$. Hill proposes a method to overcome these problems using *directional weights* [10], whereby landmarks are made free to 'slide' along target edges or across target planes.

Hill's solution involves the inversion of large weight matrices; it would be favourable to avoid this for reasons of speed. It is possible to improve on the 'simply' weighted least-squares approach without incurring too much computational cost. Directional information from the suggested landmark movements is used to determine how much the evidence from a particular landmark should contribute towards updating a particular parameter. For example, if the normal to landmark i is parallel to the x axis, its image evidence should make no contribution in calculating dv. This tactic is put into practice as follows: the least-squares equations are as for the 'simply' weighted approach; however, in calculating the change dq to model parameter q, the weighting W_i is replaced with $W_{q,i}$, which is calculated from W_i and $d\mathbf{x}_i$ specifically with respect to parameter q.

The following calculations are used:

$$W_{u,i} = W_i |du_i|; \quad W_{v,i} = W_i |dv_i| \tag{11}$$

$$W_{s,i} = \frac{W_i |d\mathbf{x}_i . (\mathbf{x}_i - \mathbf{u})|}{|\mathbf{x}_i - \mathbf{u}|} \tag{12}$$

$$W_{\mathbf{R},i} = \sqrt{W_i^2 - W_{s,i}^2} \tag{13}$$

When finding the db_j, $\mathbf{W}$ is replaced by $\mathbf{W}_D = \text{diag}(W_{x,1}, W_{y,1}, W_{z,1}, \ldots, W_{z,N})$.

It is important to appreciate that the above weighting scheme does not fully address the aperture problem; the weightings are calculated independently for each model parameter – no allowance is made for the interdependency of the parameters. However, it provides an improvement over the simply-weighted scheme at virtually no extra cost.

4 Performance evaluation

An experimental mock-up of the tracker has been constructed using a single colour camera pointing down at a homogeneous dark surface and connected to a Silicon Graphics Indy workstation running at 134MHz. Images are captured from the camera and the tracking algorithm is applied in real-time. Images are echoed to the workstation screen, with the hand model superimposed. The tracking rate is about 18 frames/second, not including image echoing and graphical model rendering. To avoid the global search problem (a hand must be found before it can be tracked), the model is initialised centrally in the image and only begins tracking when a hand is moved into position 'under' it; this event is detected by the presence of strong edges at over 80% of the model boundary landmarks. The user can see the model tracking their hand, providing useful feedback. Figure 3 shows some snapshots from the experimental system.

A quantitative evaluation of the tracker has not yet been performed. A qualitative evaluation is as follows:

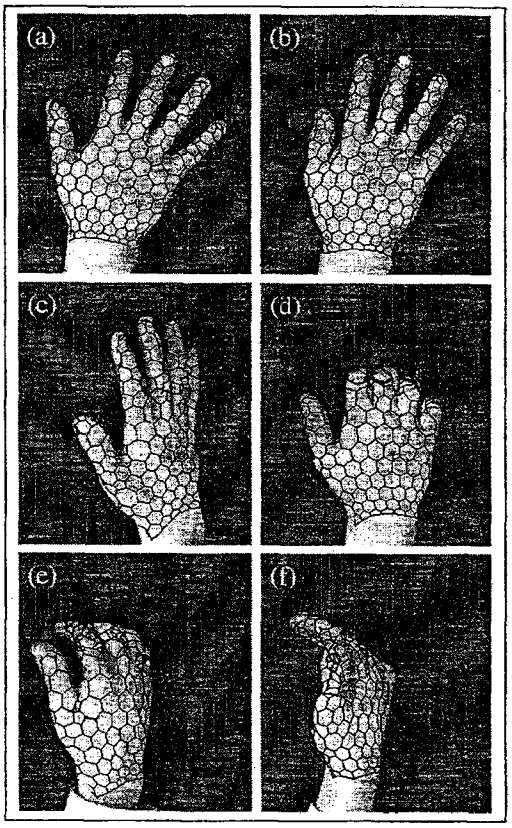

Figure 3. Hand tracking using the 3D PDM.

- Changes in x and y translation, scale and rotations in the x-y plane were tracked with no difficulty, irrespective of the hand pose.
- Rotations out of the x-y plane initially caused problems. In particular, the transition from (a) to (c) in Fig. 3 produced a decrease in scale instead of the expected rotation. This is because much of the evidence collected from the 2D image (the sides of the hand moving inwards) is consistent with such a change, and the only evidence to the contrary comes from the static position of the fingertips (the wrist is unmarked and provides no clues). As a temporary measure the model size was fixed at a constant value. The rotations are then estimated correctly.
- Rotations out of the x-y plane were estimated better with the size constraint; however, success depended very much on the starting pose. Most problems were caused by ambiguity: because the hand is roughly planar, positive and negative rotations of the hand viewed from either a direct or sideways-on view appear very similar in an orthogonal projection (eg. the transition from (a) to (c)). Consequently the model sometimes rotated the wrong way.
- Clearly visible deformations were tracked well; for example, the transition from (a) to (b). Self-occluded deformations were tracked less well, since there is little image evidence to support them. An example is the transition from (a) to (d), which was always tracked accurately, but more slowly than visible deformations.
- Self-occlusions also caused other problems. Our tracking program cannot (yet) handle occlusion, and occluded vertices therefore tend to be 'attracted' to the nearest *visible* edge. This occurred in poses such as (e) and (f). The effect is counteracted to some extent by the model shape constraints, however, the use of a *linear* PDM to model essentially non-linear deformations means that implausible model shapes can occur.

These results are roughly as we expected for our first attempt at the problem. There are obviously a few issues to be addressed, namely:

- scale/rotation confusion
- planar rotation ambiguities
- occlusions
- implausible model shapes due to linear model

The improvements we plan to make to the system are as follows:

- Address the handling of occlusions. Previous work on this (due to Rehg [14]) has made use of *layered templates* to model occlusion. We hope to adopt a simpler method whereby we determine the visibility of each vertex individually by considering whether any model facets lie in front of it.
- Use a non-linear modelling technique to improve the accuracy and specificity of the hand model, thus improving tracking. We have already developed one extension to the PDM which allows for a better modelling of pivotal motion [9] by using a mixture of Cartesian and polar coordinates.
- Improve the model's mesh configuration in some way. At present, the distribution of vertices over the model surface is roughly uniform. However, it is apparent that some parts of the hand (eg. the fingertips) provide more important information than others. To reflect this, we have two possible schemes in mind: the first is simply to manually increase the concentration of vertices in such areas of the model; the second is to automatically detect which areas are 'important' and assign a higher weight to evidence collected from them. Cues for importance of a vertex might be the local surface curva-

ture or, more likely, *the amount of movement of the vertex over the training set* – it is these vertices whose position is most sought.

The system has also been tested against a cluttered background. Figure 4 shows an example. Performance was almost as good as for the controlled background, and it is hoped that attention to the above matters will improve it further still.

Figure 4. Tracking against a cluttered background.

5 Conclusions

A description has been given of a first attempt at tracking a non-marked human hand in real time from a single camera, using a deformable model (a Point Distribution Model, or PDM) of the hand built from training examples.

It has been shown how information can be extracted from a 2D image to move and deform a 3D model; the instances where this is most and least successful have been pointed out.

The main strength of this approach is the use of the PDM, which is, or has the potential to be, a very compact and accurate model for the range of legal hand shapes, providing good contour information. It also lends itself to simple, fast processing.

In its current form, the greatest failing is due to occlusion; this problem will be addressed in future work.

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Human Hand Tracking from Binocular Image Sequences

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Abstract – **Sensing of human hand motion is very important for a variety of applications, such as CG animation and athletic performance measurement. Tracking a hand is difficult because the hand has high degree of freedom articulated mechanisms. This paper presents a 3-D model-based hand tracking method which is robust to occlusions and local minima. Tracking is performed minimizing estimation error of an optical flow and maximizing the overlap between a projected model and a silhouette image. We employ stochastic optimization to solve them, which are generally difficult. We present experimental results on tracking from synthetic and real image sequences.**

I. INTRODUCTION

Sensing of human hand motion is very important for a variety of applications, such as CG animation and athletic performance measurement. However, it is very hard to track a hand because it has high degree of freedom articulated mechanisms.

General solutions to this problem are divided into two categories. One is use of gloves with sensors [1] and the other is use of computer vision techniques. Although the former can give real-time processing and reliable information, it imposes a burden on the user and makes sensing natural human motion difficult. On the other hand, the latter is suitable for hand tracking since it is passive sensing and captures natural motion.

Previous work on vision-based hand tracking includes [2], [3], [4]. Mochimaru et al.[2] proposes a system for tracking a hand maximizing the overlap between a projected 3-D hand model and a silhouette image on the basis of information at the previous frame. The silhouette image itself has less information and it makes this method weak in occlusions, which often happen in real world. Moreover, this maximization is performed by simple hill-climbing so that it is easy to be trapped in local minima. Kameda et al.[3] estimates poses of a hand transforming a 3-D hand model which consists of patches. Since this method uses a precise model, it takes vast computational time. In [4], Rehg et al. describe a method to use the constraints of global shape features in order to solve kinematic equations of the hand model. They assume that there is no occlusions.

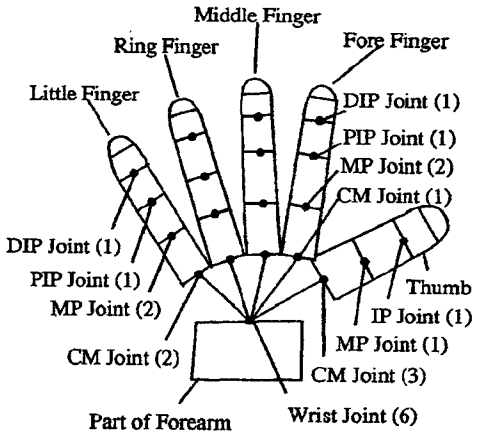

Figure 1: 21 segments and 20 joints. Figures at each joint represent their degree of freedom.

