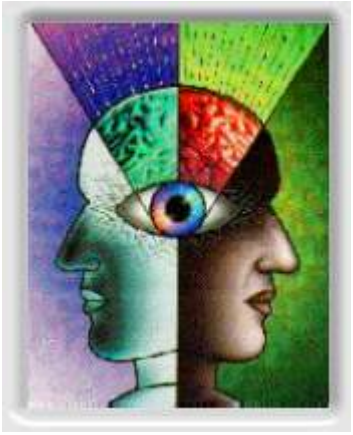
Artificial Cognition, Inc™



The Arts of Disambiguation and Machine Cognition

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INTRODUCTION

The computer industry has been in search of a proper method for machine translation for over 50 years. The ACI team believes it has invented a method and technology to store and process meanings of words. In conjunction with parsers our technology will bring the industry closer to that goal. This package is aimed at acquainting the reader with the concepts, purposes, potential, and basic structure of Artificial Cognition™[1].

WHAT IS ARTIFICIAL COGNITION?

Artificial Cognition makes a computer as capable of dealing with words as it is of dealing with floating point numbers. Artificial Cognition defines words so they are operable in current processors on current personal computers. The question "How is a motorcycle like a wristwatch?" is answered in only a few cycles: "They are both mechanisms." It gives the computer the most efficient computing facility, the ability to "understand" non-numeric information—concepts and meanings—with the same facility, speed, and efficiency as numbers.

Artificial Cognition is not artificial intelligence, *per se*; it is a method and technology to store and process meanings of words. Artificial Cognition may, indeed, become a basis for intelligent operations when used with parsers, information organization and structure systems, and other tools.

Even the most sophisticated computer applications today only work with words and meanings as character strings. String operations like comparisons and searches are the least efficient computer operations. Furthermore, meanings of words, processed by string operations, have no inherent, calculable relationship to each other. Words stored in computers today have no characteristics that reveal their relative closeness. Nor do they have any content on which the ALU can operate, that supplies information about the relationships between the meanings of words. This remains a major impediment to natural language processing and to progress towards "artificial intelligence."

Artificial Cognition lets you define words so the definitions are quantitative and operable directly—arithmetically and logically. Working at machine speeds, just one or a few clock cycles for each operation, means that with a dictionary, a parser, and an off-the-shelf desktop computer you can perform natural language operations using current computers, computer architecture, and registers.

How can a computer calculate how close the meanings of words are? With present systems, it can't; the best a "natural language" process can do today is look up the closeness of meanings in a table where all the information has been stored. This is where Artificial Cognition opens worlds of new possibilities heretofore closed to computer systems and applications. It can answer the questions: "Is a bicycle more like a car or a canoe? How?"

The center of Artificial Cognition is a dictionary of words whose meanings are expressed numerically in ways that contain the relationships among meanings. It is also referred to, in some of the intellectual property legal documents as "machine vocabulary."

Current efforts to perform natural language operations are anything but natural as computer processes. In order to seem like natural language processing, the computer needs a huge repository of words, lengthy definitions, and tables showing the relationships among words. This is a major impediment to widespread use of natural language processing in computer applications.

Key Participants

George Harvey—Vice President of Intellectual Property Development

Mr. Harvey, as Vice President, is the chief inventor and architect of Artificial Cognition and the associated dictionaries and support processes at Artificial Cognition, Inc.

George Harvey began developing Artificial Cognition in 1987 and has now refined and executed the technology to the point that Artificial Cognition operations that can run on ordinary computers.

George is the inventor of the Artificial Cognition System and, as such, the primary expert on the subject and its processes. His educational background includes studies in Humanities at Drew University and Columbia University and Art at Pratt Institute. After ten years in the publishing and graphics industries, including three teaching graphics and mathematics at the prestigious Groton School in Groton, Massachusetts, he became a systems programmer in 1982. He began work on the underpinnings of Artificial Cognition in 1987. From 1987 to 1996 he wrote compilers, libraries, and operating systems for Microway in Plymouth, Massachusetts, specializing in high speed mathematical operations. Since 1996, he has worked on patents for the Personalized Mass Media Corporation as an expert in computer technology.

Donald Greenbaum—President

Mr. Greenbaum, as President, is the Chief Executive and Chief Financial Officer of Artificial Cognition, Inc. He is the final arbiter of decisions related to allocation of ACI's resources, strategic business decisions and initiatives, and corporate and strategic level policy and funding decisions.

Don brings to ACI a long career in the computer industry. He holds an MBA in Finance from Bernard Baruch College in NY. In 1980, he was a banker on Wall Street who had amongst his clients Commodore International Ltd. In 1983 he left his position as VP at Manufacturers Hanover Trust to become VP-Investor Relations Commodore. He also held the position of SVP Strategic Planning and VP and Treasurer during his tenure there. In 1986 he joined MicroWay Inc. as SVP Operations. MicroWay is a software company specializing in Compilers and Numeric Processing. In 1992, Mr. Greenbaum was appointed to the FCC Emergency Broadcast System Board by President Bush. Most recently he was Founder and President of Aurum Telemedia Company, a VAR specializing in high-end servers to the dot com and insurance industries.

