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Attorney Docket No: **S96-213/PROV**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: 60/035,205
 Filed: 10 Jan 97
 Title: Improved Text Searching in Hypertext Systems
 Applicant(s): Lawrence Page
 Examiner: not yet assigned
 Art Unit: not yet assigned

TRANSMITTAL OF MISSING PARTS

THE COMMISSIONER OF PATENTS AND TRADEMARKS
 Washington, DC 20231

Sir:

I HEREBY CERTIFY THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL ON THE DATE OF DEPOSIT INDICATED BELOW AND IS ADDRESSED TO: ASSISTANT COMMISSIONER FOR PATENTS, WASHINGTON, DC 20231.
 DATE OF DEPOSIT 3/28/97
 SIGNED: *Thomas J. McFarlane* DATE 3/28/97
 THOMAS J. MCFARLANE REG. NO. 39,299

Transmitted herewith in the Provisional patent application identified above are:

- Small Entity Declaration; and
- A check in the amount of \$25 for the surcharge

Respectfully submitted,

Thomas J. McFarlane

Thomas J. McFarlane
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 426 Lowell Avenue
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Dated: 3/28/97

60035205 "OFFICE" 970328



01/10/97

PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53(b)(2)

Docket Number		S96-213		Type a plus sign (+) inside this box -->	+
INVENTOR(s) / APPLICANTS(s)					
LAST NAME	FIRST NAME	M.I.	RESIDENCE (CITY AND EITHER STATE OR FOREIGN COUNTRY)		
Page	Lawrence		Stanford, California CA		
TITLE OF INVENTION (280 characters max.)					
Improved Text Searching in Hypertext Systems					
CORRESPONDENCE ADDRESS					
THOMAS J. McFARLANE 426 LOWELL AVENUE PALO ALTO					
STATE	CA	ZIP CODE	94301	COUNTRY	UNITED STATES

- SPECIFICATION Number of Pages: 25
- Drawing(s) Number of Sheets: _____
- Small Entity Declaration
- Other (specify)

METHOD OF PAYMENT

- A check or money order is enclosed to cover the Provisional filing fee
- The Commissioner is hereby authorized to charge filing fees and credit Deposit Account Number _____

PROVISIONAL FILING FEE AMOUNT (\$): **75.00**

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

- No
- Yes, the name of the U.S. Government agency and the Government contract number are: National Science Foundation IRI-9411306-4

Respectfully submitted,

SIGNATURE: Thomas J. McFarlane DATE: 10 JAN 97
 NAME: THOMAS J. McFARLANE
 REG. NO.: 39,299

- Additional inventors are being named on separately numbered sheets attached hereto

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SIGNED	<i>Thomas J. McFarlane</i>	DATE	10 JAN 97
THOMAS J. MCFARLANE, REG. NO. 39,299			

Sir:

Transmitted herewith for filing is the provisional patent application of

Inventor(s): **Lawrence Page**

For: **Improved Text Searching in Hypertext Systems**

Enclosed are:

- Provisional Application Cover Sheet
- 25 pages of Specification
- _____ sheet(s) of drawings
- A verified statement to establish small entity status under 37 CFR 1.9 and CFR 1.27
- A check in the amount of \$75 to cover the filing fee.

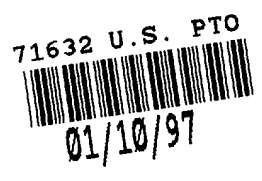
Respectfully submitted,

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Dated: 1/10/97

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S96-213



Provisional Patent Application of

Lawrence Page

for

Improved Text Searching in Hypertext Systems

5

FIELD OF THE INVENTION

10

This invention relates generally to techniques for database searching. More particularly, it relates to improved techniques for hypertext database searching.

DETAILED DESCRIPTION

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The following appendix, attached hereto, provides a detailed description of the invention.

Appendix A: **24** pages;

TOTAL appended pages: **24** (description and drawings).

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APPENDIX A

Improved Text Searching in Hypertext Systems

There is a demonstration system, called BackRub, usually available at <http://zam.stanford.edu:1972/> from within Stanford. Or, contact me, page@cs.stanford.edu to arrange for a demo.

Introduction and Summary

Existing search engines on the web produce very poor results when the query matches large numbers of documents. Yet, these simple queries are very frequently issued by users. Described here is a system which yields radically improved results for these queries using the additional information available from a large database of web links. This database of web citations is used to determine a citation importance ranking for every web page, which is then used to sort the query results. This system has been implemented, and yields excellent results, even on a relatively small database of four million web pages. Not only does the system yield better results, but it does so at significantly reduced computational cost, which can be a very large expense for web search engines¹. Demonstrating the improvement is as easy as picking a general query, for example "weather", and comparing the results to the results from a traditional web search engine, like AltaVista (the results section shows some sample queries).

Motivation and Discussion of System

Only recently with the advent of the web, have large numbers of people started to frequently search huge databases. The indexable part of the web is currently at least 60 million documents totaling around 480 gigabytes². AltaVista currently services 23 million user queries per weekday³. Many of these queries do not give people reasonable results, and improving this situation is a very important problem, especially as the web is growing very quickly⁴. The web search engines are the busiest sites on the entire web.

Many of the queries users perform in existing web search engines are simple one word queries which typically return tens of thousands of documents that match the query. This problem is only going to get worse as the web grows. Since people are only able to examine a handful of documents, only the highest ranked documents

¹AltaVista is run on several large computers that each cost around a million dollars. And, every time they add another machine, the demand increases instantly to fully utilize the new equipment.

²I recently downloaded 30 million web pages, and estimated this figure.

³From <http://altavista.digital.com/>.

⁴Some researches have claimed that the web has been doubling in size every 6 months or so.

are ever seen. Most current search engines rank documents according to how often the search terms appear relative to the size of the document, and how close the matched terms are to the beginning of the document. So, a typical search for "university" will yield all the documents that have the term "university" several times very close to the beginning of the document. This ranking method yields documents that are quite random and of low quality (see the attached results comparison section). Many experts would claim that the results for a query "university" are not good because the user has not specified enough information to narrow their search, and they should be searching for something like "stanford university professor winograd". However, if all the user knows is that they are interested in universities, it makes much more sense to return general documents of high "quality" or "importance" that seem to be about universities, rather than the top ten out of 50,000 documents which happen to "best" include the query terms. By analyzing all the links on every web page we can compute a useful ranking that approximates a "quality" or "importance" criteria.