This paper presents a 3-D model-based hand tracking method which is robust to occlusions and local minima. Tracking is performed minimizing estimation error of an optical flow and maximizing the overlap between the projected model and the silhouette image. We employ stochastic optimization to solve them, which are generally difficult.

II. HAND MODEL

Hand tracking is performed fitting the 3-D hand model to the hand in the image. The model represents all possible hand poses.

The hand is modeled as a collection of 21 segments and 20 joints on the basis of anatomy (Fig. 1). The thumb, each of four fingers, and a part of the forearm

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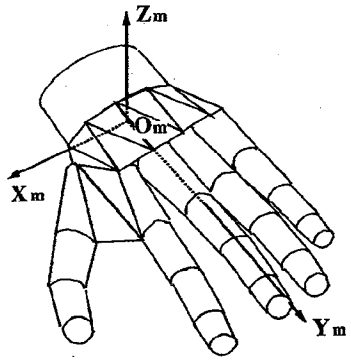


Figure 2: 3-D hand model and its coordinate system.

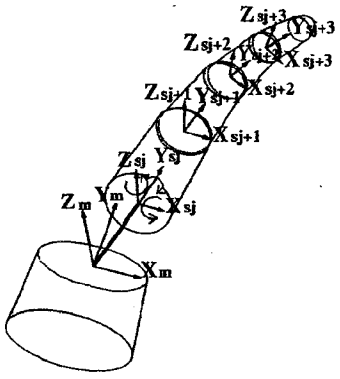


Figure 3: Segment coordinate system.

have 3, 4, and 1 segments, respectively. Each segment is described as a rigid truncated elliptic corn. Furthermore, each fingertip is described as an rigid elliptic hemisphere. The CM joint of each digit and wrist joint is handled only as skeletal model which has no shape. The gaps are covered with triangular patches (Fig. 2).

The degree of freedom for each joint is defined from its function. The wrist joint which describes the original position and pose of the model has 3 translation and 3 rotation degree of freedom (Fig. 2). As shown in Fig. 3, each segment of digits has its own segment coordinate system which has 1 - 3 degree of freedom. After all, the hand pose is represented by the model with 33 degree of freedom.

Since the shapes of are determined by actual measurement, estimation of hand pose results in estimation of 33 parameters.

III. STOCHASTIC OPTIMIZATION

Tracking articulated mechanisms such as a hand is more difficult than that of a single rigid object because their search space is larger and their state equations are nonlinear. In this case, general methods such as a least-squares method [5] and simple hill-climbing tend to be trapped in local minima and cost computational time. Contrary to this, stochastic optimization does not depend on the characteristic of search space very much and gives better solution. We employ two stochastic optimization methods, a genetic algorithm (GA) and a simulated annealing (SA).

The GA is a search algorithm based on the mechanics of natural selection and natural genetics [6]. It quickly approaches neighborhood of the best answer in large search space, while it is weak in local search. The SA is an optimization method based on temperature schedule in annealing. It is good at local search, while it is expensive computationally with large search space.

In our approach, each optimization method is put to proper use.

IV. HAND TRACKING

We estimate the pose of the hand in the same way as [2], that is, maximizing the overlap between the projected model and the silhouette image on the basis of information at the previous frame. This method works well in the case which these is no occluded area and the motion of hand is small but not in the other cases. We solve this problem utilizing the optical flow (OF) to make good use of characteristics of image sequences.

The algorithm is shown in Fig. 4

A. ESTIMATION OF INITIAL PARAMETERS

At first frame, initial parameter is estimated maximizing the overlap between the silhouette image and the projected model. The silhouette image is made binalizing the input frame. To utilize shape information of projection and silhouette, we employ a distance transform.

The overlap is defined as follows:

$$E_o = \frac{\sum_{x,y} f(x,y)g(x,y)}{\sqrt{\sum_{x,y}|f(x,y)|^2}\sqrt{\sum_{x,y}|g(x,y)|^2}} + w\sum_i \frac{O_i}{M_i} \quad (1)$$

where $f(x,y)$ and $g(x,y)$ are distance transform images of the silhouette image and the model projection on the image plane, respectively. As shown in Fig. 5, M_i and O_i are the area of the projected finger model, and the overlap region of the silhouette with M_i,

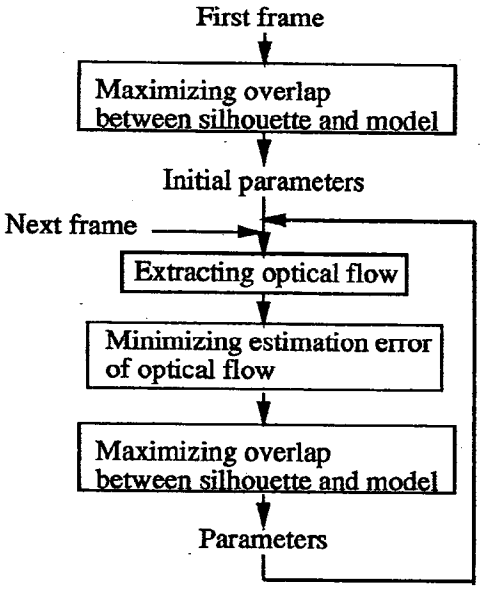


Figure 4: Algorithm of proposed method.

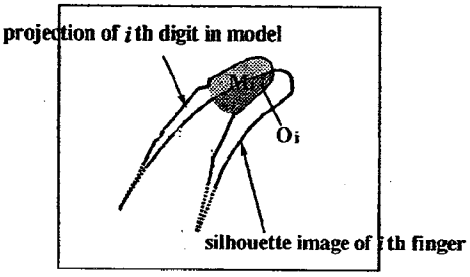


Figure 5: Overlap between the projected model and the silhouette.

respectively. Here, i represents the number of the finger, and w represents the weighting factor. The second term is defined for evaluating the overlap in the finger tip region which is important for tracking the finger motion.

Only at first frame, rough position of the hand is given by mouse input. However, search space is still very large. Therefore, E_o in Eq.(1) is maximized by using the GA which quickly approaches neighborhood of the best answer in large search space, and then sub-optimum solution can be obtained. Then the solution is maximized by the SA which is good at local search to improve the answer.

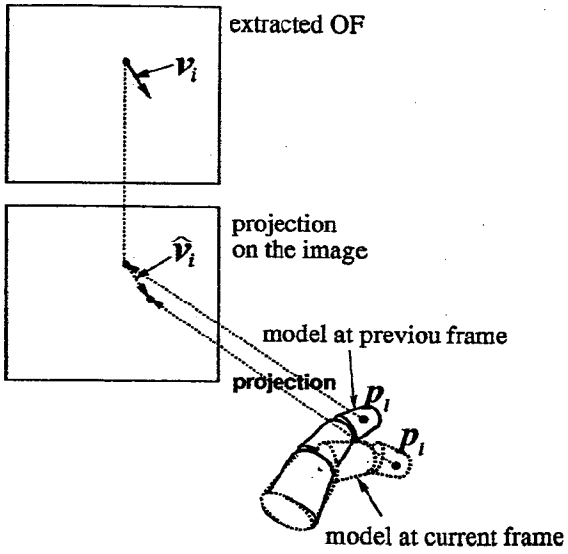


Figure 6: Extracted flow vector and its corresponding estimated flow vector

B. ESTIMATION OF PARAMETERS

After estimation of initial parameters, parameters at each frame are estimated minimizing estimation error of OF. The OF is extracted between the previous frame and the current frame.

The estimation error of the OF is defined as follows:

$$E_f = \frac{\sqrt{\sum_i \|\boldsymbol{v}_i - \widehat{\boldsymbol{v}}_i\|^2}}{n} \qquad (2)$$

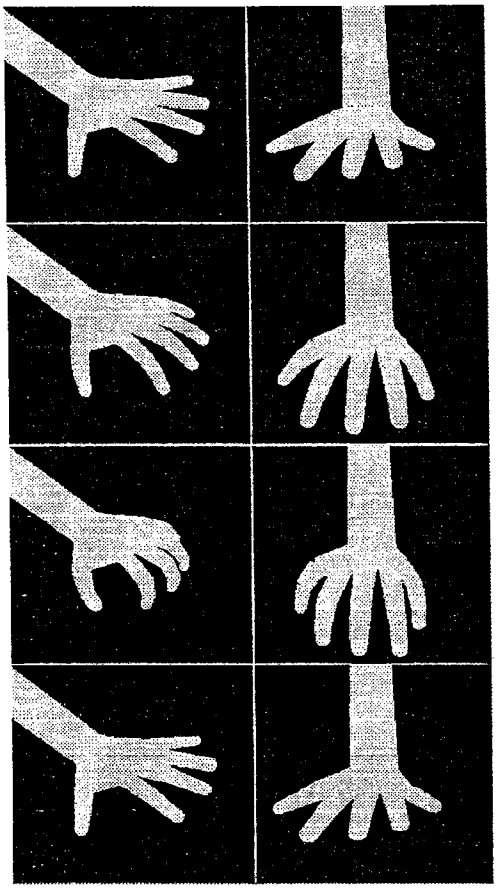
where $\boldsymbol{v}_i$ is the ith extracted flow vector, and $\widehat{\boldsymbol{v}}_i$ is its corresponding estimated flow vector calculated from the model at previous frame and the one at current frame (Fig. 6), n is the number of corresponded flow vector.

The parameter difference between successive two frames is a little and its search space is small. Therefore, (2) is minimized by the SA which is good at local search. Furthermore, the answer is improved maximizing (1) using the SA.