Charles Collins—Vice President of Development

Mr. Collins is responsible for development, implementation, quality assurance, and documentation.

Chuck has over 25 years in IT & e-commerce executive management, program & project management, vendor management, quality assurance, & disaster recovery. He is Vice President of Professional Services and principal consultant for an IT consulting firm and, in that capacity, serves manufacturing, pharmaceutical, medical products, chemical, financial, high technology, telecommunications, transportation, and other industries.

Mr. Collins has a BA in economics from Drew University. He has served at the director level for software development and international IT consulting firms.

POTENTIAL USES OF ARTIFICIAL COGNITION

Here are a few of the many potential uses of Artificial Cognition. One of the most important aspects, for most applications, is that the applications will be able to learn with each use and refine their operation in the context and setting in which they are used.

TRANSLATOR

There are about one billion internet users. Of those, 80% do not use English as their primary language and most of these do not have a working comprehension of English. Moreover, 70% of the web is still written in English. The potential market for a working translator starts with English to another language, later it will be able to translate Chinese to Indian, Russian to Arabic, etc.

We will be able to develop translators of text that automatically include context awareness in the process and translate in real time. That can improve effectiveness and responsiveness of business and government communication operations.

Using an Artificial Cognition-based system equipped with dictionaries, parsers, and phrase and slang dictionaries for several languages; the application can understand statements and translate them into grammatically and idiomatically correct statements in other languages. Adding voice recognition will enable the application to perform real-time translations of spoken language.

LANGUAGE TUTOR

95% of the world's population does not speak a second language. The internet's true value of connecting the world offers a vast market for online language tutor services.

It is difficult, particularly in the predominantly monolingual United States, for adults to learn foreign languages. Learning a language, for most adults, is daunting and generally fruitless. The success of Pimsleur, Berlitz, and others in the American market is proof that this is a lucrative market. This application is an enhancement of the translator. It adds computer-based training (CBT) architecture to teach languages, individually, to students of different levels of competence.

Current language tutor programs have students repeat known speech patterns, phrases, and sentences and match those in the computer. The storage is as images of sound, or as spellings of specific words and sets of words. They do not automatically and individually focus on weak points in vocabulary and grammar. An Artificial Cognition language tutor would this and more.

CONTEXT SENSITIVE SPELL CHECKER

In a world of 750 million computers, most of which use word processing with non-context based spell checkers, we see a huge market for a more accurate solution.

Spelling checkers in word processors and other office productivity software are handy, but the one thing they cannot do is correct a keyboard or spelling error where the error is, by

coincidence, another valid word; it's just the wrong word. If Artificial Cognition supports the spelling checker, it will catch many of those mistakes.

SEARCH ENGINE FRONT END

1 Billion Internet users depend on search engines daily. The phenomenal growth of Google and others shows the vast market potential for any improvement we can offer these search engines.

In using search engines for research and to find lost files and documents, users often conduct many searches, repeatedly and manually, refining and altering search arguments, fuzziness, and other parameters each time. That all gets complex and unwieldy, sometimes to the extent that people don't use those search engines as much they could.

With Artificial Cognition, a parser, and an inference engine, you can conduct intelligent searches both serial and parallel and, with the right application, help analyze the results.

The application understands user questions and turns them into queries appropriate to the search engine. Then it conducts the searches, retrieves the results, and presents them to users.

For example: a search can be made for "sports car." If told to do so, the search engine can return all objects it recognizes as types of sports cars (*e.g.*: roadsters, touring cars, etc.)

SPAM AND VIRUS FILTER

Email use is the number one web application. Most spam filters are English based and offer little relief to the 80% of foreign language internet users. Moreover, US companies have no solution to the foreign language spam entering the US.

Many people have produced spam filters with some benefits; none is perfect. The same is true of virus software.

For a spam filter, the Artificial Cognition-enabled program would "discuss", with the user, what types of mail the user did not want. For instance, user instructions could be sentences like: "I don't want any mail about increasing the size of my penis. Nor do I want to receive unsolicited mail about mortgage refinancing, offers for credit cards, requests for contributions, or sales pitches." On that basis, the application would screen out e-mail that fit the criteria and ask the user about doubtful cases, further refining future spam filter operation.

For an Artificial Cognition-enabled application to deal with viruses, it would scan incoming traffic **at the server** and identify viruses and Trojan horses by determining what they would do or cause to happen if activated. The application could even identify a new virus based on what it would do rather than having to refer to a database that defined all known viruses.