My demonstration system, called BackRub, returns almost entirely university homepages for the query "university" (see the attached section for comparisons of the query results). These are much more reasonable results for this "university" query than the standard approach. For this query, and most other simple queries, this system gives greatly improved results over the standard searching methods in use today, and at significantly lower computational cost.

While the system gives great improvement for simple, under constrained, queries, it also works slightly better for very specific queries, like "Jeffrey Ullman". These specific queries work quite well in the existing search engines, because there are usually few documents that match, and any that match a query like "Jeffrey Ullman" are usually close to what you are looking for. So, since these queries work well in existing search engines, it is impossible to radically improve the results. However, my search engine will tend to return the most significant page that matches. In this case, BackRub finds Jeff's main home page and returns it first. It is interesting to note that the home page Jeff does not maintain, in the College of Engineering, with very little information, is returned last in my system as it should be (again see the attached results section). However, AltaVista returns Jeff's college of engineering page as the first matching Stanford page, which is clearly not correct. So, my system still improves the search a fair amount, but not as much as an under constrained query where we have to pick between tens of thousands of possible documents to return.

PageRank -- An Approximation to "Importance"

The reason why my system works so well, is that it decides which documents to return, and in what order, by using an approximation to how well cited, or "important" the matching documents are. I will call this approximation to importance PageRank from now on. Web pages get a higher PageRank from being mentioned on other pages. But, the PageRank a page gains from a citation is based

on the PageRank of the page that cites it. This definition may sound circular because it is in fact circular. But, it turns out with a few small modifications, we can still compute a PageRank of this form. So a page can have high PageRank even if it only has one citation, such as from an ad on the Yahoo home page, which of course has high PageRank. Or, a web page can get a high PageRank by being pointed to from thousands of other pages, like the Netscape download page which has 31,284 pages that point to it in my system. The intuition is that if your query matches tens of thousands of documents, you would be happier looking at documents that many people thought to mention in their web pages, or that people who had important pages mentioned at least a few times.

Detailed Description

Although there are many components required to make the demonstration system, BackRub work, only the two main components, the PageRank system, and the search engine will be discussed here. The PageRank model and especially its use in search is what we believe to be new knowledge.

PageRank

This section will discuss the model behind PageRank, in practice what kind of documents have high PageRank, and possible future improvements in the model. It is interesting to note, that while we have been discussing use of PageRanks in queries, it is useful in its own right to have an objective measure for web documents in general.

PageRank Model

The simple motivation for the PageRank model is the following: Assume you have a set of weights for each page such that a page's weight is distributed evenly among its children. And, each page's weight is the sum of all the weights distributed from its backlinks. The analogy is that we have a hypothetical user who surfs the web randomly. Whichever page the user is on, they keep following links randomly from page to page, with an equal probability of picking any link on the current page. The probability that they will visit a given page is its PageRank. Obviously, any user who surfs randomly is much more likely to end up at the Netscape home page, than my modest home page, for example. In any case, the model turns out to be equivalent to computing the first eigenvector of the web which can be easily done using an iterative method.

The catch to this method is that the web has lots of cycles in its graph, and is not fully connected. So, we have what I like to call the cyclotron effect, where all the ranking "energy" ends up getting sucked into small loops, and goes around forever. In our random surfer analogy, this corresponds to the user getting stuck clicking back and forth between two pages which only point to each other. If such a "loop" exists, the random surfer will always end up in one if we assume surfing goes on

forever. In reality, users do not surf forever only following links on the page they are currently on. Usually, people do another unrelated task after clicking through just a few links. To roughly model this, we assume that there is a small probability (15% in the current system) that the random surfer will jump to any random page in the system from the current page. This means a page's influence decays to be very small after traversing several links. In practice, the modified model works very well, but determining the 15% figure above is a matter of experimentation. If we set the damping amount to be 100% we are simply computing the number of backlinks (citations) that point to each page. This would probably work fairly well, but not nearly as well as the iterative method described here which takes into account things like advertisements on major sites. If we set the damping factor to zero, then we have the cyclotron effect, and no reasonable ranking. So clearly, some intermediate value for the damping is reasonable. An alternative method to damping is to simply only iterate a limited number of times, for example two, then we have computed something like backlinks of backlinks.

Possible Improvements to Model

One problem with this model is that it basically assumes that every page has some importance, because we are distributing 15% of the total PageRank to every page uniformly. But, importance has to start somewhere -- it needs to have some basis. As a malicious web page author, I could automatically create a large number of pages that all point to my home page, which will cause my home page to get a high PageRank. This is a problem, because there is a great commercial interest to be at the top of the results of any search engine, and many people try to "beat" the system by this sort of "spamming". I have considered distributing the damping 15% just to the major sites, like Netscape, which would likely completely alleviate this problem, and change the ranking little. But I need to do experiments to verify this. Another likely option for improvement that also helps solve the "spamming" problem is to compute how much of a page's PageRank is due to only the pages on the top several contributing servers. This would give a measure of how "general" a page's appeal is, which also might be useful for general search. Pages which had a very high PageRank that was based on only a very small number of servers would likely be not of general interest. This is because if the page were of general interest, many servers would likely have links to the page. Or, the page could be a page of general interest that was only recently created, and no one but major sites have known about it to create the link. This is a very difficult problem to solve in general. Copyright pages, which are often linked to from every page on a commercial site, often get a high PageRank only from links on one server. Almost no one links to these pages except for the site itself. The modification to consider on and off site links differently would help alleviate this copyright page problem. In practice, even though the copyright pages have a high PageRank, they are not too much of a problem when querying because they do not match that many queries.

The model could be much more sophisticated and take into account actual user behavior based on many parameters of the links on a page. For example, the model

could take the font size and position on the page of a link as factors which determine how likely a link is to be clicked on. Another possible improvement is to weight more recently modified documents more highly. These types of improvements could yield significant gains in the quality of search results.

