EXHIBIT D

TO PLAINTIFFS' P.R. 4-5(c) REPLY BRIEF REGARDING CLAIM CONSTRUCTION

UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF TEXAS

IP INNOVATION, LLC., and)
TECHNOLOGY LICENSE)
CORPORATION,)
Plaintiff,) No.
vs.) 2:07-CV-503-LED
GOOGLE, INC.,)
Defendant.)
_____)

VIDEOTAPED TELEPHONIC DEPOSITION OF

HINRICH SCHUETZE

Palo Alto, California

Tuesday, February 24, 2009

HIGHLY CONFIDENTIAL -- ATTORNEYS' EYES ONLY

REPORTED BY:

JAY W. HARBIDGE

CSR NO. 4090

A. Yes.
Q. What does that mean, a data structure?
MR. HALL: Objection, the patent speaks for itself.
THE WITNESS: I mean, in the simplest case it could be just a list. I mean, well, I guess an array of words, the words that are covered in the thesaurus, and each array element is appointed to a list and the list contains all related words. That might be the simplest data structure you could think of.
BY MR. HINTZ:
Q. Can the data structure also take the form of a matrix?
A. Potentially. But I mean, I would think that that's not what's meant here. But I mean, if you really want to, of course you can -- what I just said, you can represent that as a matrix. But that would be a very inefficient data structure to use for what I just described.
Q. Why is that?
A. Because if you have, let's say, 100,000 words, or let's say a million words, then you have a matrix with one million times one million entries and most of them would be zeros. So why -- the

zeros would be useless. So why represent all those zeros if you can just use a list?
Q. The patent that you have, the '819 patent, in column one, line 9 to 12 says:
"More particularly, this invention determines the cooccurrence patterns of words in a document to form a thesaurus of word vectors."
Do you see that?
A. Yes.
Q. What form is the thesaurus in that is referred to here?
A. I mean, it's kind of a subtle distinction, and maybe I'm contradicting what the patent says here. But I mean, the way the list is computed is by computing the similarity between a word and all the other words, and those words are represented as vectors. But then what you actually use is just that rank list.
So the matrix is the representation that you derive the thesaurus from. But I don't remember particular methods for applying the thesaurus are given here. But I mean, the simplest way of applying the thesaurus is to say, "Okay, I have a word here. The thesaurus tells me that this other

word is equivalent, so I can substitute it." So for that you need a list, is the simplest way of doing that.
So, I mean, reading this now, I would interpret this as saying this is just describing how you get to that list and -- yeah. Because once you have that rank list, even though you used the word vectors to compute the rank list, you actually don't use the word vectors anymore. I mean, you can, of course in some cases, use them, but if you're strictly talking about thesaurus in the literal sense of the word, then I think it's more of a list.
Q. We just introduced this term "vectors," or perhaps it's even been something you've talked about before now. But in this column one, the last word of the first paragraph, in about line 11 or 12 there is "vectors," and it's in relation to "word vectors."
What is a vector?
MR. HALL: Objection, calls for speculation.
THE WITNESS: I mean, the assumption here is that you have a high-dimensional space, and in this case the high-dimensional space is a space in which each dimension corresponds to a word. And

then in a high-dimensional space you have points. And then you have a vector pointing to that point, I mean, kind of the line connecting the origin with that point. And so that's the word vector.
BY MR. HINTZ:
Q. Now, the way you described it, that's a graphical representation of a vector?
A. Yes.
Q. Is there also a numeric or mathematical representation?
A. The mathematical representation is that you take the point and its coordinants and you list all the coordinants. So that's the -- in that case it's a vector of numbers.
Q. In column one, lines 16 to 18, I'll paraphrase, but you're referring to prior systems where the usual approach was to use vectors. Do you see that?
A. Yes.
Q. So the use of vectors in information retrieval had been around for a long time before --
A. For a long time, yes.
MR. HINTZ: Let me hand you what the reporter will mark as Exhibit 7.
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Q. Prior to filing the application?
A. I think so, yes.
Q. At the time you did that work, did you reach any conclusion about whether tri-grams or fourgrams were better, one compared to the other, as far as performance of what you were trying to do?
A. I think what I found was that fourgrams were better than three-grams.
Q. Prior to filing your patent application, did you ever determine whether fourgrams were better than using actual words in performing the functions that are described in your patent?
A. I think my sense was that words are better than N-grams for a carefully edited text like the New York Times. But if you have many spelling errors or OCR output, then letter N-grams have some advantages.
Q. So when we're looking at the Summary of the Invention in this column four and we talked about the two steps, the second step was coming up with a similarity measure, and the one example that we've looked at was cosign function --
A. Uh-huh.
Q. -- were there other similarity measures that you investigated prior to filing your patent