COMMUNICATIONS MONITOR AND ANALYST

In a post 9/11 world every government is monitoring international traffic yet the availability of translators remains in short supply.

Intelligence gathering and analysis have, since the middle of the twentieth century, seen more and more machine support. Alan Turing invented Colossus, the programmable vacuum tube computer used at Blechley Park, England to decrypt *Enigma* traffic during World War II.

These functions constitute "communications intelligence" and can be used to analyze intercepted communications, compare them with other communications, and, based on those analyses and comparisons, determine disposition of the intercept and its associated analyses.

Using Artificial Cognition, computers will be able to collect, evaluate, translate, and analyze intelligence in virtually unlimited volume. This clearly has many potential uses, particularly when combined with a Translator application, *q.v.*, above.

ENCRYPTION SYSTEM

Security and privacy are pervasive government, business, and personal concerns. We think the market for a secure, easy to use encryption system for e-mails, documents, financial records, and other sensitive information would extend nearly to the complete population of computer users.

As corporations moved from paper to fax to internet interoffice communications the security of private data becomes troublesome. The news media daily reports instances of employee and customer record compromises. A better encryption system to protect data is possible based on our 64-bit numeric representation of words. Private emails could be similarly protected for the billion internet users.

As noted above in **Communications Monitor and Analyst**, cryptanalysis has benefited greatly from the development of computers. Asymmetrical encryption (public key trapdoor systems) was invented, as far as I know, by Ron Rivest, Adi Shamir, and Leonard Adleman at MIT in the 1960s and early 1970s. However, it was not generally useful until the 1980s due to the limitations of available computing power.

So far, these systems, if the key lengths are adequate, are secure as far as we know. Their security is based on the difficulty of factoring the products of very large prime numbers. How long this will remain true is open to conjecture. But there will be a market for a new method of encryption sooner or later and Artificial Cognition may hold the key.

A document that has been enciphered using Artificial Cognition can be operated such that meanings are mapped consistently to new meanings so relationships among words in sentences are preserved. The advantage of this lies in the fact that there would be many different cryptanalytic algorithms that could be used to decode the document, and each of them would produce a result that potentially made sense but would not be valid.

Put another way, a code breaker would have no way to know whether he had actually broken the code based on readability of a document, since alternative solutions would produce credible results; the only way to be certain of correctly deciphering material encrypted this way would be to know the correct key.

INTELLIGENT PHONE ASSISTANT

The answering machine was invented in the 1950s and today, 50 years later it still does little more than store a message. Imagine a telephone answering system that could understand the message and caller and respond with preprogrammed information. There are over 200 million "dumb" answering machines in the US alone.

Telephone answering machines and voicemail systems have, at most, a few standard messages: You're not in. You're on the telephone. You're on vacation. Some of the more complex business voice mail and automated call routing systems ("Press 1 for your account status; press 2 for a product list; press 3 for … . Sorry, there is no number that will connect you with a human being.") cascade you through a series of increasingly frustrating menus. All things considered, automated telephone answering systems are calculated and architected to irritate customers, prospects, and friends.

Using an Artificial Cognition-based system equipped with voice recognition and identification, the telephone can recognize callers and treat them appropriately, based on who they are and what they're calling about. This can be done conversationally and with very few steps.

OTHER USES

This technology can be used for Conversing Robots, intelligent and interactive game support, library managers, access (internet) restrictors, program debuggers and even its own Prolog like computer language.

INTELLECTUAL PROPERTY

Artificial Cognition, Inc. has applied for patents on Artificial Cognition in the United States.

PATENTS—DESCRIPTION AND STATUS

US

The United States patent application was filed in January 2006 and assigned a serial number 11343251 by the PTO.

International

Patent applications will also be filed in:

- Japan
- India
- United Arab Emirates
- Europe
- Canada

COPYRIGHTS, TRADEMARKS, SERVICE MARKS, AND OTHER IP PROTECTION

ACI is implementing copyright and trade and service mark protection on process and component names and designations associated with Artificial Cognition.

OWNERSHIP OF INTELLECTUAL PROPERTY

Prior to external financing or commercial licensing activities all patents and titles to the intellectual property will become the sole property of Artificial Cognition, Inc.

MANAGEMENT OF DICTIONARIES

One of the most important intellectual property issues is the management of Artificial Cognition dictionaries to ensure preservation of their alignment, consistency, and interoperability. This includes dictionaries in different languages and dedicated dictionaries prepared for the needs of some special licensees and applications.

Artificial Cognition, Inc. will join with licensees and partners to establish and operate a standards organization responsible to maintain and update all Artificial Cognition databases (dictionaries), to keep the dictionaries synchronized and consistent, and to address reports of defects and requested changes and enhancements from licensees, partners, and users.

WHAT MAKES ARTIFICIAL COGNITION UNIQUE

Artificial Cognition is Consistent with Human Cognition.

