

# INSTITUTE FOR INTERDISCIPLINARY RESEARCH IN CULTURE, MULTIMEDIA, TECHNOLOGY, AND COGNITION.

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## 1. INTRODUCTION

The term multimedia refers to simultaneously presented audio and visual media types, such as visual images and text, and auditory speech, music, and sound effects. People are adept at encoding such complex audiovisual materials as occur naturally in conversation or dramatic performance for example. The challenge arises from electronic multimedia because audio and visual information can be *arbitrarily* combined in ways that may not be optimal for the human receiver. The design of electronic multimedia is for the most part "one-size-fits-all". It overlooks individual differences, and the way in which culture impacts on learning. The technology is typically developed with the implicit requirement of "user-adapt" rather than the other way around: technology "adapt-to-user". The Institute for Interdisciplinary Research in Culture, Multimedia, Technology, and Cognition (CMTC) aims to develop theoretically-based guidelines for application of multimedia technology in education within a cultural context.

The proposed research to be conducted by the CMTC Institute will examine how culture impacts on the use of multimedia technology, particularly in education where adoption of multimedia technology is widespread. This research program which focuses on the interaction between culture and multimedia within an educational context can be well addressed through the test bed provided by the multicultural populations of New Brunswick and Prince Edward Island. Approximately one-third of the population of New Brunswick is Francophone, and is served by the completely Francophone Université de Moncton. The three universities (University of Prince Edward Island, Université of Moncton, and University of New Brunswick) are uniquely poised to study these complex issues of multimedia through cross-cultural research within the new CMTC Institute. Focusing on language, music, thinking, and social communication, the Institute will work toward a new model of the learner within the context of culture and electronic multimedia. This model can guide educators, technology designers, communities, families, and individuals who need to make decisions involving learning and technology.

Researchers from the fields of Education, Modern Languages, Linguistics, Music, Computer Science, Artificial Intelligence, and Psychology will cooperate in the study of audiovisual representations of various teaching materials, including cultural archives, as well as teaching interactions. Different disciplinary perspectives of the same audiovisual information imply the overwhelming richness of audiovisual data and highlight the hypothesis that culture may unknowingly predispose a learner to attend only to a particular aspect of audiovisual information available.

In the test of this hypothesis, four inter-related objectives guide the CMTC-Institute researchers

- (1) to define mental processes underlying multimedia perception and cognition including the role of cultural background
- (2) to create electronic multimedia courseware that exploits culturally relevant archival resources
- (3) to evaluate the effectiveness of this electronic multimedia in educational and laboratory settings
- (4) to create and test the effectiveness of artificial intelligence software that generates culturally-adaptive multimedia teaching tools.

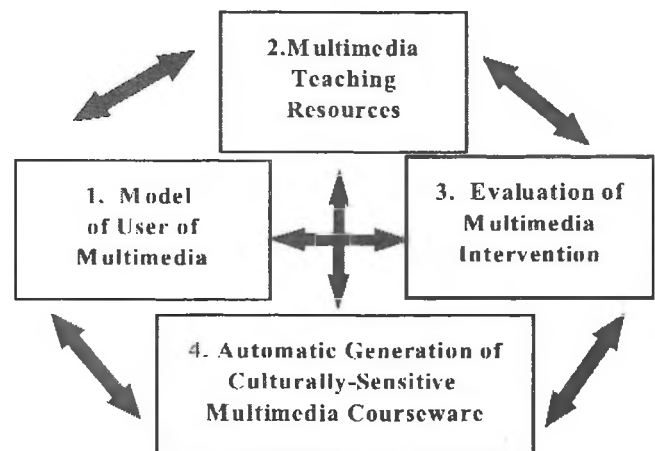


Fig. 1. Goals of the CMTC-Institute

## 2. THE INFRASTRUCTURE

The accomplishment of this work requires

- (a) laboratories dedicated to behavioural/ cognitive/linguistic response measurement, multimedia development and usability
- (b) large-scale digital storage/retrieval
- (c) interactive multimedia classrooms and
- (d) high-speed communications and teleconferencing.

These facilities will enable

1. creation and manipulation of audiovisual materials, and development of culturally relevant archival and teaching resources
2. storing AV material, text, archives and associated metadata.
3. Human response monitoring
  - (a) brain-wave recording
  - (b) eye-movements
  - (c) heart-rate and other physiological effects of multimedia, and correlation of such measures with other responses such as interest, memory, and cultural relevance
4. psychoacoustics and visual psychophysics and their interaction
5. cross-cultural research on use of multimedia software in live and distance-education teaching settings, including the recording and analysis of good teaching and learning environments
6. artificial tutoring programs
7. storage of discipline-specific metadata of audiovisual records
8. teleconferencing hardware/software, for data collection in classroom settings, research on interactive synchronous distance learning, and sharing information across CMTC nodes.

The multimedia, networking, and teleconferencing infrastructure made available through the Canada Foundation for Innovation will support a unique world-class Institute aiming to

- (a) define cultural variables that filter multimedia perception/cognition
- (b) develop and test a universal model of the learner
- (c) develop unique cultural archival data bases (e.g., Oral history and music of Francophone Acadian, Prince Edward Island, Aboriginal region)
- (d) link cultural databases to the design of culturally sensitive courseware. This new knowledge will give Canada a competitive edge in international markets for distance education, and will expedite lifelong learning across disciplines, intelligence levels, and cultures. Space does not permit develop of all facets of this project. Only the major theme is highlighted.

## 3. ACOUSTICS AND CMTC INSTITUTE

Because multimedia involves audiovisual integration, there is clearly a role for acoustics in this work. Although much research has been conducted on the perception of individual media types (e.g., text, visual images, speech, and music), less is known about the perceptual cognitive integration of the different media. In particular how can a balance be achieved between increased interest and information overload created when multiple types of media are electronically presented.

With respect to acoustics specifically, while much research has been conducted on the elements of sound, less attention has been directed to meaningful sounds of music and sound effects. In addition, while much research has been conducted on psycholinguistics and speech acoustics, there are many remaining unknowns that are relevant to theoretical and practical issues of best use of acoustically presented speech in multimedia applications in a cultural context. For example: are there universal characteristics of speech intonation that convey emotional meaning? how many audio locations is optimal for presentation of sound effects, music, and voice in an interactive learning situation? under what circumstances does music distract from a lesson or training presented via computer? does culturally significant music facilitate learning? does automatic speech recognition/translation assist the learning process of learners whose native language is other than that of the lecturer? can a second language be better taught through a "talking head" as opposed to acoustic information only? These and other questions entailing knowledge of acoustics will be addressed within the scope of the CMTC Institute. Thus, the Institute will exploit knowledge of acoustics and at the same time contribute to it while at the same time providing opportunities for research training and the acquisition of sophisticated technological skills.

Wladyslaw Cichocki, Department of French, is the Chief Liaison for UNB to the CMTC Institute and Friedemann Sallis, Department of Music, is the Chief Liaison for U de M. A primary focus of UNB is French as a second language, of UNB artificial tutoring, and of UPEI English as a second language. Appreciation is expressed to the Canada Foundation for Innovation and industrial and government partners, for the infrastructure enabling the collaboration of three campuses and their researchers across many disciplines in order to model the mind of the user of multimedia, in a cultural context.