

The Canadian Speech Processing Industry

Technology Roadmap
(2003 – 2007)



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INTRODUCTION

In the summer of 2002, industry, university and government representatives from across Canada, with the support of Industry Canada and the National Research Council of Canada, formed the Steering Committee of the Language Industries Technology Roadmap. For the purpose of the exercise, language technologies consist of the technologies related to Content Management, Speech Processing, Translation and Training subsectors. This is a summary of the first phase report on speech processing technology.

The mission of the Association de l'industrie de la langue / Language Industry Association's (AILIA) Speech Processing Technology Roadmap committee is as follows:

“Speech Processing provides powerful capabilities for improving the interaction between humans and machines, and between humans using machines. The Speech Processing Industry consists of speech recognition, text-to-speech, voice biometrics - their applications, platforms, and services. The Canadian Speech Processing Technology Roadmap Committee will assist Canadian Speech Processing Companies to achieve competitive advantage in Canada and maximize global market share.”

THE TECHNOLOGY ROADMAP (TRM) PROCESS

- Establish statements of the purpose and goals for the TRM **(2003-2004)**
- Define the scope of the Speech Processing Industry Technology Roadmap. This includes key technologies and research **(2003-2004)**
- Specify the Speech Processing technology market drivers and their targets **(2003-2004)**
- Define the needs of the Canadian Speech Processing industry and its customers **(2004-2005)**
- Recommend speech processing technology research and development support strategies that should be pursued by AILIA **(2004-2005)**
- Define what skills and knowledge the industry's future work force will require to develop and implement the new technologies **(2004-2005)**
- Implement AILIA's speech processing technology research and development support strategies **(2004 – 2007)**
- Promote skill and knowledge development of Canada's future work force through business incentives and academic financial support **(2004 –2007)**

SPEECH PROCESSING OVERVIEW

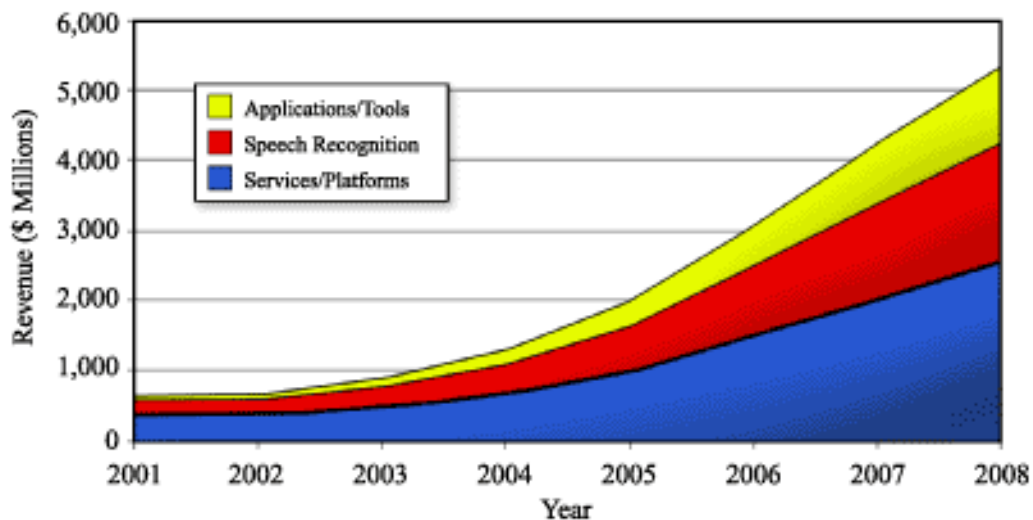
Speech processing provides powerful capabilities for improving the interaction between humans and machines, and between humans using machines. Speech processing covers the group of software components, tools, techniques and applications that replicate the human ability to hear, identify, and utter natural human spoken language. Speech processing can also be enhanced with Natural Language Processing (NLP) technology to model the human capacity to comprehend and process the content of human language, and to enable translation of a spoken sentence from one language to another, and many other intelligent linguistic applications.¹

¹ <http://www.hltcentral.org>

The convergence of information technology, telephony, and consumer electronic devices, coupled with a desire for an alternate user interface, is driving demand for Speech Processing systems. Continued investments in research and development, combined with an existing infrastructure that lowers costs to enter this market, will propel this industry to tremendous growth.