When you use Artificial Cognition, you use a process whose operations and structure are consistent with the way your own mind uses language. Therefore, when you add Artificial Cognition to your process, you are adding capabilities that operate, in many ways, like a human mind.

Artificial Cognition operations, in our tests, produce results of computer operations on word meanings, that are mathematically, logically, and empirically valid. The results of using an Artificial Cognition computer program to determine relationships (*e.g.*: subsets and supersets) are consistent with the results of having people determine the same relationships for the same words with a purely non-numeric process.

Artificial Cognition, Inc. applied for a patent for this process in January, 2005. We believe this is a seminal patent.

Artificial Cognition is a Foundation Invention

Most inventions, and most patents, are derivative and based on prior art. The automobile is based on the wheel, internal combustion engine, hundreds of electronic patents, and thousands of other inventions that reach back from yesterday into prehistory.

Artificial Cognition is basic. Its only predicates are human language, mathematics, logic, and human thought. It doesn't depend on computer technology or other inventions. However, many other inventions will be based on Artificial Cognition.

Artificial Cognition is an Optimal Process

Artificial Cognition operations can be conducted in a single clock cycle. The only way to improve on the speed of Artificial Cognition is with a faster processor and platform.

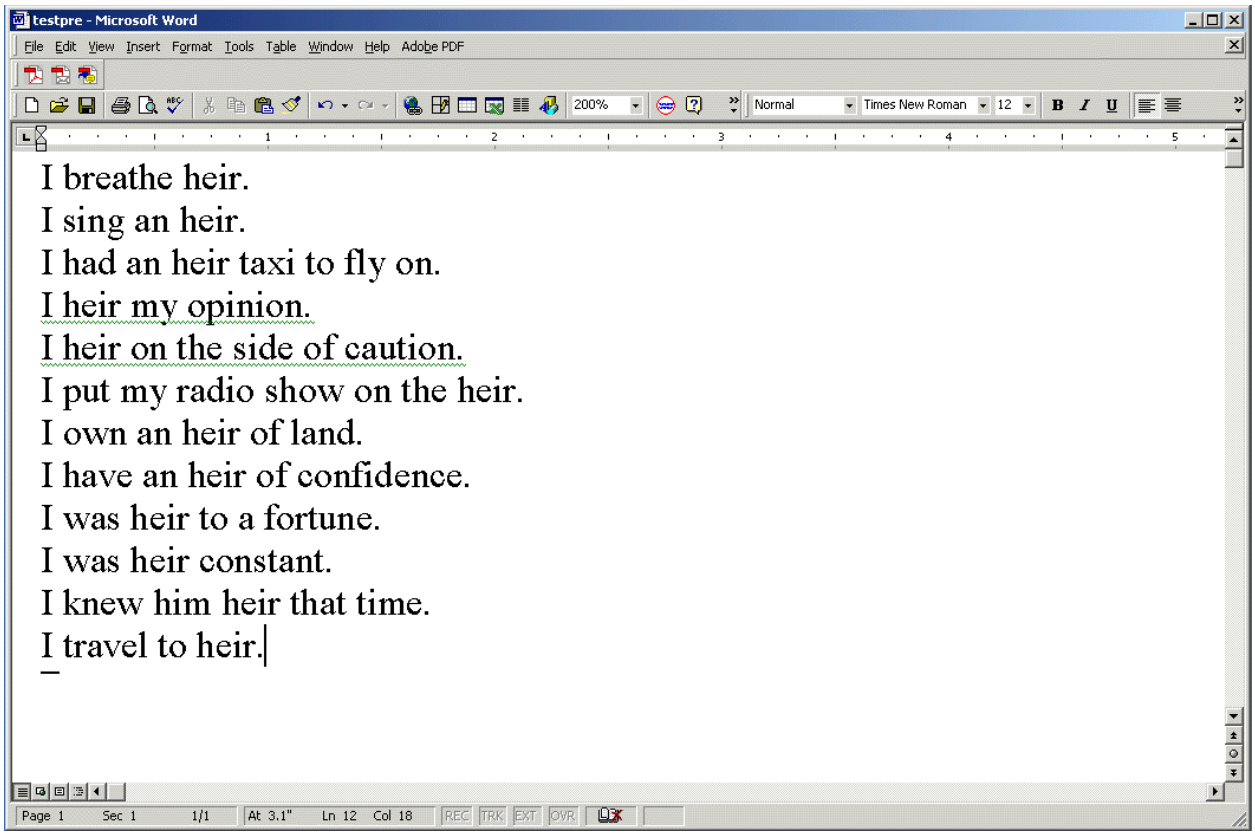
The processes and algorithms described as Artificial Cognition are designed such that, if a processor is built to implement them, the only constraint is the speed of the processor. Therefore, the process, as designed, described, and implemented is as efficient as possible.