As a result of these, parameters at each frame are estimated. Hand tracking is performed successively implementing this process for image sequences.

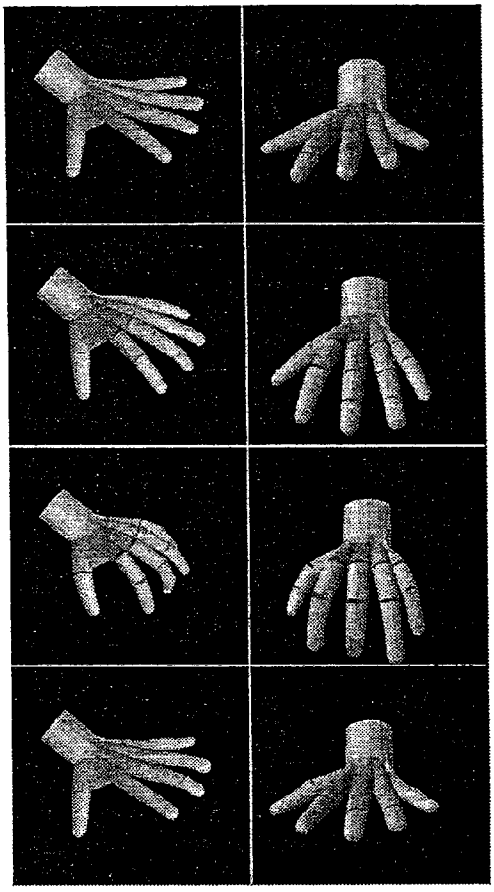
V. EXPERIMENTAL RESULTS

To test the method described above, we made experiments on tracking for both synthetic and real image sequences. Two cameras were used for avoiding the occlusion. In these experiments, the wrist joint was fixed to simplify the process. Then the parameters of joint angle of every finger are estimated. Furthermore,



Camera 1 View Camera 2 View

Figure 7: Synthetic images. Samples were taken at frame 1, 15, 30, 60.



Camera 1 View Camera 2 View

Figure 8: Estimated hand poses for the samples in Fig.7.

the CM joints were fixed after first frame because their motions seem to be small enough to be neglected.

A. EXPERIMENT USING SYNTHETIC IMAGE SEQUENCE

Using the 3-D hand model, we made a synthetic image sequence consists of 60 frames and OFs. This sequence simulates "clenching" and "unclenching." Fig. 7 shows input images and Fig. 8 shows the estimated hand poses.

Generally, tracking occluded area such as the little finger at frame 30 is difficult. We, however, successfully tracked it as shown in Fig. 8. Furthermore, the estimated parameters at the MP joint of the fore finger and the PIP joint of the little finger are shown in Fig. 9. The change of parameters are extracted though they contain errors.

These results demonstrate effectiveness of our tracking method.

B. EXPERIMENT USING REAL IMAGE SEQUENCE

The real image sequence which consists of 50 frames deals with "clenching." Fig. 10 shows input images and the estimated hand poses.

Although the estimation error was accumulated, tracking succeeded on the whole. Furthermore, the estimated parameters at the MP joint of the five digits are shown in Fig. 11. The estimated parameters represent the motion "clenching."

Effectiveness of our hand tracking method against real image sequence is shown by these results.

VI. CONCLUSION

We have proposed a model-based hand tracking method performed by minimizing estimation error of an OF and maximizing the overlap between the projected model and the silhouette image using the GA and the SA. We have demonstrated effectiveness of this method by experiments.

We will improve OF extraction process which has great effect on tracking. Moreover, we will repeatedly make experiments on various image sequences.

References

[1] T. Takahashi and F. Kishino, "A hand gesture recognition method and its application", *Trans. IEICE*, J73-D-II(12), pp.1895-1992, 1990.

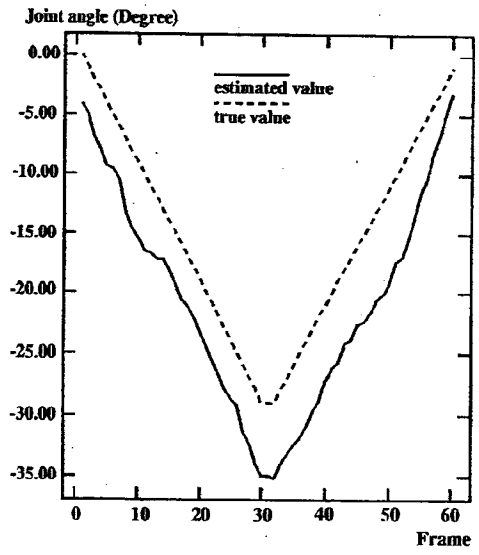
[2] M. Mochimaru and N. Yamazaki, "The three-dimensional measurement of unconstrained motion using a model-matching method", *ERGONOMICS*, vol.37, No.3, pp.493-510, 1994.

[3] Y. Kameda, M. Minoh, and K. Ikeda, "Three Dimensional Pose Estimation of an Articulated Object from its silhouette Image", *ACCV '93*, pp.612-615, 1993.

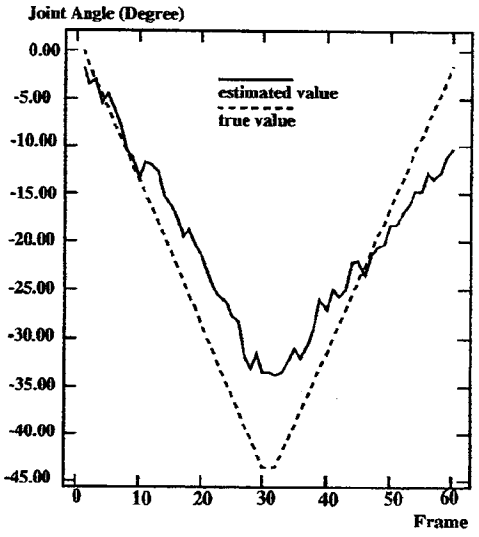
[4] J. M. Rehg and T. Kanade, "Visual Tracking of High DOF Articulated Structures: an Application to Human Hand Tracking", *ECCV '94*, pp.35-46, 1994.

[5] D. G. Lowe, "Fitting Parameterized Three-Dimensional Models to Images: *IEEE Trans. Pattern Analysis and Machine Intelligence*, 13(5), pp.441-449, 1991.

[6] D. Goldberg, *Genetic Algorithms in Search, Optimization, and Machine Learning*, Addison-Wesley, 1989.



(a) Rotation(bending) at MP joint of fore finer.



(b) Rotation at PIP joint of little finger.

Figure 9: Estimated parameters for the synthetic image sequence.

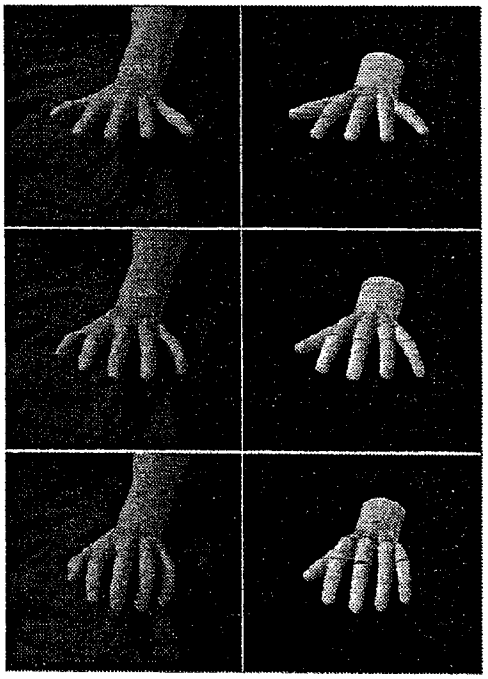


Figure 10: Real images at frame 1, 25, 49 and estimated hand poses.

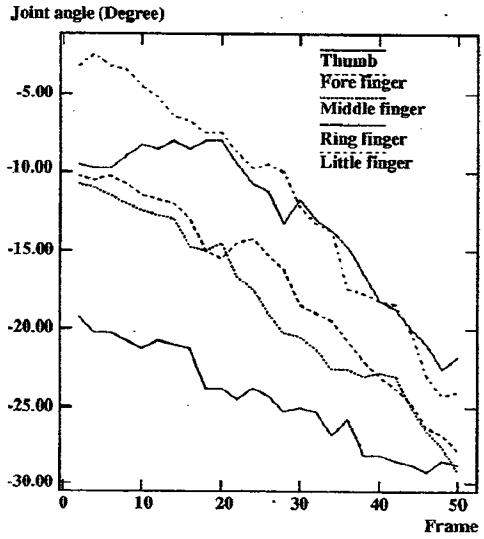


Figure 11: Estimated rotation(bending) at MP joint for the real image sequence.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/428,515	07/03/2006	WAYNE WESTERMAN	FW-0092USC5	4133

29855 7590 09/21/2007

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ART UNIT	**PAPER NUMBER**
2629	

MAIL DATE	DELIVERY MODE
09/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/428,515	WESTERMAN ET AL.	
	Examiner	Art Unit	
	Jean E. Lesperance	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *7/3/06* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/14/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The application filed July 3, 2006 is presented for examination and claims 1-16 are pending.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-16 are rejected under 35 U.S.C. 102(b) as being unpatentable over USPN 6,323,846 ("Westerman et al.").

Regarding claim 1, Westerman et al. teach apparatus and methods are disclosed for simultaneously tracking multiple finger and palm contacts as hands approach, touch, and slide across a proximity-sensing, compliant, and flexible multi-touch surface (abstract), for host computer systems supporting manipulations in three or more degrees of freedom, a left hand chord could be selected to pan, zoom, and rotate the display background while a corresponding chord in the right hand could translate, resize and rotate a foreground object (column 54, lines 30-34).