application?
A. I mean, so I mean, it depends a little bit on how you -- what division of labor you assume between the vectors and the similarity measure because, I mean, just to give you an example, usually it's not a good idea to use counts in the vectors, simple counts like five, six, seven or ten. Usually it is better to transform them using a function like square root or logarithm.
So I did experiments on which transformation of the count was the best thing to do. But I mean, the ultimate measure that was used on, you know, the post-transformation vectors was always the cosign, as far as I remember.
Q. What do you mean that you did experiments on which transformations were the best?
A. I think I did experiments on both using either logarithm or square root and looked at what happened.
Q. And this was prior to filing your application?
A. Yes.
Q. What did you conclude?
A. I don't think there was a clear conclusion. It didn't seem to matter. But counts

are definitely bad. Don't use counts directly.
Q. So prior to filing your application, you knew that either log or square root would be better than just using a straight count?
A. Yes.
Q. Now, the cosign calculation that's used to determine similarity, when the math is all done, does that result in a number?
A. Yes.
Q. A decimal? Well, I guess it could be --
A. A number between minus-one and one.
Q. So there are negative correlations?
A. There are negative correlations, yes. I mean, I'm not sure whether the work described here would ever lead to negative correlations, but in some setups you do have negative correlations.
Q. So when one is performing a comparison using the cosign function on two objects, whatever they are, is it the closer the number is to the number one means the closer those objects are to each other, the more similar they are?
A. The more similar, yes.
Q. So that the most similar would yield -- the ultimate score, if you will, would be one?
A. Yes.

Q. And the farther away you are from one is the less similar?
A. Correct.
Q. Did you, prior to filing your application, do any kind of analysis or experiments to determine what number led to a conclusion that items were similar or dissimilar, whether there was a cutoff, point .75, .6, .5? Did you ever do that kind of work?
A. I don't recall.
MR. HINTZ: This is probably a good time for us to break for lunch. Mr. Hall, is that okay with you?
MR. HALL: That's fine with us.
MR. HINTZ: Okay.
MR. HALL: For planning, how long do you think you're going to go before we get a chance in the afternoon? I know you're not -- I'm not going to hold you to it.
MR. HINTZ: No, no, no. That's a legitimate question. I think it could be another hour and a half or so, maybe two hours.
MR. HALL: Okay.
THE VIDEOGRAPHER: Going off the record, the time is 12:14 p.m.

A. Correct.
MR. HINTZ: I think we're about to run out of recording time, so we should probably take a break so that can be switched.
THE VIDEOGRAPHER: We're going off the record, the time is 1:54 p.m.
(Brief recess.)
THE VIDEOGRAPHER: Back on the record, the time is 2:06 p.m.
BY MR. HINTZ:
Q. If you would look in Exhibit 10, the second page, item 2, Related Work, the fifth line says:
"Gallant, G-a-l-l-a-n-t (1991), Gallant, et al., (1992) present a less labor-intensive method based on microfeatures, but the features for core stems still have to be encoded by hand for each new document collection. The derivation of the word space presented here is fully automatic. It also uses feature vectors to represent words, but the features cannot be interpreted on their own."
Do you see that?
A. Yes.