Even with current 64-bit processors, many basic Artificial Cognition processes (without error-checking) can be executed in from one to three clock cycles. Artificial Cognition completes an analogy in two clock cycles if done without error-checking. This speed cannot be exceeded by other methods.

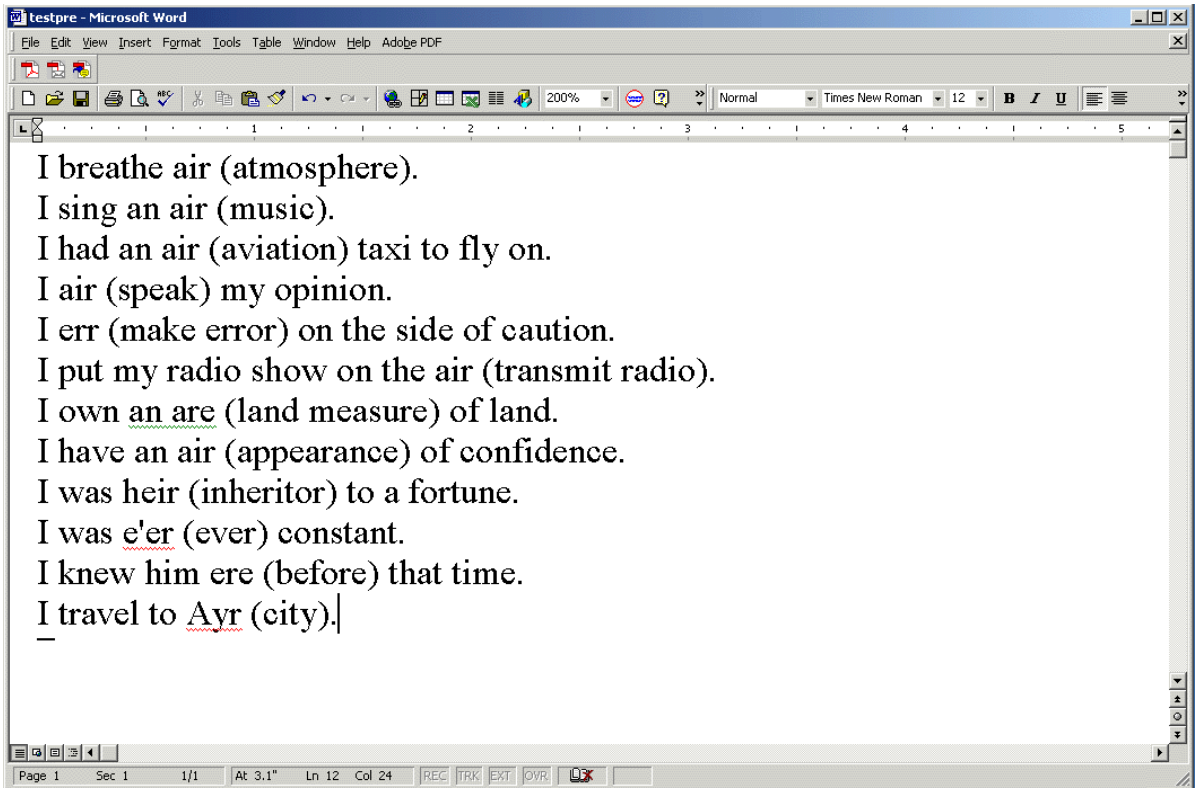
If you had a processor specifically designed for Artificial Cognition, as mentioned above, error checking could be performed concurrently with and as fast as logical and arithmetic operations. For example, in a current 64-bit processor, the above analogy production takes two clock cycles without error processing. A 64-bit processor designed for Artificial Cognition could be built to do it in a single cycle, including error-checking.

DEMONSTRATION OF THE TECHNOLOGY

Using our technology we can take the following 12 sentences and disambiguate the 12 different context meanings of the word air. We start with this:



