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COGAIN

Communication by Gaze Interaction

Network of Excellence

Information Society Technologies

Periodic Activity Report
Year 1
Executive Summary

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Project coordinator name: Kari-Jouko Räihä
Project coordinator organisation name: University of Tampere

Executive Summary

COGAIN is a network of excellence on Communication by Gaze Interaction, supported by the European Commission's IST 6th framework program. COGAIN integrates cutting-edge expertise on interface technologies for the benefit of users with disabilities. The network gathers Europe's leading expertise in eye gaze interaction with computers in a research project on assistive technologies for citizens with motor impairments.

Objectives and expected end results

Current eye tracking equipment allows users to generate text on a computer by using eye gaze. Users are able to select letters and numbers by looking at a keyboard on a screen with their eyes, and can construct words and sentences that can be spoken aloud by the system. Using these systems both empowers and enables people with disabilities as they can now communicate without the need for an assistant or helper, giving the users greater freedom in their lives. Eye tracking systems that allow text entry by eye gaze have been in existence for about two decades, but the technology is still only available to a small portion of the potential user population. Obstacles for more wide-spread use currently include: the high cost of eye tracking equipment, the limitation that gaze communication applications may only work with a particular dedicated eye tracking device, and finally that eye tracking devices are often hard to use and may require experts to operate them.

The COGAIN consortium (members of which are listed in Table 1) is formed from cutting edge research groups and companies who have joined forces for a common goal: empowering people with disabilities. The five-year project was launched in a kick-off meeting in September 2004 in Finland. There are over 100 researchers in the network. Through the integration of research activities, the network will develop new technologies and systems, improve existing gaze-based interaction techniques, and facilitate the implementation of systems for everyday communication.

The project aims to make research results and commercial solutions known and available, at an affordable cost, to the user community, to SMEs, and to local organisations and authorities. Usability and take-up of the results is ensured by having the user communities as an integral part of the network. COGAIN also hopes the project will lead us to mainstream applications that would benefit all. COGAIN believes that assistive technologies are most successful when they provide applications that are both empowering and fun to use, and this is one of our main aims.

Organisation and contractors involved

The members of the COGAIN consortium are listed below in Table 1.

Participant name	Participant short name	Country
University of Tampere	UTA	Finland
IT University of Copenhagen	ITU	Denmark
Bispebjerg Hospital	BH	Denmark
Danish Centre for Assistive Technology	DC	Denmark
Risoe National Laboratory	RISOE	Denmark

Danmarks Tekniske Universitet	DTU	Denmark
Technische Universitaet Dresden	TU DRESDEN	Germany
Universitaet Koblenz-Landau	UNI KO-LD	Germany
Universität zu Lübeck	UzL	Germany
Hewlett Packard Italiana SRL	HP	Italy
Politecnico di Torino	POLITO	Italy
Siauliu Universitetas	SU	Lithuania
Permobil AB	PAB	Sweden
Tobii Technology	Tobii	Sweden
ACE Centre Advisory Trust Ltd	ACE	United Kingdom
The Chancellor, Masters and Scholars of the University of Cambridge	UCAM	United Kingdom
University of Derby	UOD	United Kingdom
De Montfort University	DMU	United Kingdom
Tokyo Institute of Technology	TIT	Japan
Universitaet Zuerich	UNIZH	Switzerland

Table 1. List of COGAIN participants during the first project year.

COGAIN organised a competitive call for new partners (open from 23.2.2005-30.3.2005) in which three new partners were selected: Universidad Publica de Navarra (Spain), Czech Technical University of Prague (Czech) and Sahlgrenska University Hospital (Sweden). The new participants join the network from the beginning of the second project year. In addition, University of Derby is replaced by Loughborough University, because the people involved in COGAIN moved from the former university to the latter. Permobil will leave the project, because it will end its development of eye tracking technology.

In addition to the core members, COGAIN involves two external boards to consult in the future planning and decision making activities: the Board of User Communities (BUC) and the Board of Industrial Advisors (BIA). Both boards function as advisory entities whose input will be sought regarding the practical usefulness, dissemination and possible commercialisation of the research findings. The BUC has already been established, currently involving 4 representatives of user organisations. The BIA will be established later.

The work in COGAIN has been done within 9 workpackages: (WP1) Durable community building, (WP2) Standardisation, (WP3) User involvement, (WP4) Tool development, (WP5) Eye tracker development, (WP6) Analysis and evaluation, (WP7) Community outreach, (WP8) Training, and (WP9) Management.

Work performed and results achieved during the first year of the project

During its first year or existence, COGAIN has laid the basis for the work in the form of surveys, state-of-the-art reports, and requirements reports:

- *Survey of de-facto standards in eye tracking (D2.1)* gives an overview of what methods the diversity of gaze tracking manufacturers use in their proprietary systems. It was found that there were few de-facto standards present in gaze tracking systems. Only the general look and feel of operation showed any commonality. However, the systems were considerably different if one wants to use them interchangeably, mixing and matching between systems. The *Requirements for the common format of eye movement data (D2.2)* report outlines the requirements for standards to enable gaze-based communication systems to work on a more 'plug-and-play' approach.