Implementation of PageRank

The iterative method used to compute the model can be very efficiently implemented. My implementation uses only half the RAM required to hold all the weights for the pages. The rest of the link information is kept on disk, and read sequentially. I have computed this model to reasonable convergence for 30 million pages and about 400 million links in several hours on a large workstation. This is a very small computational cost compared with building a full text index of the same amount of information. So, this computation required to compute PageRank is insignificant compared to the rest of the computation required to run a web search engine.

PageRank in Practice

In practice, a high PageRank seem to indicate several things. One is **popular content**, that is pages that people like a lot, and add to their public bookmarks, or otherwise mention on their pages. Good examples of this category include things such as search engines like AltaVista or popular web soap operas such as The Spot, both of which have high PageRanks, and large numbers of backlinks. A **root of a hierarchy** also tends to get a very high PageRank because all the nodes in the hierarchy point to it, as do many other people because it is the root, and you can rely on it being there and being a good place to start navigation. Examples of such pages might be a university homepage, company homepage, personal homepage, or Yahoo. **Things people tend to put on their pages** also end up with very high PageRanks. This includes things like the EFF's Blue Ribbon Campaign, and several companies that provide web counters automatically when you create a link to them, and the Excite search box which searches a local site.

While PageRank is not intended to approximate usage, it probably has a fairly high correlation with actual usage of web pages for most types of pages. Notably, things like sex, which people do not feel comfortable mentioning in their web pages, have a low PageRank, but high usage. PageRank may be better than usage data for measuring "eye traffic", that is how many people see various things. For example, many people see the Blue Ribbon logo all the time, but likely rarely follow it because they already know what it is. Brand name ads would fall into a similar category, where people see them a lot, but rarely follow them.

Search Engine

The search engine is quite simple and is primarily based on PageRank. Currently, it searches only the titles of the web documents due to space constraints, and returns

the documents that match sorted by PageRank. It also does duplicate detection, and grouping by site. If the search engine was extended to search full text, some function of the full-text match value, and the PageRank value would have to be constructed to yield good results. Developing a reasonable rank-merge function would likely be a matter of some simple experimentation. If I simply did the same thing I am doing now on full text, any query that matched any part of Netscape's home page would always return Netscape's home page first, which is not a reasonable response.

When searching with an existing search engine, often a user finds a semi-relevant page, and then surfs from that page to what they are actually looking for. This means, that the user tends to end up at pages that have a lot of links, which tend to be of higher quality. My search engine helps automate this process, simply returning the higher quality pages first rather than relying on intermediate searching. Also, since the pages my system returns tend to be roots of hierarchies, they are often the most efficient place to start navigating from, assuming the user can not express exactly what they want using a boolean query specific enough to return only a few results.

Possible Enhancements to Search Engine

Besides full-text searching which is a necessary enhancement, another possible enhancement to the search engine is to search the titles of the backlinks to a document as well, and include them in the text-matching rating. Or, the text that is right around the neighborhood of a backlink could also be included in the text-matching rating. The intuition is that by looking at the text that occurs in the neighborhood around all the links to a page, we could get a good summary of a pages content. I am working on implementing these enhancements in the near future.

For certain queries, like "weather", the search engine already yields excellent Yahoo like categorizations automatically. Generating a set of queries for common categories and simply recording the results might be enough to build a reasonable automatically generated Yahoo like categorization system.

Possible Close or Related Patents

There is a company, which I have recently become aware of, located at <http://www.linkrank.com/>. They seem to be getting similar results, but they do not explain their methods in any detail. They claim they have a patent pending.

Results Explanation

I have chosen to display AltaVista vs. BackRub (my system). Most web search engines seem to give similar results to AltaVista.

The PageRank citation importance number, which determines the order of results, is depicted by the bar graph and number below it on the BackRub results. High PageRank indicates a well cited page. The bar graph gives you some idea of the absolute ranking of a page. A full bar graph is only displayed for Netscape's download page (the most highly ranked page at 6033.37). Obscure pages with only one link to them have a completely empty bar graph and a PageRank of much less than one⁵, and so are usually not returned unless there are very few documents that match a query.

BackRub's database is smaller (4 million pages) versus AltaVista's 30 million. Since BackRub can only search titles because of space and processing constraints, we have restricted AltaVista to search titles as well. Title searching generally seems to improve AltaVista's results for the kinds of queries we have displayed here, so we have not handicapped AltaVista.

Please feel free to try it out yourself and compare the results:
<http://zam.stanford.edu:1972/> If it does not work, let me know and I'll start it up for you. Please keep in mind the smaller database, and lack of full text search. Also, the database only contains web pages which are inside of the US. Queries for city names, and state names, and companies with a reasonable web presence generally yield excellent results, and are good things to try first.

Example Queries (Printouts Follow)

1. "university"

BackRub returns major universities homepages, with only a few inappropriate pages. AltaVista returns pages which have university twice in their title first, which seem to be on relatively random topics. Note that there is a slight Stanford bias in the BackRub data, since I started downloading web documents at Stanford, so the Stanford ratings are slightly higher than you would normally expect.

2. "weather"

Note that the first four documents returned by BackRub are the major weather sites, The Weather Underground, The National Weather Service, Intellicast, and The Weather Channel. The indented results are the results that are on the same server, and should be generally considered as a unit with the documents above. A member of one of these weather companies considers the results BackRub returned to be very representative of the good weather services that are available. Indeed the results even represent a reasonable Yahoo like categorization of the topic. None of these four main sites that BackRub returned first are even in the first three pages of AltaVista's results! Note that if you were looking for weather information using AltaVista, you would scan through the list returned by AltaVista, and you would

⁵The bar graph is a log scale, because the PageRanks seem to have a Zipfian distribution, as would be expected for any citation ranking system.

"UNIVERSITY" SEARCH RESULTS

find a page that appeared to list a bunch of weather sites. Then, you would go to that page and then try to follow a link to a major site. This is exactly what BackRub and PageRank are automating for you, by returning the pointers to the major sites first.