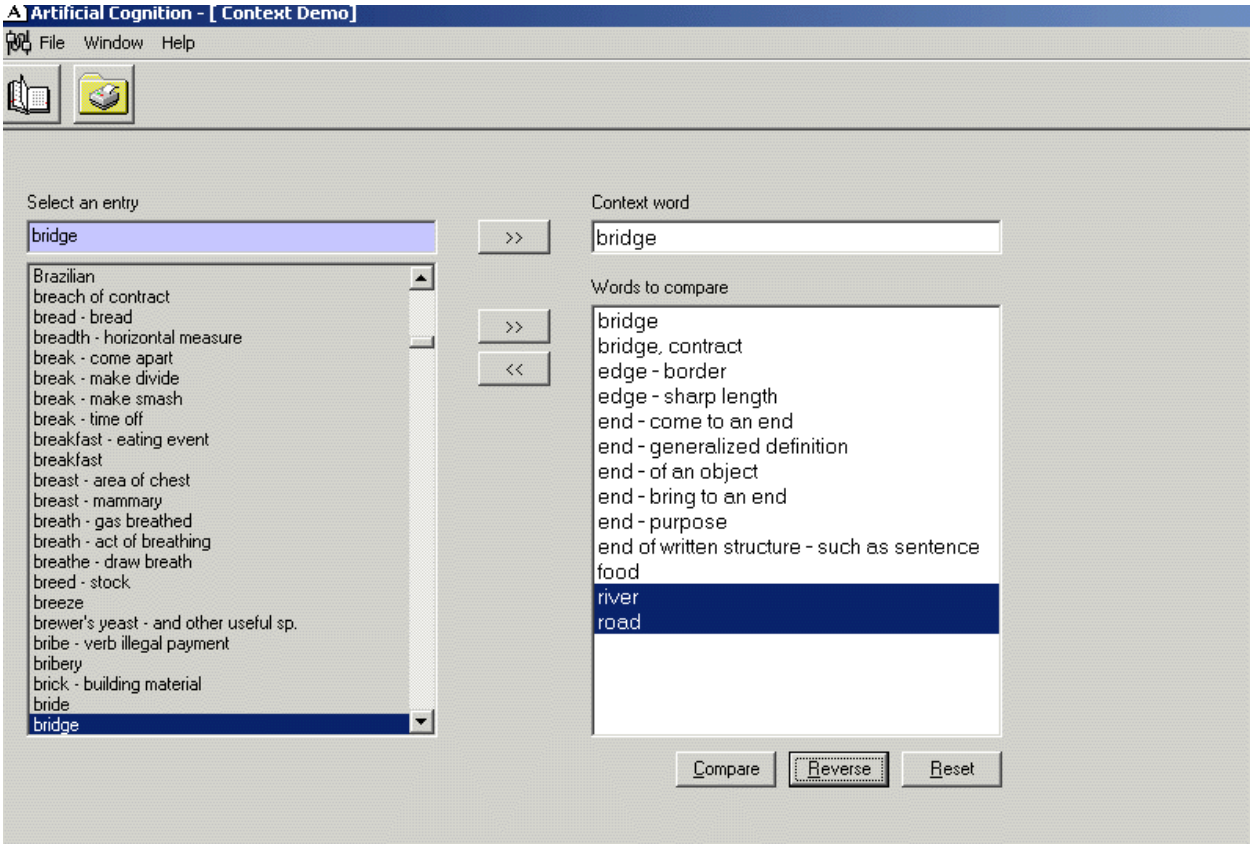
And wind up with this:

