Re: Mathematician/contractor

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- *From*: "Androcles" <Engineer@xxxxxxxxxxxxxxxxxxxxx>

- *Date*: Wed, 04 Apr 2007 13:37:26 GMT

"Give me a lever long enough and a fulcrum upon
which to rest it, and I shall move the Earth." −− Archimedes

When the telephone voice tells us to "say one" or "say two"
there is a limited context and an expected reply within a limited
range of replies, 0−9.

"The Petrana Presentation Controller 1.2 (Beta) enables the user to control Microsoft PowerPoint
presentations entirely by voice command. " −− very limited.

Speech recognition has to be context sensitive. No computer
today can distinguish between "a grey day" (weather) and
" a grade 'A' " (egg).
In the written form words are separated by white space, but in the
spoken form no separation is present, werunwordstogether.

Also English varies from country to country. In the USA the
cliché is "Do you'll want that to go?" but in England it would be
"Is that to take away?" − Same function, different cliché, the
context is still to buy a hamburger.
Indians have shirtings and suitings, Americans have Realtors
and Britain has Estate Agents.
Phrase recognition is more important than word recognition.
Any recognizer needs to be fluent in clichés with a context
database of known speech patterns.

To illustrate my point, try translating any simple phrase
from English to French to German and back
to English again, using http://babelfish.altavista.com/tr

I want some french fries
Je veux quelques pommes frites
Ich will einige brat Äpfel
I want some roast apples

You want WHAT!? Repeat please, use another phrase.
As you can see, it is word based and not phrase based.

Current recognizers "learn" by the user uttering and typing words

and associating them within a database, lacking any intelligence
whatsoever.
The way forward in AI is to simulate the mind of a child,
possibly with a neural network, and to be as patient as a parent.
When little Johnny utters his first "baba" one parent will
claim he said "dada", the other will claim he said "mama"
and they'll reinforce their claims for days on end until little
Johnny gets both right, unless the parents are Russian
in which case "baba" will be reinforced.

My cat knows how to communicate, he can tell me he wants
to go out by jumping on the table and uttering "mew" (meaning
"Oy, you, get off that computer and look at me") or if he's hungry
by laying on my keyboard and looking up at me, which when I
rise is followed by a leap toward the kitchen and scratching his
carpet by the kitchen door. Ok, it's body language, but it is also
intelligent communication.

Speech recognition requires much more than differential equations.
It requires simulated intelligence and a patient nursemaid with
10 years to spare raising a kid. Once you have the kid, then
of course you can clone him and he can learn local dialect
and accent. Until then you'll be limited to "say one" and
Artificial Stupidity, clockwork mice learning to run a maze,
programmed by clockwork Ph.Ds.

<audio.magician@xxxxxxxxx> wrote in message
news:1175677862.029457.177980@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
Job Description

Title: Mathematician (Consultant/Contractor)

GFT Group seeks a highly creative individual with solid skills and
experience in advanced mathematics for a speech recognition project.
The project will develop new concepts and advanced mathematics that
substantially improve the accuracy of current speech recognition
technology. This is a challenging project that requires unusual
skills. It involves a close integration of advanced theory and
practice not found in most commercial algorithm projects and academic
research projects. The project offers the opportunity to perform
fundamental scientific research with substantial immediate practical
benefits and applications.

GFT Group is developing a new speech recognition engine with superior
accuracy compared to current speech recognition engines such as Dragon
Naturally Speaking, ViaVoice, Microsoft Speech, and the open−source
SPHINX speech recognition engine. The engine should enable or enhance
rapid jumping to targets such as files, web sites, PowerPoint slides,
submenu selections and so forth on computers by simple voice command,
dictation of documents, and hands−free operation of computers,

cell−phones, automobile accessories and many other devices. Our target
is to achieve 100% accurate speaker−independent phoneme recognition in the presence of typical background sounds such as car noises that do not impair human speech recognition. We do not expect to solve the homonym resolution problem for general unstructured human speech. The effective speech recognition accuracy, the word error rate, of the engine will be determined by the frequency of homonyms and near−homonyms, words and phrases that sometimes sound the same, in the recognized speech.

The Mathematician will help translate advanced concepts in human speech
to specific mathematical formulas that can be tested on human speech data and, if successful, converted quickly to software for a real−time commercial speech recognition engine written in a portable compiled language such as ANSI C. The engine will include a Microsoft Speech compatible wrapper.

The task is similar to the inference of mathematical formulas such as differential equations from experimental data and from concepts expressed in words, pictures, and rough mathematical formulas. It may resemble, for example, the translation of Michael Faraday's ideas about electricity and magnetism from the words and pictures that Faraday used to a set of new differential equations by James Clerk Maxwell. Experience with this process is most valuable for this position but is not a requirement.

A strong knowledge of the physical processes and/or visual representations corresponding to individual terms and factors within terms in differential equations and other mathematical formulas should be helpful. A strong knowledge of English verbal descriptions, words, and phrases used for these physical processes and/or visual representations should also be helpful. This should make it easier to identify the mathematics −− for example construct a new differential equation −− corresponding to features of data and advanced concepts expressed in words and pictures.

Experience in the following areas may be helpful, but is in no way a specific requirement of the position:

1. Non−linear differential equations
2. Classical invariant theory
3. Differential geometry and tensor analysis
4. Hidden Markov Model speech recognition methods
5. Adaptive signal processing
6. Music theory and practice
7. Acoustics of Speech Communication
8. Implementation of advanced mathematical algorithms in C or similar languages
9. Mechanical modelling, finite element analysis, and simulation of

elastic materials.

The Mathematician must be able to think creatively, "outside the box", and have a solid foundation in advanced mathematics including the ability to learn new areas rapidly as needed. An advanced degree in mathematics, applied mathematics, or theoretical physics may be helpful, but is not required. This is primarily a pencil and paper task; computer skills (for example, knowledge of a computer algebra system such as Mathematica) may be helpful but are not required.

The Mathematician will be an independent contractor and will need to sign a non−disclosure agreement to perform the task. The Mathematician
will need to work closely with a scientist from GFT Group in a collegial style. This is not implementing someone else's ideas but requires shared creativity by skilled experts in complementary fields. The opportunity to share license fees from the technology and inventor status (on patent applications for example) may exist.

GFT Group is a private research and development and contracting organization with several products in the speech recognition field. For more information, see http://www.Petrana.net

Please submit a cover letter and a résumé and/or curriculum vitae in the body of a single plain text e−mail message. A statement of research interests and research philosophy may be helpful, but is not required. Please send plain text only. No attachments, hypertext, or active content. Please include the word "Mathematician" in e−mail subject line. Please send to:

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