3. "Jeffrey Ullman"

Refer to the previous Motivation and Discussion section for an explanation of the results for this query.

university

Search

BackRub Query Results

BackRub's Highest Ranked Sites

University of Illinois at Urbana-Champaign

██████████ <http://www.uiuc.edu/>
694.687 8460 backlinks 12k - 10/25/96 - 11/1/96

Stanford University Homepage

██████████ <http://www.stanford.edu/>
609.303 8857 backlinks 4k - none - 11/1/96

Stanford University: Portfolio Collection

██████████ <http://www.stanford.edu/home/administration/portfolio.html>
167.919 34 backlinks

University of California, Irvine

██████████ <http://www.uci.edu/>
273.621 2390 backlinks 2k - 10/20/96 - 11/1/96

Baylor University

██████████ <http://www.baylor.edu/>
218.372 2761 backlinks 6k - none - 11/1/96

Glimpse Working Group - University of Arizona, CS Dept.

██████████ <http://glimpse.cs.arizona.edu/>
214.736 663 backlinks 9k - none - 11/1/96
██████████ Duplicate: <http://glimpse.cs.arizona.edu:1994/>

Northwestern University: NUInfo

██████████ <http://nuinfo.nwu.edu/>
204.169 1227 backlinks 3k - 9/28/96 - 11/1/96
██████████ Duplicate: <http://www.nwu.edu/>

University of Colorado at Boulder

██████████ <http://www.colorado.edu/>
182.671 3015 backlinks 4k - none - 11/1/96

Iowa State University Homepage

██████████ <http://www.iastate.edu/>
178.431 2341 backlinks 3k - 9/13/96 - 11/1/96

The George Washington University Home Page

██████████ <http://www.gwu.edu/>
174.856 2222 backlinks 2k - none - 11/1/96

University of Virginia

██████████ <http://www.virginia.edu/>
168.576 2724 backlinks 3k - none - 11/1/96

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University of Wisconsin-Madison: WiscINFO
██████████ <http://www.wisc.edu/>
164.481 2331 backlinks 1k - 9/21/96 - 11/1/96

University of Pennsylvania
██████████ <http://www.upenn.edu/>
163.961 2755 backlinks 1k - 11/1/96 - 11/1/96

The University of Michigan
██████████ <http://www.umich.edu/>
151.114 2874 backlinks 1k - none - 11/1/96

Indiana University
██████████ <http://www.indiana.edu/>
146.445 1409 backlinks 1k - 9/28/96 - 11/1/96

Indiana University copyright statement
██████████ <http://www.indiana.edu/copyright.html>
88.9323 703 backlinks

Carnegie Mellon University
██████████ <http://www.cmu.edu/>
144.987 1762 backlinks 2k - 3/24/96 - 11/1/96

JHUNIVERSE: Johns Hopkins University on the Web
██████████ <http://www.jhu.edu/>
140.429 2060 backlinks 4k - 10/27/96 - 11/1/96

University of Minnesota
██████████ <http://www.umn.edu/>
136.827 2489 backlinks 0k - 10/11/96 - 11/1/96

University of Minnesota, Twin Cities Campus
██████████ <http://www.umn.edu/tc/>
102.56 424 backlinks

The University of Delaware
██████████ <http://www.udel.edu/>
132.334 1598 backlinks 4k - 10/22/96 - 11/1/96

Welcome to the University of Chicago
██████████ <http://www.uchicago.edu/>
130.815 2770 backlinks 4k - 10/18/96 - 11/1/96

The University of Iowa
██████████ <http://www.uiowa.edu/>
118.989 1315 backlinks 2k - 9/3/96 - 11/1/96

University of Florida Home Page
██████████ <http://www.ufl.edu/>
117.691 1997 backlinks 5k - 10/14/96 - 11/1/96

USCWeb, the University of Southern California
██████████ <http://www.usc.edu/>
115.256 1573 backlinks 4k - none - 11/1/96

Welcome to New York University

██████████ <http://www.nyu.edu/>
113.217 1884 backlinks 5k - 10/22/96 - 11/1/96

Michigan State University

██████████ <http://www.msu.edu/>
109.508 1623 backlinks 2k - 10/27/96 - 11/1/96

Cornell University Home Page

██████████ <http://www.cornell.edu/>
108.117 2319 backlinks 4k - none - 11/1/96

Purdue University

██████████ <http://www.purdue.edu/>
106.65 1495 backlinks 3k - 9/3/96 - 11/1/96

Harvard University WWW Home Page

██████████ <http://www.harvard.edu/>
101.376 2014 backlinks 4k - 10/12/96 - 11/1/96

Mississippi State University

██████████ <http://www.msstate.edu/>
99.1736 1465 backlinks 3k - none - 11/1/96

Alfred University

██████████ <http://www.alfred.edu/>
96.4112 1281 backlinks 3k - 9/11/96 - 11/1/96

UNICORN: Kansas State University's Information System

██████████ <http://www.ksu.edu/>
94.9499 1388 backlinks 3k - 8/22/96 - 11/1/96

University of Washington Home Page

██████████ <http://www.washington.edu/>
93.514 1376 backlinks 4k - 11/1/96 - 11/1/96

University of California, Santa Barbara

██████████ <http://www.ucsb.edu/>
91.8778 1685 backlinks 3k - none - 11/1/96

Boston University Home Page

██████████ <http://web.bu.edu/>
91.7343 1435 backlinks 14k - 10/22/96 - 11/1/96

North Dakota State University

██████████ <http://www.ndsu.nodak.edu/>
90.9534 770 backlinks 4k - none - 11/1/96

University of Maryland at College Park

██████████ <http://www.umcp.umd.edu/>
85.7528 1278 backlinks 4k - 10/25/96 - 11/1/96

University of Missouri - Rolla

██████████ <http://www.umr.edu/>
85.5691 1233 backlinks 2k - none - 11/1/96

WWW.SOURCE

Princeton University - Home Page

<http://www.princeton.edu/>
85.179 1489 backlinks 4k - none - 11/1/96

Bradley University

<http://www.bradley.edu/>
84.435 1171 backlinks 5k - none - 11/1/96

ASFTD" SUESCS



Search and Display the Results

Tip: To find a page from a given site, try: [host:this.site.com](#)

Word count: title:university: about 60000

Documents 1-10 of about 60000 matching the query, best matches first.