Regarding claim 2, Westerman et al. teach the inner separation and angle factors are highly discriminating of neutral thumb postures, but users often exceed the above cited separation and angle ranges when performing hand scaling or rotation gestures. For instance, during an anti-pinch gesture, the thumb may start pinched against the

index or middle fingertip, but then the thumb and fingertip slide away from one another. This causes the inner separation factor to be relatively small at the start of the gesture. Similarly, the thumb-index angle can also exceed the range expected by the inner angle factor at the beginning or end of hand rotation gestures, wherein the fingers rotate as if turning a screw (column 33, lines 31-42).

Regarding claim 3, Westeramn et al. teach the motion component extraction module 16 computes multiple degrees of freedom of control from individual finger motions during easily performable hand manipulations on the surface 2, such as hand translations, hand rotation about the wrist, hand scaling by grasping with the fingers, and differential hand tilting (column 13, lines 49-54).

Regarding claim 4, Westerman et al. teach since the differences in finger motion are usually greatest between thumb and pinky, step 526 only retrieves the current and previous positions of the innermost and outermost touching fingers for the hand scaling and rotation measurements (column 43, lines 22-26).

Regarding claims 5-8, Westerman et al. teach When only four degrees of freedom are needed, the basic motions can be whole hand translation, hand scaling by uniformly flexing or extending the fingers, and hand rotation either about the wrist as when unscrewing a jar lid or between the fingers as when unscrewing a nut (column 42, lines 10-14).

Regarding claim 9, Westerman et al. teach apparatus and methods are disclosed for simultaneously tracking multiple finger and palm contacts as hands approach, touch, and slide across a proximity-sensing, compliant, and flexible multi-touch surface

(abstract), the inner separation and angle factors are highly discriminating of neutral thumb postures, but users often exceed the above cited separation and angle ranges when performing hand scaling or rotation gestures. For instance, during an anti-pinch gesture, the thumb may start pinched against the index or middle fingertip, but then the thumb and fingertip slide away from one another. This causes the inner separation factor to be relatively small at the start of the gesture. Similarly, the thumb-index angle can also exceed the range expected by the inner angle factor at the beginning or end of hand rotation gestures, wherein the fingers rotate as if turning a screw (column 33, lines 31-42).

Regarding claim 10, Westerman et al. teach the motion component extraction module 16 computes multiple degrees of freedom of control from individual finger motions during easily performable hand manipulations on the surface 2, such as hand translations, hand rotation about the wrist, hand scaling by grasping with the fingers, and differential hand tilting (column 13, lines 49-54).

Regarding claim 11, Westerman et al. teach since the differences in finger motion are usually greatest between thumb and pinky, step 526 only retrieves the current and previous positions of the innermost and outermost touching fingers for the hand scaling and rotation measurements (column 43, lines 22-26).

Regarding claims 12-14, Westerman et al. teach when only four degrees of freedom are needed, the basic motions can be whole hand translation, hand scaling by uniformly flexing or extending the fingers, and hand rotation either about the wrist as

when unscrewing a jar lid or between the fingers as when unscrewing a nut (column 42, lines 10-14).

Regarding claim 15, Westerman et al. teach apparatus and methods are disclosed for simultaneously tracking multiple finger and palm contacts as hands approach, touch, and slide across a proximity-sensing, compliant, and flexible multi-touch surface (abstract), when only four degrees of freedom are needed, the basic motions can be whole hand translation, hand scaling by uniformly flexing or extending the fingers, and hand rotation either about the wrist as when unscrewing a jar lid or between the fingers as when unscrewing a nut (column 42, lines 10-14).

Regarding claim 16, Westerman et al. teach for host computer systems supporting manipulations in three or more degrees of freedom, a left hand chord could be selected to pan, zoom, and rotate the display background while a corresponding chord in the right hand could translate, resize and rotate a foreground object (column 54, lines 30-34).

Conclusion

3. Any inquiry concerning this communication or earlier communications from the ably examiner should be directed to Jean Lesperance whose telephone number is (571) 272-7692. The examiner can normally be reached on from Monday to Friday between 10:OOAM and 6:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Hjerpe, can be reached on (571) 272-7691.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(571) 273-8300 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Jean Lesperance
Art Unit 2629

Date 9/15/2007

BIPIN SHALWALA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/428,506	07/03/2006	WAYNE WESTERMAN	FW-0092USC4	4122

29855 7590 09/24/2007

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LESPERANCE, JEAN E	

ART UNIT	PAPER NUMBER
2629	

MAIL DATE	DELIVERY MODE
09/24/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

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	11/428,506	WESTERMAN ET AL.	
	Examiner	Art Unit	
	Jean E. Lesperance	2629	

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Status

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2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

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4a) Of the above claim(s) _____ is/are withdrawn from consideration.

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6)☒ Claim(s) *1-16* is/are rejected.

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Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *7/3/2006* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

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Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

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6) ☐ Other: _____.

DETAILED ACTION

1. The application filed July 3, 2006 is presented for examination and claims 1-16 are pending.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-16 are rejected under 35 U.S.C. 102(b) as being as being unpatentable over USPN 6,888,536 ("Westerman et al.").

Regarding claim 1, Westerman et al. teach apparatus and methods are disclosed for simultaneously tracking multiple finger and palm contacts as hands approach, touch, and slide across a proximity-sensing, compliant, and flexible multi-touch surface (abstract$3), the method and apparatus comprising:

glancing motions of single fingers as they tap key regions are easily tolerated since most cursor manipulation must be initiated by synchronized slides of two or more fingers (column 60, lines 41-44);

primary mouse clicks would be generated by a tap of a fingertip pair on either half of the surface (column 54, lines 18-20).

mouse cursor motion can be allocated to the fingertip pair chord on both hands and mouse button drag to a triple fingertip chord on both hands (column 54, lines 14-

16).

Regarding claim 2, Westerman et al. teach double-clicks could be ergonomically generated by a single tap of three fingertips on the surface (column 54, lines 20 and 21).

Regarding claims 3, 7, and 12, Westerman et al. teach mouse cursor manipulations could be allocated as discussed above to the right hand and right half of the surface, while corresponding text cursor manipulations are allocated to chords on the left hand (column 54, lines 24-27).

Regarding claims 4, 8, and 13, Westerman et al. teach left fingertip pair movement would generate arrow key commands corresponding to the direction of motion, and three fingertips would generate shift arrow combinations for selection of text (column 54, lines 27-31).

Regarding claims 5, 6, 9, 10, 14, and 15, Westerman et al. teach three fingertips would generate shift arrow combinations for selection of text (column 54, lines 29-31).

Regarding claim 11, Westerman et al. teach apparatus and methods are disclosed for simultaneously tracking multiple finger and palm contacts as hands approach, touch, and slide across a proximity-sensing, compliant, and flexible multi-touch surface (abstract$3), the method and apparatus comprising:

generating cursor motion signals in response to translational slides of two fingertips (column 62, lines 30 and 31);

Primary mouse clicks would be generated by a tap of a fingertip pair on either half of the surface (column 54, lines 18-20); and

double-clicks could be ergonomically generated by a single tap of three fingertips on the surface (column 54, lines 20 and 21).

Regarding claim 16, Westerman et al. teach Window scrolling could be allocated to slides of four fingers on either hand (column 54, lines 21-23).

Conclusion

3. Any inquiry concerning this communication or earlier communications from the ably examiner should be directed to Jean Lesperance whose telephone number is (571) 272-7692. The examiner can normally be reached on from Monday to Friday between 10:OOAM and 6:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Hjerpe, can be reached on (571) 272-7691.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(571) 273-8300 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Jean Lesperance

BIPIN SHALWALA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

Art Unit 2629

Date 9/15/2007

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/428,521	07/03/2006	WAYNE WESTERMAN	FW-0092USC7	4142

29855 7590 09/24/2007

WONG, CABELLO, LUTSCH, RUTHERFORD & BRUCCULERI, L.L.P.
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EXAMINER	
LESPERANCE, JEAN E	

ART UNIT	PAPER NUMBER
2629	

MAIL DATE	DELIVERY MODE
09/24/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/428,521	WESTERMAN ET AL.	
	Examiner	Art Unit	
	Jean E. Lesperance	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 July 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/14/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The application filed July 3, 2006 is presented for examination and claims 1-9 are pending.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-9 are rejected under 35 U.S.C. 102(b) as being unpatentable over USPN 6,323,846 ("Westerman et al").

Regarding claim 1, Westerman et al. teach finding a shortest path connecting all of the contacts assumed to be from a given hand (column 69, lines 1 and 2), passing through each contact once to form an ordered loop (column 69, lines 3 and 4); and step 444 concludes that contacts above are most likely fingertips, and contacts in the ring below the thumb are most likely palms. If (442) the innermost path is a palm heel, step 446 concludes the paths significantly above the innermost must be fingers while paths at the same vertical level should be palms. The thumb and palm tests are then repeated for the contacts adjacent in the ring to the innermost until any other thumb or palm contacts are found. Once any thumb and palm contacts are identified, step 448 identifies remaining fingertip contacts by their respective ordering in the ring and their relatively high vertical position (column 35, lines 6-14).

Regarding claim 2, Westerman et al. teach assigning thumb, fingertip, or palm identities to non-innermost contacts based upon the features of the contacts, assignment of the innermost contacts, vertical position relative to assigned contacts, and the loop ordering (column 69, lines 9-13).

Regarding claim 3, Westerman et al. teach defining a template of hand part attractor points on the surface, the attractor points for each hand roughly forming a ring (column 69, lines 65-67); constructing a partition from each contour by tentatively assigning contacts which are positioned to the left of a contour to the left hand cluster and contacts to the right of a contour to the right hand cluster. (column 70, lines 26-31); assigning finger and palm identities to the contacts within each cluster (column 70, lines 3 and 4); computing for each partition an assignment fitness measure which represents the biomechanical consistency of the fit of contact clusters to their assigned attractor rings (column 70, lines 3 and 4);.