In April 2003, ABIresearch projected the Speech Processing market to increase to \$897.8 million in 2003 (all figures in \$US), up from \$677 million in 2002. Over the longer term, the speech recognition market is forecasted to grow to \$5.3 billion by 2008.² Although a Datamonitor³ January newswire indicated revenue for 2003 was closer to \$800million, this still puts the market on track for \$5 billion by 2008.

Speech Technology Market Revenue, World Market: 2001 to 2008
(Source: Allied Business Intelligence Inc)



In its October 2003 report ABIresearch stated, "Speech recognition has experienced significant technological improvements in the past several years. Accuracy rates now reach the 95%-98% level for automatic speech recognition. Call centers, one of the primary applications for speech technology, are finding the ROIs for speech a strong factor in justifying the move to speech enable their operations. Telcos and carriers are looking to generate additional revenues through voice services delivered to subscribers. The embedded segment for mobile devices shows real promise as users become frustrated with tiny keyboards and small screens."⁴

In October 2003, Gartner Inc. reported, "There are several signs that the speech recognition industry is maturing. Many implementations provide proof that solutions that use speech recognition can deliver business value, as cost savings or improved customer service," said Steve Cramoysan, principal analyst for Gartner. "The clear market leaders today are Nuance and ScanSoft. Entry by Microsoft, IBM, and Intel into the market is providing significant momentum, and further changes in the vendor landscape are to be expected. We expect the industry to grow strongly during 2004, due to continued pressure on call center operations to be competitive, increased awareness of the role of speech solutions to achieve this and deliver benefits across the enterprise, and a broader supply of proven speech solution modules, which reduce the costs and risks for companies"⁵

² <http://www.abiresearch.com/abiprdisplay2.jsp?pressid=143>

³ <http://www.datamonitor.com>

⁴ <http://www.abiresearch.com/reports/SRS.html>

⁵ http://www4.gartner.com/5_about/press_releases/pr15oct2003a.jsp

THE SPEECH PROCESSING INDUSTRY

The Speech Processing Roadmap Committee has agreed to the following parameters for speech processing technologies:

TECHNOLOGIES

<p>Automatic Speech Recognition <i>Speaker dependent speech recognition</i> <i>Speaker independent automatic speech recognition</i></p> <p>Speech Synthesis <i>Text-To-Speech</i> <i>Language Generation</i></p> <p>Voice Biometrics <i>Speaker Verification (Authentication)</i> <i>Speaker Identification</i> <i>Lie Detection</i></p>	<p>Audio classification (<i>silence/noise/music/speech</i>)</p> <p>Natural Language Understanding <i>Topic Spotting</i></p> <p>Dialog Management</p> <p>Applications and Tools</p> <p>Speech Recognition Services and Platforms</p>
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APPLICATIONS

<ul style="list-style-type: none"> ▪ <i>Interactive Voice Response (Call Centers & Auto-Attendants)</i> ▪ <i>Voice-enabled Telephony Portals</i> ▪ <i>Voice-enabled Web Portals</i> ▪ <i>Unified messaging (Voice-activated voice mail, etc.)</i> ▪ <i>Embedded Speech Recognition (cell phones and PDAs)</i> ▪ <i>Directory Assistance</i> ▪ <i>Outbound dialing applications</i> ▪ <i>Broadcast News Applications</i> ▪ <i>Automatic Transcription</i> ▪ <i>Speech-to-Speech Translation</i> ▪ <i>Lie Detector</i> 	<ul style="list-style-type: none"> ▪ <i>Telematics (automobiles)</i> ▪ <i>PC Dictation</i> ▪ <i>PC Operating System and application, voice-enabled command and control</i> ▪ <i>Security (fraud detection, customer verification, access control)</i> ▪ <i>Home Automation</i> ▪ <i>Computer Control for the Disabled</i> ▪ <i>Audiovisual document indexation & search (MPEG-7)</i> ▪ <i>Speech processing assisted Language Training</i> ▪ <i>Dubbing, Digital Audio post-production</i>
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CANADIAN SPEECH PROCESSING

The Canadian language industry has long enjoyed an enviable reputation thanks to the efforts of top professionals, associations and educational institutions that have produced specialists in translation, languages and speech processing technologies.⁶

Canada continues to be a significant player on the world stage in Speech Processing technologies, voice platforms, application development, and services. The Canadian global advantages include:

- Our obligation to fulfill the needs of a bilingual society;
- Our experience, knowledge base;
- Low resource costs in speech processing technology and applications research & development; and,
- Our proven track record of useful and profitable speech processing deployments.