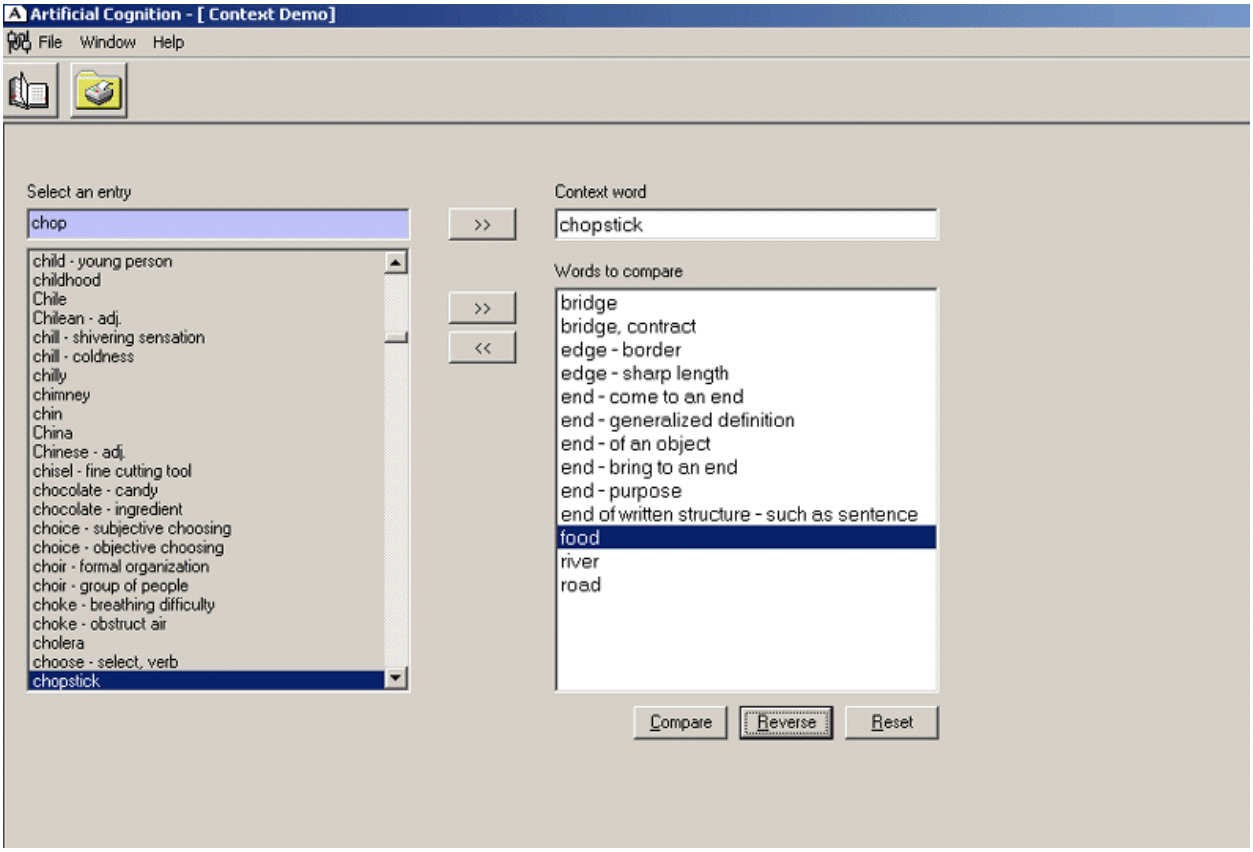


The parenthetical words following the corrected "air" are only used in this demonstration to show the context descriptor and would be left out in any application.

DEMONSTRATION OF JAPANESE HOMOPHONES

The Japanese language has many homophones that create unusual challenges for machine translation. Our technology differentiates words based on context as demonstrated in the following screen shots of our database tools. The word Hashi for instance can mean bridge, chopstick, edge of an object, or beak (of a parrot). Since our software knows that bridge cannot be associated on a context basis with edge or food, when we translate Hashi as it relates to food, the meaning chopstick is the only context word match.


Artificial Cognition - [Context Demo]
File Window Help
Select an entry
bridge
Brazilian
breach of contract
bread - bread
breadth - horizontal measure
break - come apart
break - make divide
break - make smash
break - time off
breakfast - eating event
breakfast
breast - area of chest
breast - mammary
breath - gas breathed
breath - act of breathing
breathe - draw breath
breed - stock
breeze
brewer's yeast - and other useful sp.
bribe - verb illegal payment
bribery
brick - building material
bride
bridge
>>
>>
<<
Context word
bridge
Words to compare
bridge
bridge, contract
edge - border
edge - sharp length
end - come to an end
end - generalized definition
end - of an object
end - bring to an end
end - purpose
end of written structure - such as sentence
food
river
road
Compare
Reverse
Reset