Regarding claim 4, Westerman et al. teach forepalm contacts of the hands are recognized by adding attractor points near the center of the attractor point ring of each hand, and weighting the distances to the forepalm attractor points so that contacts are assigned to the forepalm attractor points only if the hand produces enough contacts to nearly fill the attractor ring (column 67, lines 58-63).

Regarding claim 5, Westerman et al. teach the attractor point positions correspond to the positions of hand part surface contacts measured when each hand is in a neutral posture (column 67, lines 55-57).

Regarding claim 6, Westerman et al. teach step 454 does this by ordering all

surface contacts by their horizontal coordinates and establishing a vertical contour halfway between each pair of adjacent horizontal coordinates (column 37, lines 16-20); and constructing a partition from each contour by tentatively assigning contacts which are positioned to the left of a contour to the left hand cluster and contacts to the right of a contour to the right hand cluster (column 70, lines 26-31).

Regarding claim 7, Westerman et al. teach the hand assignments of previously identified contacts can be locked so to not depend on which side of the dividing contour the contacts lie, while assignments of new contacts still depend on which side of the contour they lie (column 70, lines 32-36).

Regarding claim 8, Westerman et al. teach the attractor ring can also be rotated or scaled by estimates of hand rotation and size such as the estimated finger offsets, but care must be taken that wrong finger offset estimates and identification errors don't reinforce one another by severely warping the attractor ring (column 30, lines 19-23).

Regarding claim 9, Westerman et al. teach step 350 initializes the locations of the attractor points to the approximate positions of the corresponding fingers and palms when the hand is in a neutral posture with fingers partially curled. Preferably these are the same default finger locations (Fi.sub.defx,Fi.sub.defy) employed in hand offset estimation. Setting the distances and angles between attractor points from a half-closed hand posture allows the matching algorithm to perform well for a wide variety of finger flexions and extensions (column 29, lines 43-51).

Conclusion

3. Any inquiry concerning this communication or earlier communications from the

ably examiner should be directed to Jean Lesperance whose telephone number is (571) 272-7692. The examiner can normally be reached on from Monday to Friday between 10:OOAM and 6:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Hjerpe, can be reached on (571) 272-7691.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Jean Lesperance

Art Unit 2629

Date 9/16/2007

BIPIN SHALWALA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/428,522	07/03/2006	WAYNE WESTERMAN	FW-0092USC6	4146

69753 7590 01/28/2008

APPLE C/O MORRISON AND FOERSTER ,LLP
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EXAMINER	
LESPERANCE, JEAN E	
ART UNIT	**PAPER NUMBER**
2629	

MAIL DATE	DELIVERY MODE
01/28/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/428,522	WESTERMAN ET AL.	
	Examiner	Art Unit	
	Jean E. Lesperance	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 January 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 July 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/14/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The response to restriction/election filed January 7, 2008 is entered and claims 1-10 have been selected and pending.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over PCT international Application 9718547 ("Michael").

Regarding claim 1, Michael teaches a touch sensor data is input to various program segments. One segment 710 performs one-touch processing and another segment 720 performs two-touch processing. A third segment 730 may be provided to perform three-touch processing if desired. Results of one-touch and two-touch (and, if desired, three-touch) processing are provided to a touch-inflections segment 740 for further processing. If the outcome of touch-inflection processing is that a valid touch gesture has been recognized, then the touch gesture is communicated to a protocol segment 750 for communication to the electronic device. Processed track data, or pointing data, is also input to the protocol segment 750 (see Fig.7); the middle finger ("second ancillary indicator") touches within a region 105 if applicable. For each position 1-9 of the index finger, there are four possible combinations of the "ancillary indicators"—thumb only, middle finger only, both, or neither--for a total of 36 distinct

gestures. Further in accordance with the prior-art input system, a DatOSet TM gesture set is a set of eight groups of 36 gestures, different groups being selected by tapping once or twice with different combinations of the ancillary indicators only, for a total of 288 mode-distinguishable gestures (page 2, lines 12-19). Accordingly, the prior art does not specifically teach extracting from at least one group of electrodes one or more parameters selected. However, the prior art teaches the middle finger ("second ancillary indicator") touches within a region 105 if applicable. For each position 1-9 of the index finger, there are four possible combinations of the "ancillary indicators"—thumb only, middle finger only, both, or neither--for a total of 36 distinct gestures. Further in accordance with the prior-art input system, a DatOSet TM gesture set is a set of eight groups of 36 gestures, different groups being selected by tapping once or twice with different combinations of the ancillary indicators only, for a total of 288 mode-distinguishable gestures (page 2, lines 12-19). Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the middle finger ("second ancillary indicator") touches within a region 105 if applicable. For each position 1-9 of the index finger, there are four possible combinations of the "ancillary indicators"—thumb only, middle finger only, both, or neither--for a total of 36 distinct gestures. Further in accordance with the prior-art input system, a DatOSet TM gesture set is a set of eight groups of 36 gestures, different groups being selected by tapping once or twice with different combinations of the ancillary indicators only, for a total of 288 mode-distinguishable gestures (page 2, lines 12-19) to obtain extracting from at least one group of electrodes one or more parameters selected because this

would provide a very compact, touch-sensitive input device for inputting to digital electronic devices command/control information and/or text.

Regarding claim 2, Michael teaches a system is marketed under the tradename TracKey", referring to the dual capabilities of tracking a pointer finger as in conventional touchpads, and also of keying in information (page 6, lines15-17).

Regarding claim 3, Michael teaches the one-touch processing segment 710, there is shown a subprocess 713 that detects a thumb touch and a fur, her subprocess 715 that detects a touch on an arrow. Within the touch-inflections processing segment 740, there is shown a subprocess 741 that detects added pressure, subprocesses that detect a roll gesture (743) and a waggle gesture (745), respectively, a subprocess 747 that detects a thumb stroke in particular, and a subprocess 749 that detects other stroke inflections (see Figure 7).

Regarding claim 4, Michael teaches referring still to Figure 3, note that small arrows appear along each edge of the device, two arrows along each edge. The arrows coincide with the boundary between adjacent keys. When a single finger is touched on one of the arrows, the device recognizes the touch as a cursor key input. Depending on the direction of the arrow, the cursor is spaced upward, downward, rightward or leftward (see Figure 3).

Regarding claims 5 and 8, Michael teaches a touch sensor data is input to various program segments. One segment 710 performs one-touch processing and another segment 720 performs two-touch processing. A third segment 730 may be provided to perform three-touch processing if desired. Results of one-touch and two-

touch (and, if desired, three-touch) processing are provided to a touch-inflections segment 740 for further processing. If the outcome of touch-inflection processing is that a valid touch gesture has been recognized, then the touch gesture is communicated to a protocol segment 750 for communication to the electronic device. Processed track data, or pointing data, is also input to the protocol segment 750 (see Fig.7).

Regarding claims 6 and 9, Michael teaches applying a single touch to a number 0-9, indicate a corresponding function key by rolling the finger slightly rightward (see Figure 3).

Regarding claims 7 and 10, Michael teaches the one-touch processing and touch-inflection processing segments, various subprocesses have been called out. More particularly, within the one-touch processing segment 710, there is shown a subprocess 713 that detects a thumb touch and a fur, her subprocess 715 that detects a touch on an arrow. Within the touch-inflections processing segment 740, there is shown a subprocess 741 that detects added pressure, subprocesses that detect a roll gesture (743) and a waggle gesture (745), 10 respectively, a subprocess 747 that detects a thumb stroke in particular, and a subprocess 749 that detects other stroke inflections (see Figure 7).

Conclusion

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jean Lesperance whose telephone number is (571) 272-7692. The examiner can normally be reached on from Monday to Friday between 10:OOAM and 6:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Hjerpe, can be reached on (571) 272-7691.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Jean Lesperance

Art Unit 2629

Date 1/21/2008

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/428,515	07/03/2006	WAYNE WESTERMAN	10684-20086.05	4133

69753 7590 02/04/2008

APPLE C/O MORRISON AND FOERSTER ,LLP
LOS ANGELES
555 WEST FIFTH STREET SUITE 3500
LOS ANGELES, CA 90013-1024

EXAMINER	
LESPERANCE, JEAN E	

ART UNIT	PAPER NUMBER
2629	

MAIL DATE	DELIVERY MODE
02/04/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/428,515	WESTERMAN ET AL.	
	Examiner	Art Unit	
	Jean E. Lesperance	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

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Status

1)☒ Responsive to communication(s) filed on *14 November 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *9-14 and 16* is/are allowed.

6)☒ Claim(s) *1,5 and 15* is/are rejected.

7)☒ Claim(s) *2-4 and 6-8* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *7/3/06* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

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2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The amendment filed November 14, 2007 is entered and claims 1-16 are pending.

2. The previous Office Action mailed September 21, 2007 is withdrawn and another Office Action is provided below.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 5, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,883,619 ("Ho et al.").