Q. What did you mean by "the features cannot be interpreted on their own"?
A. I think I was referring to the fact that if you do a singular value decomposition, then you get a reduced space with fewer dimensions. But the dimensions in that reduced space are -- I mean, that's my opinion. The opinions expressed in the paper are not interpretable anymore. They don't have any pure semantic content. The aggregate patterns of all of them together means something, but not the features individually.
Q. And then another distinction you pointed out here was that Gallant encodes things by hand whereas word space is automatic; is that right?
A. Right.
Q. The next sentences say:
"The Vector similarity is the only information present in word space: Semantically related words are close, unrelated words are distant. The emphasis on semantic similarity rather than decomposition into interpretable features is similar to Kawamoto (1998)."
Do you see that?
A. Yes.

Q. What is Kawamoto?
A. He's a cognitive scientist, and I was kind of inspired by his work when I first started working on this.
Q. And the reference on the page that I just read, the Kawamoto paper, is listed on the last page of Exhibit 10; is that right?
A. Yes.
Q. Did you provide that paper by Kawamoto to your attorneys who worked on your patent application that led to the '819 patent?
A. I don't remember.
Q. Did you provide the word space paper, Exhibit 10, to the attorneys who worked on your patent application that led to the '819 patent?
A. I don't remember if I did or not.
Q. If we could go back to the Dimensions of Meaning paper quickly, I forgot to ask something. It's Exhibit 9.
On page 6, where section four begins, under 4.1, Window Size, there was a reference in the sentence that I read to a context vector, and I neglected to ask you what that means in this paper. What does context vector mean as used here?
A. I think I've used different definitions

of it over time, so I should probably try and find the place where it's introduced. I mean, I think it refers to the sum of vectors in that window, so you take the vectors of the words occurring in that window and you sum them and then you get the context vector.
Q. Okay. And that -- I'm glad you mentioned how it might be used differently.
If you look back in the patent, Exhibit 3, column five --
A. Yes.
Q. -- line 5 to 7, is that a definition of context vector there? I should be specific, a context vector for a particular document?
A. I mean, it's a definition of context vector, yes.
Q. And it is defined as the weighted sums of the thesaurus vectors of all the words contained in the document, right?
A. I guess I'm puzzled why it would be plural. It would make sense to me if it just said, "The context vector is the sum of the 50 thesaurus vectors." I'm not sure what is referred to by the combination of the weighted sums.
Q. If you'd look in column 17 of the '819

patent, lines 16 through 20, it says:

"The document vectors that are computed are called 'context vectors.' The simplest approach is to represent each document by a vector, which is the sum of the thesaurus vectors for the words in its text."

Do you see that?

A. Yes.

Q. Is that the definition of "context vector" that you were just referring to?

MR. HALL: Objection, calls for speculation.

THE WITNESS: It's different, though, slightly from what is -- what we just looked at in the paper, right, because this is a vector of context; this is the vector of a document. But they're computed the same way, if that's what you're asking.

BY MR. HINTZ:

Q. I was just going back to when you commented that the description in column five did not seem accurate to you --

A. I didn't say that.

Q. Okay, I'm sorry.

A. It doesn't make sense to me and it is

different from -- it seems different to me from what you just pointed to. But where was that again?

Q. It's column 17, lines 16 to 20, or column five, line 4 to 7.

A. So column 17, lines 16 through 20, column 17, lines 16 through 20, that, I understand as a definition of "context vector." I'm not sure I understand column five, but this is referred to as a combination of the weighted sums of the thesaurus vectors.

Q. Is the description in column five, lines 5 to 7, inaccurate, to your understanding?

A. No.

MR. HALL: Objection to the use of the word "inaccurate." It's vague.

THE WITNESS: It's different -- I would think it is different from what is said in the other passage.

BY MR. HINTZ:

Q. All right. Well, this is in your patent. I'm trying to understand what "context vector" means, and do you agree with either definition that we've looked at?

A. I agree with the second.

Q. Okay.

A. Maybe the patent gives two different definitions.

Q. In your work in the early to mid 1990s, did you work with weighted sums of vectors?

A. Yes.

Q. I'm using some of the words in column five.

A. Yes, I did work with weighted sums of vectors.

Q. And what type of work did you do with weighted sums?

A. The weighting would come about through a weighting function on the window where the vectors closest to the center word would be rated higher than the vectors further apart from the word in the middle when computing context vectors.