DePauw University Introduction/Intent of University Policy

Introduction/Intent of University Policy. Both use and abuse of alcohol have become widespread in our society. While most people are able to use alcohol...

<http://www.depauw.edu/stulife5/section1.htm> - size 2K - 20 Feb 96

University Medical Center (UMC) - University Physicians - Medical Offices --Ar

Internal Medicine Office 6th floor at University Medical Center 1501 N. Campbell Avenue Tucson, Arizona 85724 (520)694-8888. Description of Facility. The..

<http://www.ahsc.arizona.edu/~umc/inmedoff.htm> - size 7K - 12 Apr 96

University Medical Center (UMC) -- University Physicians -- Physicians Resource

Physicians' Resource Service (for physicians only) The Physicians' Resource Service provides 24-hour priority physician access to faculty physicians,...

<http://www.ahsc.arizona.edu/~umc/resourc.htm> - size 3K - 12 Apr 96

UNIVERSITY ARCHIVES, UNIVERSITY OF MISSOURI-ST. LOUIS

UNIVERSITY ARCHIVES, UNIVERSITY OF MISSOURI-ST. LOUIS. ADDRESS: 8001 Natural Bridge Rd. Thomas Jefferson Library St. Louis, MO 63121. TELEPHONE: (314)...

<http://library.wustl.edu/~spec/archives/aslaa/umsl-archives.html> - size 2K - 16 Jun 96

The University of Queensland Enrolments 1995

The University of Queensland. STUDENT LOAD. 1994 1995. By Course Level: Higher Degree 2891 3032 Bachelor Degree 16165 16269 Other 1545 1630. By Group:...

<http://www.uq.edu.au/~adbamesb/stats/load.html> - size 1K - 14 Dec 95

DePauw University Violations of University Regulations

Violations of University Regulations. The consumption and serving of alcoholic beverages involves responsibility for both individuals and groups. These...

<http://www.depauw.edu/stulife5/section3.htm> - size 2K - 20 Feb 96

DePauw University University Alcohol Regulations

University Alcohol Regulations. Any violation of laws of the State of Indiana on alcohol is grounds for University disciplinary action. (See Section IV)...

<http://www.depauw.edu/stulife5/section2.htm> - size 5K - 20 Feb 96

Use of University Facilities by the University Community (AD 1-7)

nbsp SIMON FRASER UNIVERSITY. Policies and Procedures. Date. May 1, 1969. Number. AD 1-7. Revision Date. December 1, 1980. Revision No. B..

<http://www.sfu.ca/policies/admin/ad1-07.htm> - size 3K - 8 Feb 96

University Medical Center (UMC) - University Physicians - Medical Offices --Ar

North Hills Center 265 West Ina Road Tucson, Arizona 85704 (520)575-7600. Description of Facility. North Hills Center is located at 265 W. Ina, just east..

<http://www.ahsc.arizona.edu/~umc/norhill.htm> - size 11K - 12 Apr 96

University Medical Center (UMC) - University Physicians - Medical Offices --Ar

Broadway Family Health Center 2916 E. Broadway Blvd. Tucson, Arizona 85716 (520)694-8888. Description of Facility. The Broadway Family Health Center is...

<http://www.ahsc.arizona.edu/~umc/famoffb.htm> - size 8K - 12 Apr 96

p. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 [Next]

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Search and Display the Results

Tip: When in doubt use lower-case. Check out Help for better matches.

Word count: title:university: about 60000

Documents 21-30 of about 60000 matching the query, best matches first.

Division of Occupational Therapy, Queen's University

School of Rehabilitation Therapy, Division of Occupational Therapy. Philosophy and Objectives. Home Pages | Rehabilitation Therapy | Occupational Therapy..

<http://meds-ss10.meds.queensu.ca/medicine/rehab/otobject.htm> - size 6K - 12 Jun 96

Anesthesiology Residency Program at University Hospitals of Cleveland/Case Wes

University Hospitals of Cleveland & Case Western Reserve University. Anesthesiology Residency Program. Message From the Chairman. Message From the...

<http://mediswww.meds.cwru.edu/dept/anesth/program.htm> - size 7K - 16 Jun 96

Human Dimensions/ Fisheries Lab @ Texas A&M University

Executive Summaries of Recent Research Completed for The Billfish Foundation: Costa Rica. A Social and Economic Study of the Costa Rica Recreational...

<http://lutra.tamu.edu/0c:/rditton/execcr.html> - size 34K - 16 Jun 96

Human Dimensions/ Fisheries Lab @ Texas A&M University

Executive Summaries of Recent Research Completed for The Billfish Foundation: Mexico. A Social and Economic Study of the Recreational Billfish Fishery in..

<http://lutra.tamu.edu/0c:/rditton/execmex.html> - size 25K - 16 Jun 96

ARMENIAN STUDENTS' ASSOCIATION OF YORK UNIVERSITY

A.S.A. ARMENIAN STUDENTS' ASSOCIATION. YORK UNIVERSITY. Take a look at this site! LINKS. OTHER A.S.A. SITES. U of T. MCGILL. U.C. BERKELEY. OTHER ARMENIAN.

<http://www.yucc.yorku.ca/~asa/asa2.html> - size 7K - 7 Apr 96

University Medical Center (UMC) -- Arizona -- University Physicians

University Physicians. How To Choose Us | Types of Primary Care Primary Care Physicians | Specialty Care Physicians Medical Offices | Physician Resource...

<http://www.ahsc.arizona.edu/~umc/univphys.htm> - size 2K - 13 Apr 96

University of Texas System - Permanent University Fund: Analysis of Growth

THE UNIVERSITY OF TEXAS SYSTEM THE PERMANENT UNIVERSITY FUND ANALYSIS OF GROWTH IN THE VALUE OF THE PUF FOR THE YEARS 1991-1995 (Dollars in Millions) BOOK.

<http://mercury.utsystem.edu/FEB1996/Investments96/BookMarket1.html> - size 6K - 29 Mar 96

Article List for Temple University School of Medicine and Thomas Jefferson Uni

Temple University School of Medicine and Thomas Jefferson University School of Medicine. 24 Oct 1995 - WHITEHALL-ROBINS HEALTHCARE NAMES ROGER G. BERLIN...