Regarding claim 1, Ho et al. teach a plurality of sensing elements 66 installed over a PCB board 68 of the mouse 10 for sensing the direction of each finger input and a touch pad 68 installed above the sensing elements 66 which can be tilted within a fixed angle toward various directions when receiving each finger input so that the movements of the touch pad 68 caused by each finger input can be sensed by the sensing elements 66 and converted into the scrolling signals by the mouse 10 (column 3, lines 52-60) wherein the plurality of sensing elements 66 function as a multi-touch sensor because it senses each of the finger that touches. The prior art does not specifically teach generating a pan command in response to whole hand translation. However, the prior art teaches a touch pad 68 installed above the sensing elements 66

which can be tilted within a fixed angle toward various directions when receiving each finger input so that the movements of the touch pad 68 caused by each finger input can be sensed by the sensing elements 66 and converted into the scrolling signals by the mouse 10 (column 3, lines 52-60). Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify a touch pad 68 installed above the sensing elements 66 which can be tilted within a fixed angle toward various directions when receiving each finger input so that the movements of the touch pad 68 caused by each finger input can be sensed by the sensing elements 66 and converted into the scrolling signals by the mouse 10 (column 3, lines 52-60) to obtain generating a pan command in response to whole hand translation because this would provide an improved process which is less complex than the processes known hitherto.

Regarding claim 5 and 15, Ho et al. teach a bi-directional button 18 which is depressible over its front end 20 for zooming in a view and its rear end 22 for zooming out a view, a view control button 24 installed over the mouse 10 which can be depressible toward various direction (two dimension) for sensing a two dimensional direction of a finger input from a user, a roller ball (not shown) installed on the bottom end of the housing 12, and a flexible cable 26 for connecting the mouse 10 to a host computer (see Fig.2) wherein the fingers of the hand with inherently flexing when depressing the button 18.

Allowable Subject Matter

4. Claims 9-14 and 16 are allowed.

5. Claims 2-4 and 6-8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance: the claimed invention is directed to a method of mapping gestures on a multi-touch surface.

Independent claim 9 identifies a uniquely distinct feature "generating a rotate command in response to hand rotation".

Independent claim 16 identifies a uniquely distinct feature "performing a gesture with a first hand to manipulate a foreground object and performing a gesture with a second hand to manipulate a background object:".

Conclusion

6. Any inquiry concerning this communication or earlier communications from the ably examiner should be directed to Jean Lesperance whose telephone number is (571) 272-7692. The examiner can normally be reached on from Monday to Friday between 10:OOAM and 6:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Hjerpe, can be reached on (571) 272-7691.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(571) 273-8300 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Jean Lesperance
Art Unit 2629

Date 1/28/2008

RICHARD HJERPE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/428,521	07/03/2006	WAYNE WESTERMAN	10684-20086.07	4142

69753 7590 07/09/2008

APPLE C/O MORRISON AND FOERSTER ,LLP
LOS ANGELES
555 WEST FIFTH STREET SUITE 3500
LOS ANGELES, CA 90013-1024

EXAMINER	
NADKARNI, SARVESH J	
ART UNIT	PAPER NUMBER
2629	

MAIL DATE	DELIVERY MODE
07/09/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/428,521	WESTERMAN ET AL.	
	Examiner	Art Unit	
	SARVESH J. NADKARNI	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 February 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) *1-2* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-5,8 and 9* is/are rejected.

7)☒ Claim(s) *6 and 7* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the Amendment filed November 1, 2007, and further in accordance with the Response to Election/Restriction filed February 27, 2008, in relation to Application Number: 11/428,521 (hereinafter referred to as "amendment"). Applicant has elected Group II claims 3-9 for examination without traverse. Of these, no claims have been amended or newly added. Therefore, claims 3-9 are currently pending.

NOTE: This application has been transferred to Examiner Sarvesh J. Nadkarni; although Applicant may notice formatting and stylistic changes from the First Office Action, all substantive matters have been addressed in accordance with guidelines as established by the MPEP, and further, in accordance with Applicant's amendment.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 3 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The phrase "computing…an assignment fitness measure" has not been adequately described in the specification. Appropriate correction is required. Strictly for purposes of examination, this language is given the broadest reasonable interpretation in view of the originally filed specification and is understood to mean

"assignment algorithm taking into account all of the contact positions at once" (see paragraph [0175] in the specification).

Double Patenting

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claims 3 of the instant application is unpatentable under the judicially created doctrine of obviousness-type double patenting with respect to claim 65 of parent U.S. Patent No. 6,323,846 (hereinafter referred to as the '846 patent) Application claim 3 defines an obvious variation of the invention claimed in the '846 patent. Claim 3 of the instant application is therefore anticipated by '846 patent claim 65 in that claim 65 of the '846 patent contains all the limitations of claim 3 of the instant application. Claim 3 of the instant application therefore is not patently distinct from the earlier patent claim and as such is unpatentable for obvious-type double patenting. This is therefore a double patenting rejection. The following chart exemplifies the coextensive scope of the presented claim 3 in Application 11/428,521 and U.S. Patent No. 6,323,846, claim 65.

U.S. Patent No. 6,323,846 claim 65	Currently Examined Application: 11/428,521, Claim 3
65. A method for determining which hand causes each surface contact detected on a multi-touch surface so that input signals generated by hand activity on the surface can depend on the identity of the hand performing the activity and so that multiple hands can	3. A method for determining which of a user's hands causes each of a plurality of surface contacts detected on a multi-touch surface, the method comprising:

perform independent activities on the surface simultaneously, the method comprising the steps of:	
defining a template of hand part attractor points on the surface, the attractor points for each hand approximately forming a ring;	defining a template of hand part attractor points on the surface;
generating partitions which divide the set of all surface contacts into left hand clusters and right hand clusters;	partitioning the plurality of surface contacts into at least one left hand cluster and at least one right hand cluster;
assigning finger and palm identities to the contacts within each cluster;	assigning identities to one or more contacts within each cluster;
computing for each partition an assignment fitness measure which represents the biomechanical consistency of the fit of contact clusters to their assigned attractor rings;	computing for each partitioned cluster an assignment fitness measure;
choosing the partition which has the best assignment fitness measure as the partition containing the true contact identities; and	and choosing the partitioned cluster that has the best assignment fitness measure.
recognizing each hand's configuration from the combination of and features of surface	

contacts assigned within each attractor ring of the best partition.	

3. The instant application claim is broader in every aspect than the patent claim and is therefore an obvious variant thereof. Although the conflicting claims are not identical (as demonstrated above with non-identical terms of the '846 patent underlined) they are not patentably distinct from each other because claim 3 of the currently examined application is generic to all that is recited in claim 65 of the '846 patent.

4. Additionally, claims 5, 6, 8 and 9 of the currently examined application correspond with and have all the same limitations as claim 68, 69, 71 and 72 respectively of the '846 patent and are similarly dependent from the above rejected claims 3.

Claim Objections

5. Claim 8 is objected to because of the following informalities: the element "attractor ring" is not introduced using proper antecedent basis format; the article "a" or "an" is used to introduce an element, whereas "the" or "said" is used to refer to a previously introduced element or step. "Attractor ring" was previously introduced in claim 4, upon which **claim 8** DOES NOT depends. Appropriate correction is required

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bisset et al., (U.S. Patent Number: 5,825,352) hereinafter referred to as "Bisset" further in view of Shieh (U.S. Patent Number: 5,835,079) hereinafter referred to as "Shieh".

8. With regard to claim 3, Bisset clearly teaches **a method for determining which of a user's hands causes each of a plurality of surface contacts detected on a multi-touch surface** (see at least column 2 lines 38-55 describing multi-touch contacts)**, the method comprising: defining a template of hand part attractor points on the surface** (see at least FIGs. 3 and 4 and further described at least at column 6, lines 26-58)**; partitioning the plurality of surface contacts into at least one left hand cluster and at least one right hand cluster** (see at least FIGs. 7C and 7D wherein the device is capable of exemplary operations deciphering input from one, two or three fingers further described at least at column 12 lines 15-end and further described at least at column 13 lines 59-end)**; assigning identities to one or more contacts within each cluster** (see at least FIGs. 7A-F and further FIGs. 8 and 9 further described at least at column 13, lines 59-end and continued at column 14 lines 3-end describing assignment of identities to the contacts)**; computing for each partitioned cluster an assignment fitness measure** (see at least FIGs. 8 and 9 described at least at column 14, lines18-22 determining whether the contact has been made based on algorithm)**; and choosing the partitioned cluster that has the best assignment fitness measure (**see FIGs. 8 and 9 described at least at column 14, lines 18-65, determining the best suit for the number of fingers based on input)**.**

9. Bisset does not explicitly teach determining which of the **hands** causes the contact. In the same field of endeavor, Shieh clearly teaches **hand** recognition (see at FIGs. 2, 5 and 6 further described at least at column 3, lines 52-end and also at column 4, lines 51-65 and also lines 31-54) It would have been obvious to one having ordinary skill in the art at the time the invention was made to have been motivated to combine the hand recognition and multiple input device as taught by Shieh into the multiple input device of Bisset because both are within the same field of endeavor and also because of the commonly understood need to improve and increase productivity of the touch device in order to meet or exceed that of the input devices available (see Bisset at least at column 2, lines 8-14).

10. With regard to claim 4, Bisset in view of Shieh clearly teaches **the method of claim 3** (see above) **wherein the attractor points for each hand approximately form a ring** (see Shieh at least FIG. 5, depicting a ring-like formation further described at least at column 4, lines 51-65)**.**

11. With regard to claim 5, Bisset in view of Shieh clearly teaches **the method of claim 3** (see above)**, wherein each attractor point is placed at an expected position of a corresponding hand part** (see Shieh at least FIG. 5 further described at least at column 4, lines 51-65)**.**

12. With regard to claim 8, Bisset in view of Shieh clearly teaches **the method of claim 3** (see above)**, wherein each attractor ring is translated, scaled and/or rotated to match previous position estimates for the hand corresponding to the attractor ring** (see Shieh at least at FIG. 5 further described at column 4, lines 51-65 describing translating and re-defining the activated areas)

13. With regard to claim 9, Bisset in view of Shieh clearly teaches **the method of claim 3** (see above)**, wherein the attractor points within each ring are individually offset by previously estimated finger offsets** (see at least FIGs. 2, 3, 5and 6 further described at least at column 3 lines 52-end and additionally at column 4, lines 1-67 further described at column 8, lines 31-end).