Q. What results did that weighting provide in your work in your research?

A. My recollection is that I did a lot of experiments on that in the beginning, but then I later found that it actually didn't make a lot of difference, so I just used uniform weighting at some point.

But I mean, looking back at this supercomputing paper, the '92 paper, it seems like I

don't remember a lot of things that I did. So -- I mean, I'm looking at the window sizes here. I guess it has pretty detailed experimental results on that. And it also has -- you can actually see in Fig. 5 of the supercomputing paper the optimal dimension weights for -- oh, no, that's dimensions. That's different, sorry.

I'm just looking whether there are numbers on weights within a window or -- I don't think I published that. I'm not sure.

Q. I'd like to go back and talk about the time before your patent application was filed and talk about the work that you were doing.

You said earlier how Mr. Pedersen wanted you to file a patent application.

A. Yes.

Q. And did you write up a description of your work to be used as part of that process?

A. I think I did, yes.

Q. Do you remember an invention proposal?

A. I don't remember that.

Q. Let me show you a document that was produced, I believe, by Xerox, and it will be marked as Exhibit 11.

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understanding?
A. Yes, I guess -- I mean, I haven't been involved in the patent process for a number of years now, but I think that's what I -- what I remember, yes.
Q. And if you could, turn to the column five of your '819 patent, line 66.
A. Yes.
Q. It states, beginning on line 66:
"While this invention is described in some detail herein, with specific reference to illustrated embodiments, it is to be understood that there is no intent to be limited to these embodiments. On the contrary, the aim is to cover all of the modifications, alternatives and equivalents falling within the spirit and scope of the invention as defined by the claim."
So you understand, sir, that some of the examples of embodiments that Mr. Hintz was taking you through are not the only ones that your inventions could cover; is that correct?
A. I mean, I think that sounds correct to me.
Q. Maybe we can go through a couple of

those.
A. Okay, all right.
Q. With respect to a corpus, a corpus of documents can be defined by whoever sets up the particular system; is that correct?
A. That's correct.
Q. But for example, in a Google search system, Google would determine what the corpus of documents is; is that correct?
A. Whoever applies the plan would determine what the corpus is, correct.
Q. So in your '819 patent, a corpus of documents would not have to be limited to a particular subject; is that correct?
A. That's correct.
Q. Sir, when was the last time you read the file history in this case, or the file wrapper as we discussed?
A. I'm sorry, could you repeat the question, please?
Q. Yes, I was asking when was the last time you read the file wrapper or the file history in this case?
A. What's the file wrapper, the file history?

Q. It's Schuetze Exhibit 4. Actually, have you ever seen it before?
A. I don't recall having seen it.
MR. HALL: All right. Let's take five or ten minutes and I should be able to wrap up in about a half hour.
MR. HINTZ: Great.
THE VIDEOGRAPHER: Going off the record, the time is 4:30 p.m.
(Brief recess.)
THE VIDEOGRAPHER: Back on the record, the time is 4:42 p.m.
BY MR. HALL:
Q. Dr. Schuetze, could you turn in your patent, which is Schuetze Exhibit No. 3.
A. Yes.
Q. Please turn to column 24.
A. Yes.
Q. And about on line 37, it begins, it says, "I claim."
A. Yes.
Q. You understand that from that point on in your patent, it has the claims of your patent, correct?
A. Yes.

Q. And you have written patent claims before; is that correct?
A. Yes.
Q. And you understand that your patent claims are what define your invention?
A. Yes.
Q. And so do you understand with respect to Claim 1, your invention is the combination of all those elements as written in patent Claim 1; is that correct?
A. Yes.
Q. And your invention is the combination of those elements even if one or more of those elements were already known in the public; is that correct?
A. Yes.
Q. All right. Counsel for Google earlier talked a lot about singular value --
A. Decomposition.
Q. -- decomposition. Do you see the phrase "singular value decomposition" in paragraph one?
A. Give me a minute to read the claim.
Q. Okay.
A. No, in Claim 1 it doesn't mention singular value decomposition.
Q. All right. Could you turn to column 25,