<http://projects.sra.com/nametag/demol/names/sub7/N1027.html> - size 753 bytes - 1 Feb 96

University of Guelph Central WWW Server

University of Guelph Accomplishments. Rural elderly -- A recent project by Geography professor Alun Joseph shows that many small rural communities face...

http://trillium.cs.uoguelph.ca/home_pages/home_page_model1/Accomplishments.html - size 4K - 16 Jun 96

Horizon Development Partners -- University of Chicago and Indiana University

University of Chicago and Indiana University, Horizon Development Partners. The University of Chicago and Indiana University are Ameritech Library...

<http://www.als.ameritech.com/iu-uc.htm> - size 3K - 31 Jan 96

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5003525-011097

weather

Search

BackRub Query Results

BackRub's Highest Ranked Sites

Welcome to The Weather Underground Inc.

<http://www.wunderground.com/forecasts/indexnew.html>
229.685 567 backlinks *10k - 10/17/96 - 11/1/96*

Interactive Weather Information Network

<http://iwin.nws.noaa.gov/iwin/main.html>
220.778 610 backlinks *2k - 9/8/96 - 11/1/96*

Interactive Weather Information Network

<http://iwin.nws.noaa.gov/iwin/graphicsversion/main.html>
62.5904 336 backlinks

Interactive Weather Information Network (text version)

<http://iwin.nws.noaa.gov/iwin/textversion/main.html>
54.247 88 backlinks

INTELLCAST: USA Weather

<http://www.intellicast.com/weather/usa/>
207.477 1130 backlinks *9k - none - 11/1/96*

The Weather Shops Home Page

<http://www.intellicast.com/wxshops/>
58.6819 92 backlinks

INTELLiCast: world weather

<http://www.intellicast.com/weather/intl/>
58.193 600 backlinks

INTELLiCast: December Almanac - Typical Weather Across The Country

<http://www.intellicast.com/weather/usa/papers/december.html>
48.2945 195 backlinks

The Weather Shops - Weather Instruments

<http://www.intellicast.com/wxshops/wxinst.htm>
32.1697 17 backlinks

The Weather Shops - Unique Gifts

<http://www.intellicast.com/wxshops/gifts.htm>
21.4518 9 backlinks

The Weather Shops - Books, Videos and Posters

<http://www.intellicast.com/wxshops/books.htm>
20.2358 8 backlinks

The Weather Shops - Weather Classroom

GET "SERIES"

<http://www.intellicast.com/wxshops/wxclass.htm>
19.5332 9 backlinks

The Weather Shops - Seasonal Survival Tools
<http://www.intellicast.com/wxshops/sstools.htm>
18.8673 8 backlinks

The Weather Channel
<http://www.weather.com/index.html>
181.226 1076 backlinks 8k - 11/1/96 - 11/1/96
[Duplicate: http://www.weather.com/](http://www.weather.com/)

The Weather Channel Site Guide
http://www.weather.com/site_guide/
102.73 190 backlinks

The Weather
<http://www.weather.com/weather/>
101.968 2036 backlinks

Weather Whys
http://www.weather.com/weather_whys/
89.1901 1329 backlinks

Weather News
http://www.weather.com/weather_news/
79.7606 1337 backlinks

Weather & You
<http://www.weather.com/weather-n-you/>
74.7016 1316 backlinks

The Weather Channel - Skiers' Forecast
<http://www.weather.com/ski/>
29.1629 429 backlinks

The Weather Channel
<http://www.weather.com/weather/us/>
26.7181 498 backlinks

SALT LAKE CITY NATIONAL WEATHER SERVICE
<http://nimbo.wrh.noaa.gov/Saltlake/slc.noaa.html>
77.5424 3190 backlinks 30k - 11/1/96 - 11/1/96

Aviation Weather Center and Storm Prediction Center
<http://www.awc-kc.noaa.gov/index.html>
55.4443 439 backlinks 1k - 10/7/96 - 11/1/96

Aviation Weather Center list of products
<http://www.awc-kc.noaa.gov/awc/Aviation Weather Center.html>
33.7168 430 backlinks

Purdue Weather Processor
<http://wpx.atms.purdue.edu/>
52.369 514 backlinks 1k - 7/8/96 - 11/1/96

Weather World

██████████ <http://www.ems.psu.edu/WeatherWorld/>
21.792 52 backlinks 11k - 10/21/96 - 11/1/96

The Palm Beach Post Weather Page

██████████ <http://www.pbpost.com/weather/index.html>
21.7622 145 backlinks 6k - none - 11/3/96

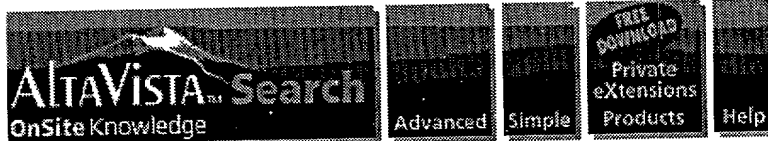
Current Weather Maps/Movies

██████████ <http://wxweb.msu.edu/weather/>
21.4497 255 backlinks 6k - none - 11/1/96

TopNews: Weather

██████████ <http://www.topnews.com/wx.html>
20.4341 2 backlinks 7k - none - 11/1/96

460710 "SERIES009"



Search and Display the Results

Tip: Do not use AND or OR to combine words, simply type a few words or phrases.

Word count: title:weather: about 10000

Documents 11-20 of about 10000 matching the query, best matches first.

National Weather Service. State College PA

Welcome to the Experimental HomePage. Wed Jun 19 20:02:17 EDT 1996 click here to to see whats new. Choose from a target area below. Weather Graphics....

<http://bookend.met.psu.edu/cgi-bin/exhome.cgi> - size 1K - 20 Jun 96

Weather-Health Link: Asthma and the Weather

WEATHER-HEALTH LINK. The Canadian Medical Meteorology Network (CMMN). ASTHMA AND THE WEATHER. Homepage. Index. About us. What we provide. ASTHMA. Tom...