Allowable Subject Matter

14. Claims 6 and 7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

15. The following is a statement of reasons for the indication of allowable subject matter:

With regard to claim 6, Bisset in view of Shieh clearly teaches **the method of claim 3** (see above)**,** but does not explicitly teach **wherein partitioning the plurality of surface contacts further comprises: constructing approximately vertical contours between each pair of horizontally adjacent contacts; and constructing a partitioned cluster from each contour by tentatively assigning contacts that are positioned left of the contour to the left hand cluster and contacts right of the contour to the right hand cluster.**

With regard to claim 7, Bisset in view of Shieh does not explicitly teach **the method of claim 6 further comprising locking one or more previously identified contacts to one of the left or right hand clusters so to not depend on which side of the contour the one or more previously identified contacts lie.**

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SARVESH J. NADKARNI whose telephone number is (571)270-1541. The examiner can normally be reached on 11AM-7PM EST Monday - Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amare Mengistu can be reached on 571-272-7674. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Sarvesh J. Nadkarni
Examiner – Art Unit 2629

/Amare Mengistu/
Supervisory Patent Examiner, Art Unit 2629

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/428,522	07/03/2006	WAYNE WESTERMAN	10684-20086.06	4146

69753 7590 09/02/2008

APPLE C/O MORRISON AND FOERSTER ,LLP
LOS ANGELES
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LOS ANGELES, CA 90013-1024

EXAMINER	
SHAPIRO, LEONID	
ART UNIT	PAPER NUMBER
2629	

MAIL DATE	DELIVERY MODE
09/02/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/428,522	WESTERMAN ET AL.	
	Examiner	Art Unit	
	Leonid Shapiro	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
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Status

1)☒ Responsive to communication(s) filed on *22 May 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) *11-15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☒ Claim(s) *7-10* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1-6 are rejected under 35 U.S.C. 102(e) as being anticipated by Ure (6,107,997).

As to claim 1, Ure teaches a method for tracking and identifying contacts in a sequence of proximity images (col. 2, lines 13-17), the method comprising:

segmenting each proximity image (in reference 9 regions) (fig. 4-5-6) into a plurality of groups of electrodes (in reference - conductive lines) (fig. 6, col. 10, lines 28-39) or 0.1 square touch sensors (fig. 5) which indicate significant proximity (figs. 5-6), wherein at least one group represents proximity of a distinguishable contact (fig. 5, item pattern, col. 2, lines 59-60);

extracting from at least one group of electrodes (in reference - conductive lines) (fig. 6, col. 10, lines 28-39) or 0.1 square touch sensors (fig. 5) one or more parameters - position, shape, size, and orientation parameters from each group of electrodes (fig. 5, item pattern, from col. 6, line 64 to col.7, line 6 and fig. 6, items 4-5,4-7,4-8, col. 8, lines 42-58).

As to claim 2, Ure teaches tracking a path of one or more groups through successive proximity images (fig. 5, item pattern, from col. 6, line 64 to col.7, line 6 and fig. 6, items 4-5,4-7,4-8, col. 8, lines 42-58).

As to claim 3, Ure teaches detection of one or more path endpoints corresponding to a contact touchdown or liftoff (col. 6, lines 42-44).

As to claims 4-6, Ure teaches computing at least one of velocity and position vectors along each path (fig. 5, item pattern, from col. 6, line 64 to col.7, line 6).

Allowable Subject Matter

2. Claims 7-10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Relative to claim 7 the major difference between the teaching of the prior art of record (Ure) and the instant invention is that the estimates of contact positions provide feedback to segmentation and contact identification of future images.

Relative to claim 8 the major difference between the teaching of the prior art of record (Ure) and the instant invention is that assigning a contact identity to at least one group by incorporating at least one of: relative path positions and velocities, individual contact features, and previous estimates contact positions.

Claims 9-10 depend on claim 8.

Response to Arguments

3. Applicant's arguments with respect to claims 1-7 have been considered but are moot in view of the new ground(s) of rejection.

Telephone inquire

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonid Shapiro whose telephone number is 571-272-7683. The examiner can normally be reached on 8 a.m. to 5 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Hjerpe can be reached on 571-272-7691. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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02.09.08
/L. S./
Examiner, Art Unit 2629

/Richard Hjerpe/
Supervisory Patent Examiner, Art Unit 2629

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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/428,506	07/03/2006	WAYNE WESTERMAN	106842008604	4122

69753 7590 09/15/2008

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EXAMINER	
SHENG, TOM V	
ART UNIT	**PAPER NUMBER**
2629	

MAIL DATE	DELIVERY MODE
09/15/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/428,506	WESTERMAN ET AL.	
	Examiner	Art Unit	
	TOM V. SHENG	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

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Status

1)☒ Responsive to communication(s) filed on *28 May 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

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7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 July 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Claim Objections

1. Claims 1 and 11 are objected to because of the following informalities:

As for claim 1, line 4, need to insert “of” before “fingertips”.

As for claims 11, line 4, need to insert “of” before “fingertips”.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 2 and 11 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Bisset et al. (US 5,825,352).

As for claim 1, Bisset teaches a method for mapping gestures performed on a multi-touch surface to simulate mouse manipulations (column 11 lines 16-23), the method comprising:

generating mouse pointer motion signals in response to translational slides of a first predetermined number of fingertips (from periods 700 thru 705, cursor movement is performed by the relative motion of a single/first finger <first number of fingertips>; column 13 lines 4-8);

generating a single mouse click signal in response to a synchronized tap of a second predetermined number of fingertips (from periods 710 thru 720, a select function is carried out by a single finger tap of a second finger <second number of fingertips>;

column 13 lines 8-12); and

generating mouse drag signals in response to translational slides of a third predetermined number of fingertips (from periods 740 thru 750, a drag function is carried out by moving both first and second fingers <third number of fingertips> across the sensor; column 13 lines 12-22).

Note: the number of fingertips used for each case is not restricted as shown but could also be defined differently (column 13 lines 1-4). For example, the two finger tap (periods 760 thru 770) defined as a double-click could be defined as a single click instead; and the three finger move (periods 800 thru 810) defined as a scroll could be defined as a drag instead.

As for claim 2, Bisset teaches generating a double mouse click signal in response to a synchronized tap of a fourth predetermined number of fingertips (from periods 760 thru 770, a double click function is performed by a double finger tap of both first and second fingers <fourth number of fingertips>; column 13 lines 23-31).

Claim 11 is rejected over the rejections of claims 1 and 2.

Double Patenting

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir.

1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

5. Claims 1-15 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 105-118 of U.S. Patent No. 6,323,846. Although the conflicting claims are not identical, they are not patentably distinct from each other because the inventive ideas are in the patent.

Detailed rejection analyses for claim 1 are listed below:

Claim 1	Patent 846'	Comparison
A method for mapping gestures performed on a multi-touch surface to simulate mouse manipulations, the method comprising.	Claim 118: A method for mapping gestures performed on a multi-touch surface by a right hand to simulate mouse manipulations, the method comprising the steps of.	Both on mapping a multi-touch to a corresponding mouse manipulation.
Generating mouse pointer motion signals in response to translational slides of a	Claim 118: Generating mouse pointer motion signals in response to	Two fingertips correspond to the first predetermined number of fingertips.

first predetermined number of fingertips.	translational slides of two fingertips.	
Generating a single mouse click signal in response to a synchronized tap of a second predetermined number of fingertips.	Claim 118: Generating a single mouse click signal in response to a synchronized tap of two fingertips.	Two fingertips correspond to the second predetermined number of fingertips.
Generating mouse drag signals in response to translational slides of a third predetermined number of fingertips.	Claim 118: Generating mouse drag signals in response to translational slides of three fingertips.	Three fingertips correspond to the third predetermined number of fingertips.

Patent 846' teaches that the mapping is specifically by a right hand while claim 1 of application has no such designation. However, one of ordinary skill in the art would recognize that the designation is not limited as such. Moreover, claim 1 of the application is the broader claim of the two. Therefore, it would have been obvious that the two claims are in fact functionally equivalent.

Similarly, claims 2-15 are rejected over claims 105-118 of Patent 846'.

Response to Arguments

6. Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection. Since new rejections are not based on

prior officer actions and there is no amendment to the claims, this action is made non-final.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TOM V. SHENG whose telephone number is (571)272-7684. The examiner can normally be reached on 9:00am - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Hjerpe can be reached on (571) 272-7691. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Tom Sheng

/Richard Hjerpe/
Supervisory Patent Examiner, Art Unit 2629

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/428,515	07/03/2006	WAYNE WESTERMAN	10684-20086.05	4133

69753 7590 10/31/2008

APPLE C/O MORRISON AND FOERSTER ,LLP
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LOS ANGELES, CA 90013-1024

EXAMINER	
PERVAN, MICHAEL	
ART UNIT	PAPER NUMBER
2629	

MAIL DATE	DELIVERY MODE
10/31/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/428,515	WESTERMAN ET AL.	
	Examiner	Art Unit	
	Michael Pervan	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 May 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,9-11,15 and 16* is/are rejected.

7)☒ Claim(s) *5-8 and 12-14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 July 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

9DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-16 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1, 9 and 15-16 are rejected under 35 U.S.C. § 112, first paragraph, as being of undue breadth.

A "single means" claim, i.e. where a means recitation does not appear in combination with another recited element or means, is subject to an undue breadth rejection under 35 U.S.C. 112, first paragraph. See In re Hyatt, 218 USPQ 195, (CAFC 1983) and MPEP 2164.08(a).