Artificial Cognition - [Context Demo]
File Window Help
Select an entry
chop
child - young person
childhood
Chile
Chilean - adj.
chill - shivering sensation
chill - coldness
chilly
chimney
chin
China
Chinese - adj.
chisel - fine cutting tool
chocolate - candy
chocolate - ingredient
choice - subjective choosing
choice - objective choosing
choir - formal organization
choir - group of people
choke - breathing difficulty
choke - obstruct air
cholera
choose - select, verb
chopstick
>>
>>
<<
Context word
chopstick
Words to compare
bridge
bridge, contract
edge - border
edge - sharp length
end - come to an end
end - generalized definition
end - of an object
end - bring to an end
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food
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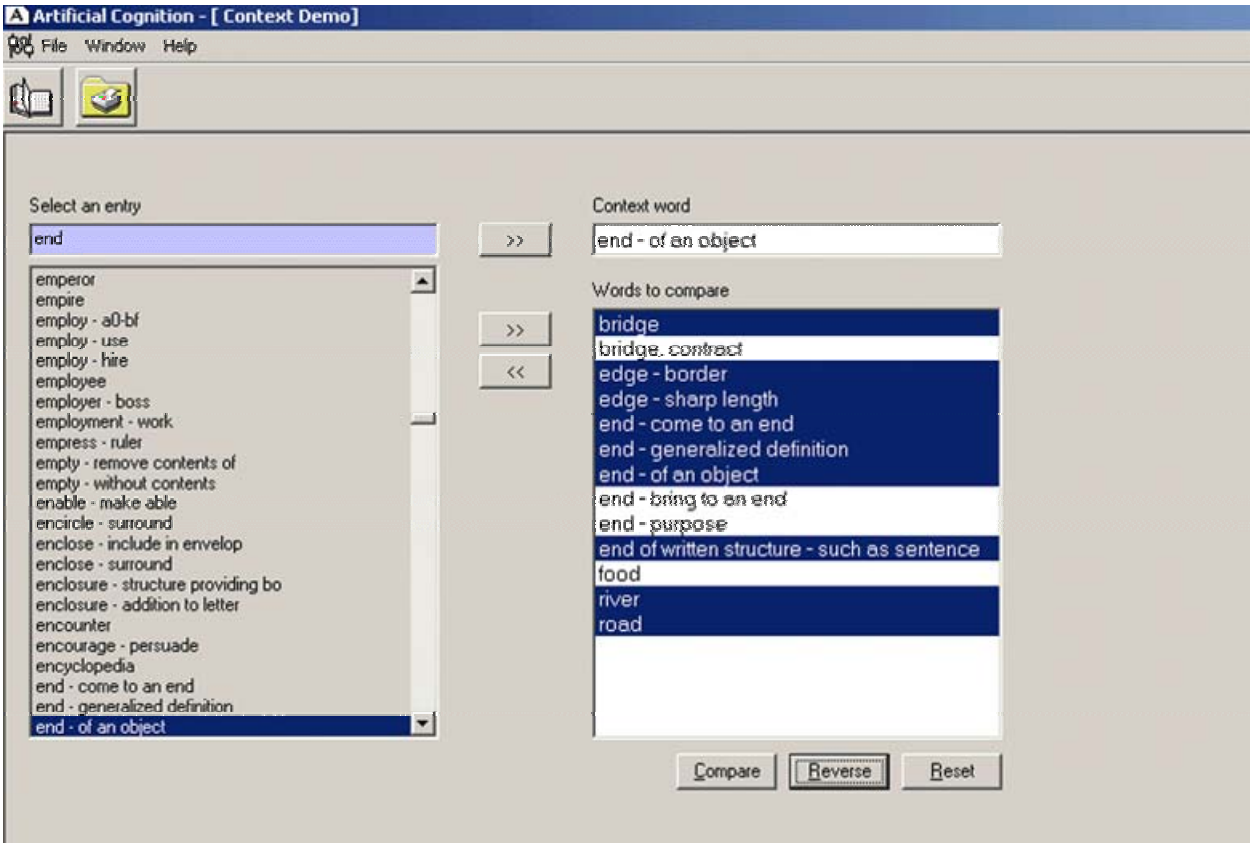
Artificial Cognition - [Context Demo]
File Window Help
Select an entry
end
emperor
empire
employ - a0-bf
employ - use
employ - hire
employee
employer - boss
employment - work
empress - ruler
empty - remove contents of
empty - without contents
enable - make able
encircle - surround
enclose - include in envelop
enclose - surround
enclosure - structure providing bo
enclosure - addition to letter
encounter
encourage - persuade
encyclopedia
end - come to an end
end - generalized definition
end - of an object
>>
>>
<<
Context word
end - of an object
Words to compare
bridge
bridge. contract
edge - border
edge - sharp length
end - come to an end
end - generalized definition
end - of an object
end - bring to an end
end - purpose
end of written structure - such as sentence
food
river
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Compare
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Reset

THE ART OF DISAMBIGUATING WORDS IN A CELL PHONE TRANSLATION APPLICATION

Once words are converted to a digital format they can be checked for context meaning. The output can be in any language the recipient chooses. Occasionally a new word will be encountered. We have a solution to that problem:

1. A Japanese caller speaks a sentence containing the word "Tomesode"

2. The cell phone translates this into an intermediate computer language

3. The English speaking users' cellphone translates this from the intermediate language to English

4. A search of the database finds no match in the English language for the equivalent of the word Tomesode.

5. The database software analyzes the definition and finds that it means "formal kimono for married woman"

6. The receiving cell phone finishes the translation and speaks

WORD ANALOGIES AS MATH PROBLEMS

High school students are subjected to analogy questions as part of the SAT college entrance exams. Instead of logic, our software compares the differential of each pair of words numerically. After comparing all 5 sets, the differential that is closest to the original differential is the correct answer. Look at these questions. How long does it take you to do them? Did you get the correct pair? Conventional wisdom says that this type of work cannot be done by computers at all. ACI's technology allows the computer to find these analogy answers in less than a millionth of second.

1.) BIRD : NEST ::

(A) dog:doghouse
(B) squirrel : tree
(C) beaver : dam <= answer
(D) cat : litter box
(E) book : library

2.) DALMATIAN : DOG ::

(A) oriole : bird <= answer
(B) horse : pony
(C) shark : great white
(D) ant : insect
(E) stock : savings

3.) DOCTOR : HOSPITAL ::

(A) sports fan : stadium
(B) cow : farm
(C) professor : college <= answer
(D) criminal : jail
(E) food : grocery store

4.) CUB : BEAR ::

(A) piano : orchestra
(B) puppy : dog <= answer
(C) cat : kitten
(D) eagle : predator
(E) fork : utensil

5.) TENET : THEOLOGIAN ::

(A) predecessor : heir
(B) hypothesis : biologist <= answer
(C) recluse : rivalry
(D) arrogance : persecution
(E) guitarist : rock band

6.) AUTOMOBILE : MOTORBOAT ::

(A) gas generator : water wheel
(B) balloon : raft
(C) freight train : ocean liner
(D) rickshaw : rowboat <= answer
(E) windmill : sailboat