⁶ <http://www.ailia.ca>

THE CANADIAN SPEECH PROCESSING INDUSTRY

A 2003 AILIA sponsored survey of Canadian Speech Processing business activity identified the following key Canadian Speech Processing Technology providers⁷.

<ul style="list-style-type: none"> ▪ CGI ▪ ComputerTalk ▪ Diaphonics ▪ Elix ▪ Max Systems Inc. ▪ Mitel ▪ NMS ▪ Nortel Networks 	<ul style="list-style-type: none"> ▪ Nuance Communications Canada ▪ Nü Echo ▪ OTG ▪ Pika Tech. ▪ Pronexus ▪ ScanSoft Canada ▪ Ryshco Media 	<ul style="list-style-type: none"> ▪ Speech Gadgets Inc. ▪ Time ICR ▪ Vestec ▪ VisuAide ▪ Voice Gate ▪ VoiceGenie ▪ Wavemakers (Acquired by Harman International)
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CANADIAN SPEECH RESEARCH

A 2003 survey of Canadian Speech Processing Research identified the following key Canadian institutions actively involved in Speech Research⁸ and their key research areas :

KEY RESEARCH AREAS		
<ul style="list-style-type: none"> ▪ Audio Classification and Segmentation ▪ Speech Recognition in Noisy Environments ▪ Large Vocabulary Recognition ▪ Finite State Transducers ▪ Automatic Closed Captioning 	<ul style="list-style-type: none"> ▪ Automatic Transcription ▪ AudioVisual Document Indexation and Search ▪ Information Extraction (Audio Mining) ▪ Universal Translation (speech-to-speech) ▪ Language Training (NLP & Speech Processing) 	<ul style="list-style-type: none"> ▪ 'Reading Lips' To Improve Accuracy of ASR ▪ Conversational Agents ▪ Voice Biometrics ▪ Speech Synthesis ▪ Natural Language Generation
CANADIAN INSTITUTIONS INVOLVED IN SPEECH RESEARCH		
<ul style="list-style-type: none"> ▪ Centre de Recherche Informatique de Montréal - CRIM ▪ INRS-EMT ▪ l'École de technologie supérieure (ÉTS) ▪ Université de Sherbrooke ▪ Université du Québec à Chicoutimi ▪ University of Toronto 	<ul style="list-style-type: none"> ▪ University of Victoria ▪ University of Calgary ▪ McGill University ▪ National Centre for Audiology ▪ St. Mary's University - Liberated Learning ▪ University of Ottawa ▪ Université de Montréal 	

⁷ This list is not exhaustive. A complete survey will be conducted in 2004. Please contact AILIA at communication@ailia.ca to add your company to our growing list.

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AILIA – THE LANGUAGE INDUSTRY ASSOCIATION

Canada, is considered a top supplier of language products and services but its market share is seriously challenged. Stakeholders in the field have therefore decided to act by doing all that is needed to give the sector a fresh start. The Association de l'industrie de la langue/Language Industry Association (AILIA) has been created to meet this challenge.⁹

Vision To make Canada a world leader in the language industry.

Mission To join forces and be the voice of the Canadian language industry.

BENEFITS OF JOINING AILIA FOR SPEECH ORGANIZATIONS AND PROFESSIONALS

By joining AILIA you can participate in defining and implementing AILIA's speech processing technology research and development support strategies. The committee's preliminary recommendations include:

- Build an inventory of Canadian speech processing technology providers, researchers, and adaptors
- Build a repository and inventory for audio data (corpus)
- Provide a Canadian Speech Processing "who's who" directory with a brief description of their offerings, demonstration numbers, and contact information.
- Provide an information portal on Canadian Speech Processing Research. The goal is to provide a bridge from Research to Commercialization and to boost the number of best-in-class technology, platform, and application developers participating in research projects.
- Provide a forum to form strategic alliances (e.g. Industry, Universities, Government)
- Provide a forum to interact with the other language technology roadmap committees and AILIA members (Content Management, Translation, and Training)
- Build an information portal on business and research funding. This will include Government and Venture Capital information.
- Provide up-to-date News and events on Human Language Technologies in Canada & around the world.

Sign up today at <http://www.ailia.ca> !

⁹ <http://www.ailia.ca>