2164.08(a) Single Means Claim

A single means claim, i.e., where a means recitation does not appear in combination with another recited element of means, is subject to an undue breadth rejection under 35 U.S.C. 112, first paragraph. In re Hyatt, 708 F.2d 712, 218 USPQ 195 (Fed. Cir. 1983) (A single means claim which covered every conceivable means for achieving the stated purpose was held nonenabling for the scope of the claim because the specification disclosed at most only those means known to the inventor). When claims depend on a recited property, a fact situation comparable to Hyatt is possible, where the claim covers every conceivable structure (means) for achieving the stated property (result) while the specification discloses at most only those known to the inventor. Although the court in Fiers v. Sugano, 984 F.2d 164, 25 USPQ2d 1601 (Fed. Cir. 1993) did not decide the enablement issue, it did suggest that a claim directed to all DNAs that code for a specified polypeptide is analogous to a single means claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-4 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amro et al (US 6,278,443) in view of Shieh (US 5,748,184).

In regards to claim 1, Amro discloses a method for mapping gestures performed on a multi- touch surface to graphical user interface commands, the method comprising generating a pan (scrolling in any direction) command in response to detecting a finger translation on the multi-touch surface (col. 5, lines 36-51).

Amro does not disclose detecting whole hand translations.

Shieh discloses detecting whole hand translations (col. 2, lines 23-32).

It would have been obvious at the time of invention to modify Amro with the teachings of Shieh, detecting a handprint, because it would allow object icons and text to be placed close to one another and allow user customization of the pointing device and pointer (col. 2, lines 13-15).

In regards to claim 2, Amro discloses the method of claim 1 further comprising generating a rotate command in response to detecting a finger rotation on the multi-touch surface (col. 5, lines 36-51).

Amro does not disclose detecting hand translations.

Shieh discloses detecting hand translations (col. 2, lines 23-32).

It would have been obvious at the time of invention to modify Amro with the teachings of Shieh, detecting a handprint, because it would allow object icons and text to be placed close to one another and allow user customization of the pointing device and pointer (col. 2, lines 13-15).

In regards to claims 3 and 10, Amro does not disclose the method of claim 2 wherein the hand rotation is rotation about a wrist.

Amro discloses wherein the hand rotation is rotation between fingers (col. 5, lines 39-41; since the fingers are being rolled the hand rotation is between fingers).

Since there is no benefit or advantage described in the specification for choosing hand rotation about a wrist or between fingers, it would have been obvious to one of ordinary skill in the art at the time of invention to choose either having hand rotation between fingers or about a wrist based on a design choice.

In regards to claims 4 and 11, Amro discloses the method of claim 2 wherein the hand rotation is rotation between fingers (col. 5, lines 39-41; since the fingers are being rolled the hand rotation is between fingers).

In regards to claim 9, a method for mapping gestures performed on a multi- touch surface to graphical user interface commands, the method comprising generating a rotate command in response to detecting hand rotation on the multi-touch surface (col. 5, lines 36-51).

Amro does not disclose detecting hand translations.

Shieh discloses detecting hand translations (col. 2, lines 23-32).

It would have been obvious at the time of invention to modify Amro with the teachings of Shieh, detecting a handprint, because it would allow object icons and text to be placed close to one another and allow user customization of the pointing device and pointer (col. 2, lines 13-15).

Allowable Subject Matter

6. Claims 5-8 and 12-14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Pervan whose telephone number is (571) 272-0910. The examiner can normally be reached on Monday - Friday between 8am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amr Awad can be reached on (571) 272-7764. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MVP

/Amr Awad/
Supervisory Patent Examiner, Art Unit 2629

Oct. 27, 2008

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/428,522	07/03/2006	WAYNE WESTERMAN	10684-20086.06	4146

69753 7590 02/17/2009

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LOS ANGELES, CA 90013-1024

EXAMINER	
SHAPIRO, LEONID	
ART UNIT	**PAPER NUMBER**
2629	

MAIL DATE	DELIVERY MODE
02/17/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/428,522	WESTERMAN ET AL.	
	Examiner	Art Unit	
	Leonid Shapiro	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

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Status

1)☒ Responsive to communication(s) filed on *02 December 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) *11-15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,16-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

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11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

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6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1,3-10,16-19 are rejected under 35 U.S.C. 102(e) as being unpatentable over Furuhata et al. (5.,943,043).

As to claim 1, Furunata et al. teaches a method for tracking and identifying contacts on a touch surface in a sequence of proximity images (fig.1, col. 1, lines 8-14), the method comprising:

segmenting each proximity image into a plurality of locations which indicate significant proximity, wherein at least one group represents proximity of a distinguishable contact (figs. 1-3, items 52,58,60,64, col. 4, lines 23-36);

extracting from at least one group of locations position (col. 37-51); and

tracking paths for a plurality of groups through successive proximity images (fig. 4, items Steps 60,110).

Furunata et al. does not disclose segmenting each proximity image into a plurality of groups of electrodes which indicate significant proximity.

However, Furunata et al. teaches right, left boundaries, limits (fig. 2, items 36R-36L,60R,60C,60L, col. 4, lines 36-65).

It would have been obvious to one of ordinary skill in the art at the time of the invention to identify limits, boundaries with a plurality of groups of electrodes **in the X direction** (col. 4, lines 19-22 in the Furunata et al. reference).

As to claims 16-17, Furunata et al. teaches a method for tracking and identifying contacts on a touch surface in a sequence of proximity images (fig.1, col. 1, lines 8-14), the method comprising:

segmenting each proximity image into a plurality of locations which indicate significant proximity, wherein at least one group represents proximity of a distinguishable contact (figs. 1-3, items 52,58,60,64, col. 4, lines 23-36);

extracting from at least one group of locations position (col. 37-51); and

tracking paths for a plurality of groups through successive proximity images (fig. 4, items Steps 60,110);

computing position vectors along each path (fig. 4, items Steps 60,110);

assigning a contact identity to at least one group by incorporating at least one of relative path positions and velocities, individual contact features, and previous estimates contact positions (fig. 4, items Steps 60,110);

maintaining estimates of contact positions from trajectories of paths currently assigned to the contacts, wherein the estimates of contact positions provide feedback to segmentation and contact identification of future images (fig. 1, 4, items Step 120).

Furunata et al. does not disclose segmenting each proximity image into a plurality of groups of electrodes which indicate significant proximity.

However, Furunata et al. teaches right, left boundaries, limits (fig. 2, items 36R-36L,60R,60C,60L, col. 4, lines 36-65).

It would have been obvious to one of ordinary skill in the art at the time of the invention to identify limits, boundaries with a plurality of groups of electrodes **in the X direction** (col. 4, lines 19-22 in the Furunata et al. reference).

As to claim 3, Furunata et al. teaches tracking group paths through successive proximity images further comprises detection of one or more path endpoints corresponding to a contact touchdown or liftoff (fig. 4, item Step 10).

As to claims 4-5, Furunata et al. teaches computing position vectors along each path (fig. 4, items Steps 60,110).

As to claims 7-10,18-19 Furunata et al. teaches Claim 7 (original): the estimates of contact positions provide feedback to segmentation and contact identification of future images, assigning a contact identity to at least one group by incorporating at least one of relative path positions (fig. 1, items 34,36,40,42,44, from col. 3, line 54 to col. 4, line 13).

Response to Arguments

2. Applicant's arguments with respect to claims 1, 3-10,16-19 have been considered but are moot in view of the new ground(s) of rejection.

Telephone inquire

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonid Shapiro whose telephone number is 571-272-7683. The examiner can normally be reached on 8 a.m. to 5 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Hjerpe can be reached on 571-272-7691. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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02.08.09
/L. S./
Examiner, Art Unit 2629

/Richard Hjerpe/

Supervisory Patent Examiner, Art Unit 2629

Notice of Allowability	Application No.	Applicant(s)	
	11/428,521	WESTERMAN ET AL.	
	Examiner	Art Unit	
	TOM V. SHENG	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *amendment filed on 11/10/08*.

2. ☒ The allowed claim(s) is/are *3-9*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 12/11/08
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/Richard Hjerpe/
Supervisory Patent Examiner, Art Unit 2629

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Cancel claims 1 and 2.

Election/Restrictions

2. This application is in condition for allowance except for the presence of claims 1 and 2 directed to a group non-elected without traverse. Accordingly, claims 1 and 2 have been cancelled.

Information Disclosure Statement

3. The information disclosure statement filed on 12/11/2008 has been considered. However, line item CG has been crossed out since that item could not be located. Applicant is advised to re-submit the item of information for consideration.

Terminal Disclaimer

4. The terminal disclaimer filed on 11/10/2008 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of

patent No. 6,323,846 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Allowable Subject Matter

5. Claims 3-9 are allowed.

6. The following is an examiner's statement of reasons for allowance: none of the prior art of record teaches the method in determining the best fitting partition with respect to the template of left and right hands' hand part attractor points, as in claim 3. Claims 4-9 are dependent from claim 3.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TOM V. SHENG whose telephone number is (571)272-7684. The examiner can normally be reached on 9:00am - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Hjerpe can be reached on (571) 272-7691. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Tom Sheng

/Richard Hjerpe/
Supervisory Patent Examiner, Art Unit 2629

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EXAMINER	
SHENG, TOM V	
ART UNIT	PAPER NUMBER
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DATE MAILED: 02/11/2009

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

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HAND TRACKING, FINGER IDENTIFICATION, AND CHORDIC MANIPULATION ON A MULTI-TOUCH SURFACE

by

Wayne Westerman

A dissertation submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Electrical Engineering

Spring 1999

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by

Wayne Westerman

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John Scholz, Ph.D.
Member of dissertation committee

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This manuscript is dedicated to:

My mother, Bessie,

who taught herself to fight chronic pain in numerous and clever ways,

and taught me to do the same.

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