- *User requirements report, with observations of difficulties users are experiencing (D3.1)* concludes based on literature and data from user trials that, at present, eye control can only be used effectively to meet a limited range of user requirements by a limited number of people with disabilities who might benefit greatly from it. To address these issues, a number of recommendations for both the eye control hardware and software requirements are made.
- *Design specifications and guidelines for COGAIN eye typing systems (D4.1)* defines common principles and guidelines for eye writing systems developed within COGAIN. Unified specifications enable integration and exchange of modules and functionality between the future systems inside and outside the COGAIN network.
- *Catalogue of currently available eye trackers (D5.1)* includes mainly commercial eye communication systems for interactive applications within augmented and alternative communication (AAC), with descriptions of their main features. In the future, COGAIN plans to include low-cost and freeware systems, and a possibility for the users and professionals to write about their experiences with the systems. The catalogue is available online at http://www.cogain.org/eyetrackers.
- *State of the art report of evaluation methodology (D6.1)* describes potential evaluation metrics and methods that can be used in evaluating gaze communication systems; mainly, *what* and *how* to measure. Text entry research metrics can be applied in eye typing research. Most of the general usability evaluation methods and gaze-specific interaction research methods can also be applied. COGAIN aims to adapt the existing knowledge into a common evaluation methodology for evaluating gaze interaction systems, with special consideration on conducting user trials with users with disabilities.
- *Report on a market study and demographics of user population (D7.2)* found that today there are only a few eye control systems in use by people with disabilities (estimated less than 2000 in Europe). There is a great potential for the market to grow, but for that to happen, special attention must be paid to the following areas: (1) the quality of the eye control systems should improve to better meet the user requirements, (2) the prices of the eye control systems should be lower, and (3) information dissemination is needed to inform the assistive technology professionals and users.

  COGAIN reports are available online at http://www.cogain.org/results/reports.

COGAIN has put special effort on dissemination activities, including the scientific community, assistive technology professionals, and the general public. To ensure efficient dissemination of the results, a *detailed dissemination plan (D7.1)* was prepared. It lists the target groups, key messages and dissemination methods.

To distribute awareness of COGAIN, 7 press releases were prepared (2 in Finnish, 3 in English, 1 in German, and 1 in Danish). During the first year, COGAIN has attracted a lot of interest in public newspapers, magazines, and TV, including at least 19 COGAIN related articles and 10 TV appearances. A list of (known) media appearances and material for the media is available online at http://www.cogain.org/media.

The IST 2004 event in the Hague was a great success for disseminating information about COGAIN, thanks largely to the presence of a representative (Sarah, see Figure 1) of the real user community and careful pre-event publicity efforts. The stand had a constant flow of visitors, including visits by the Director-General and the organisers of the event. A 30-second shot of the stand was presented in EuroNews, a 2-minute promotional video was shot during the event and the stand also sparked the filming of an 8-minute video on the daily life of Sarah after the event.

Figure 1. User needs are fundamental to the work of COGAIN. Sarah helped demonstrating the potentials of gaze interaction at the COGAIN stand at IST 2004.

Special training on gaze interaction has been organised in the form of tutorials given in scientific conferences and intensive courses for Ph.D. students. These include:

- A tutorial on Gaze Based Human-Computer Interaction, given at NordiCHI 2004 and IUI 2005.
- A tutorial on "Blickbewegungsmessung und praktische Anwendungen" (Eye tracking research and practical applications, in German), given at the TeaP 2005 conference in Germany.
- A course on Gaze-based human-computer interaction 28.-29.4.2005, Politecnico di Torino, Italy. The course was open to the local students and COGAIN students and researchers. COGAIN students could apply for mobility grants to attend the course.
- PhD Course on "Under the hood of advanced AAC systems". The course was held in conjunction with the COGAIN Camp (more about the camp below) 30.5.-3.6.2005 in Copenhagen, Denmark.

COGAIN has organised several internal research retreats where the COGAIN researchers have worked together on specific issues related to the work of the workpackage(s). In addition, two special sessions were organised in scientific conferences:

- A special session on "Communication by Gaze Interaction – from AAC to Mainstream HCI" in the UAHCI/HCI 2005 International Conference, 22.-27.7.2005, Las Vegas, USA.
- A workshop on "Communication by gaze interaction – in search of new solutions", at the 13th European Conference on Eye Movements (ECEM 13) conference, 14.-18.8.2005, Bern, Switzerland.

COGAIN Camp is a major event where all the COGAIN researchers and students meet each other and users. The first camp was organised on 30.5.-3.6.2005 in Copenhagen, Denmark. The camp contained both internal and external events. On Monday and Friday the members of COGAIN worked together in internal research retreats. Friday's WP3 (user involvement) workshop also involved users and device manufacturers. Tuesday was reserved for the COGAIN conference, where all the partners could present their research. Thursday was a local info day, when the users, researchers, AT professionals and device manufacturers could meet each other (see Figure 2). Press was also invited to the Open House on Thursday.

Figure 2. COGAIN researchers and students meet the users, AT professionals, device manufacturers and the press during the first COGAIN Camp.

One of the main aims of COGAIN is to make the gaze communication *applications* available for the users. Therefore, COGAIN has decided to distribute some of the applications developed within COGAIN freely at the COGAIN web portal. In the end of the first year, there are 3 gaze communication applications available: Dasher, GazeTalk and UKO-II. For more information and to download, see http://www.cogain.org/applications/.

Contact details

Co-ordinator:	Kari-Jouko Räihä (kari-jouko.raiha@cogain.org)
COGAIN Office:	COGAIN Network Coordination Office (office@cogain.org)
	Department of Computer Sciences / Pinni B1011
	FIN-33014 University of Tampere, Finland
Project website:	http://www.cogain.org