<http://www.inforamp.net/~eeyore/asthma2.htm> - size 8K - 19 Jun 96

KCRG's 9online - TV 9 Weather Lab - Beyond the Weather

Beyond The Weather with Meteorologist Joe Winters. Looking into the sky is something we do everyday to check weather conditions. How many of you have...

<http://www.fyiowa.com/kcrg/weather/kbeyond.htm> - size 5K - 24 Apr 96

The Earthquake and Weather Station ©

The Earthquake and Weather Station! *** TABLE OF CONTENTS *** Craig's Weather and Earthquake Reports, Images and Animations. NEW! For 28800-ISDN/FAME...

<http://griffithc.lib.csus.edu/weather/hsindex.htm> - size 12K - 27 Feb 96

Nature Poem for the Week

Weather Trivia. June 18-19th. One of the very first computers dedicated to atmospheric science research was the IBM 1620--it could perform about 1,000...

<http://www.satlab.hawaii.edu/weather/trivia.html> - size 4K - 19 Jun 96

Weather Project: Weather Project Mailing List Initialization

Weather Project Mailing List Initialization. Bob Tolbert (tolbert@xenon.chem.uidaho.edu) 27 Sep 1995. Messages sorted by: [date] [thread] [subject] [...]

<http://xenon.chem.uidaho.edu/hypermail/weather/0000.html> - size 3K - 19 Jun 96

NASA RP 1301: Weather Prospects for the Eclipse: Strategies to Cope with the W

STRATEGIES TO COPE WITH THE WEATHER. Outside of the southwestern U. S. and Mexico, weather becomes much more variable. Cloudiness changes with each...

<http://umbra.nascom.nasa.gov/eclipse/940510/text/weather- coping.html> - size 2K - 19 Jun 96

Weather Forecasting Using the University of Michigan Weather Underground

Weather Forecasting Using the University of Michigan Weather Underground. Adapted to the World Wide Web from a file on the University of Michigan Gopher...

http://atm.geo.nsf.gov/instruction/forecast_contest.html - size 13K - 19 Jun 96

Weather Information From Other Servers

Weather Information From Other Servers. This page contains the following different types of servers. University. Government and Institution. Climate....

<http://www.met.utah.edu/html/other.html> - size 29K - 29 Apr 96

North American Weather

Current Weather in North America. For information on current hurricanes, tornados, earthquakes, and the like check out the Severe Weather Page. From the...

<http://space.rice.edu/~rss/weather/namer.html> - size 17K - 3 Jun 96

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450710 "50710505



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Tip: Do not use AND or OR to combine words, simply type a few words or phrases.

Word count: title:weather: about 10000

Documents 21-30 of about 10000 matching the query, best matches first.

Dr. Ted K's Weather Links [--THE WEATHER PAGE--]

Dr. Ted K's Weather Links. National Weather Service Links. Regional Offices. Southern Offices. Central Offices. Western Offices. Pacific Offices. Weather..

<http://www.jsu.edu/depart/geography/Tedlink.html> - size 22K - 13 Jun 96

Whom God Loves he shakes the hell out of Special secret godly music music musi

Click RELOAD on your Netscape software when you get to page! - Click here to go to color page!!! - For SLOWER computers with slower modems!

<http://w3.trib.com/~acrutch/blacks.html> - size 6K - 6 Jun 96

City of Maple Plain -Weather Information - Other Links to Weather Information

The Official weather information page for the City of Maple Plain. These pages contain links commercial weather services all over the USA. Thanks>

<http://www.mapleplain.com/city/weathermore.html> - size 6K - 24 May 96

weather sites

Weather. The Science of Forecasting. http://antietam.nssl.uoknor.edu/mosaic_files/fffc/statefcst.html -- The State of Forecasting....

<http://www.geo.nsf.gov/adgeo/geofield/geotopic/weather/weather.htm> - size 5K - 14 May 96

The Earthquake and Weather Station ©

The Earthquake and Weather Station! *** TABLE OF CONTENTS *** Craig's Weather and Earthquake Reports, Images and Animations. NEW! For 2400-14400 Baud...

<http://griffithc.lib.csus.edu/weather2/> - size 9K - 27 Feb 96

Web Weather Resource: Meteorology on the Web

Web Weather Resource. Meteorological Information on the Web. Send email to: dwlehning@nwiinc.com. Web Weather Resource was compiled by David W. Lehning....

<http://lochnet.com/client/dwlehning/wxdir/> - size 13K - 17 Jun 96

The Earthquake and Weather Station ©

The Earthquake and Weather Station! Please Choose Your Connection Speed or Browser Type. Craig's Weather and Earthquake Reports, Images and Animations....

<http://griffithc.lib.csus.edu/weather/> - size 5K - 4 Jun 96

Allentown Weather Center - Weather Software and Instruments

Weather Instruments and Software. [SCHOOLS] [TV-RADIO] [INSTRUMENTS] [NWS-NWSFO] [WWW] [HOME] AGRIWEATHER INC. Weather Instrument Catalog. Alden...

<http://www.ot.com/~tjowens/instrument.html> - size 7K - 16 Jun 96

Weather Watchers Weather Instruments

DIGITAL ELECTRONIC RAIN GUAGE -- "WIRELESS" Self emptying -- You never have to empty. Easy to install -- No wires to worry about. Measures rainfall in...

<http://www.oia.net/~weatherwatchers/wx2h.html> - size 1K - 23 Jan 96

Weather Watchers Weather Instruments

RAINWATCH DIGITAL RAIN GAUGE. Double duty rain gauge displays long or short term rainfall. Digital LED displays rainfall from 00.01" to 99.99". Reset...

<http://www.oia.net/~weatherwatchers/wx2f.html> - size 1K - 21 Jan 96

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<http://altavista.digital.com/cgi-bin/query?pg=q&stq=20&q=title%3a%2bweather>

ALTA VISTA SEARCH

ullman;jeffrey

Search

BackRub Query Results

BackRub's Highest Ranked Sites

Jeffrey D. Ullman

http://www-db.stanford.edu/~ullman/index.html

1.96587 13 backlinks 2k - 10/22/96 - 11/1/96

Duplicate: http://www-db.stanford.edu/~ullman/

Jeffrey D. Ullman -- Papers

http://www-db.stanford.edu/~ullman/ullman-papers.html

0.681988 4 backlinks

Jeffrey D. Ullman --- Books

http://www-db.stanford.edu/~ullman/ullman-books.html

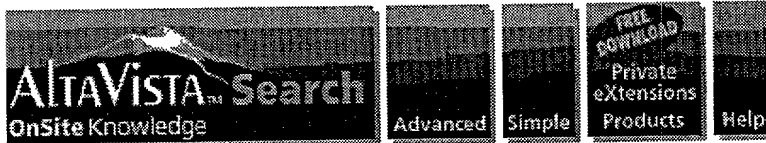
0.5818 10 backlinks

Stanford University Professor - Jeffrey D. Ullman

http://www-ee.stanford.edu/compsci/faculty/Ullman_Jeffrey.html

0.000549815 1 backlinks 1k - 8/26/94 - 11/2/96

460710 "5025E005"



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Word count: title:Jeffrey: about 3000; Ullman:11177

Documents 1-10 of about 5000 matching the query, best matches first.

Jeffrey Ullman

Jeffrey Ullman. Up-Close and Personal Conversation. Process these original and thought-provoking responses from Jeffrey Ullman, celebrated CS professor...

- <http://www.geekchic.com/repliq3.htm> - size 4K - 3 Apr 96
- <http://access.advr.com/~geekchic/repliq3.htm> - size 4K - 19 Nov 95

Stanford University Professor - Jeffrey D. Ullman

Jeffrey D. Ullman. Professor. (and, by courtesy, of Electrical Engineering) Database Systems Ullman is working on the integration of databases and other...

- http://www-soe.stanford.edu/compsci/faculty/Ullman_Jeffrey.html - size 1K - 27 Sep 94

Jeffrey D. Ullman

Jeffrey D. Ullman. J. E. Hopcroft and J. D. Ullman. Two results on one-way stack automata. In Conference Record of 1967 Eighth Annual Symposium on...

- <http://theory.lcs.mit.edu/~dmjones/FOCS/Authors/ullmanjeffreyd.html> - size 7K - 16 Jun 96

Jeffrey D. Ullman -- Papers

Jeffrey D. Ullman -- Recent Papers. Constraint Checking With Partial Information (PODS 1994 paper with coauthors Ashish Gupta, Shuky Sagiv, and Jennifer...

- <http://www-db.stanford.edu/~ullman/ullman-papers.html> - size 6K - 10 Jun 96

Elements of ML Programming --- Jeffrey D. Ullman

Elements of ML Programming --- Jeffrey D. Ullman. Class Notes. Chapter 2. Notes 1. Notes 2. Notes 3. Notes 4. Chapter 3. Notes 1. Notes 2. Notes 3. Notes..

- <http://www.cs.sunysb.edu/~baoquan/notes.html> - size 3K - 8 Mar 96

HealthWorld - Dana Ullman, M.P.H. - Biography

Dana Ullman, M.P.H. Dana Ullman, M.P.H. (Masters in Public Health, U.C. Berkeley) is widely recognized as one of the foremost spokespersons for...

- <http://206.135.37.254/bios/DanaUllman/advisory.htm> - size 4K - 30 Mar 96

James Ullman's Homepage

NAME James R. Ullman, 31 years old. CIVILSTATUS Married. RESIDENCE Permanent in Tromsø, Norway. CIVILIAN University of Tennessee, Knoxville EDUCATION 1982.

- <http://irc.ingok.hitos.no/webmasters/james/> - size 4K - 10 May 96

Web Paradise notes...Tracey Ullman

Tracey Ullman Filmography! Bullets Over Broadway (1994) I'll Do Anything (1994) Pret-a-Porter (1994) Household Saints (1993) Robin Hood: Men in Tights...

- <http://146.176.129.71/ph/ullman.html> - size 1K - 14 Feb 96

HealthWorld - Judith Reichenberg-Ullman, N.D., M.S.W., DHANP - Biography

Judith Reichenberg-Ullman, N.D., M.S.W., DHANP. Judyth Reichenberg-Ullman, ND, DHANP, MSW is a licensed naturopathic physician board certified in...

- <http://206.135.37.254/bios/reichenberg-ullman/advisory.htm> - size 2K - 29 May 96

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#3

Attorney Docket No: S96-213

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) and 1.27(d)) - NONPROFIT ORGANIZATION

Application No.: 60/035,205
Filing Date: 10 Jan 97
Applicant(s): **LAWRENCE PAGE**
Title: **IMPROVED TEXT SEARCHING IN HYPERTEXT SYSTEMS**

I hereby declare that I am an official empowered to act on behalf of the entity identified below:

Name of Concern: **The Board of Trustees of the Leland Stanford Junior University**
Address of Concern: **900 Welch Road, Suite 350
Palo Alto, CA 94304**

I hereby declare that the entity identified above qualifies as a nonprofit organization as defined in 37 CFR 1.9(e), for purposes of paying reduced fees to the United States Patent and Trademark Office under section 41(a) and (b) of Title 35, United States Code, in that the entity is an institution of higher education.

I hereby declare that rights under contract or law have been conveyed to and remain with the entity identified above with regard to the invention identified above.

RECEIVED

If the rights held by the entity identified above are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(i) or a nonprofit organization under 37 CFR 1.9(e).

* NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

Name:		<input type="checkbox"/> Individual
Address:		<input type="checkbox"/> Small Business Concern
		<input type="checkbox"/> Nonprofit Organization

I acknowledge the duty to file, in conjunction with any Patent Application filed based on this Provisional Application, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the Provisional Application, any patent applied for based on this Provisional Application, or any patent to which this verified statement is directed.

ASSIGNEE: THE BOARD OF TRUSTEES OF THE LELAND STANFORD JUNIOR UNIVERSITY

Stanford University
Office of Technology Licensing
900 Welch Road, Suite 350
Palo Alto, CA 94304

Official Authorized to Act on Behalf of Assignee:

Signature: *Luis R. Mejia* 3/20/97
Name: Luis R. Mejia Date
Title: Senior Associate, Office of Technology Licensing