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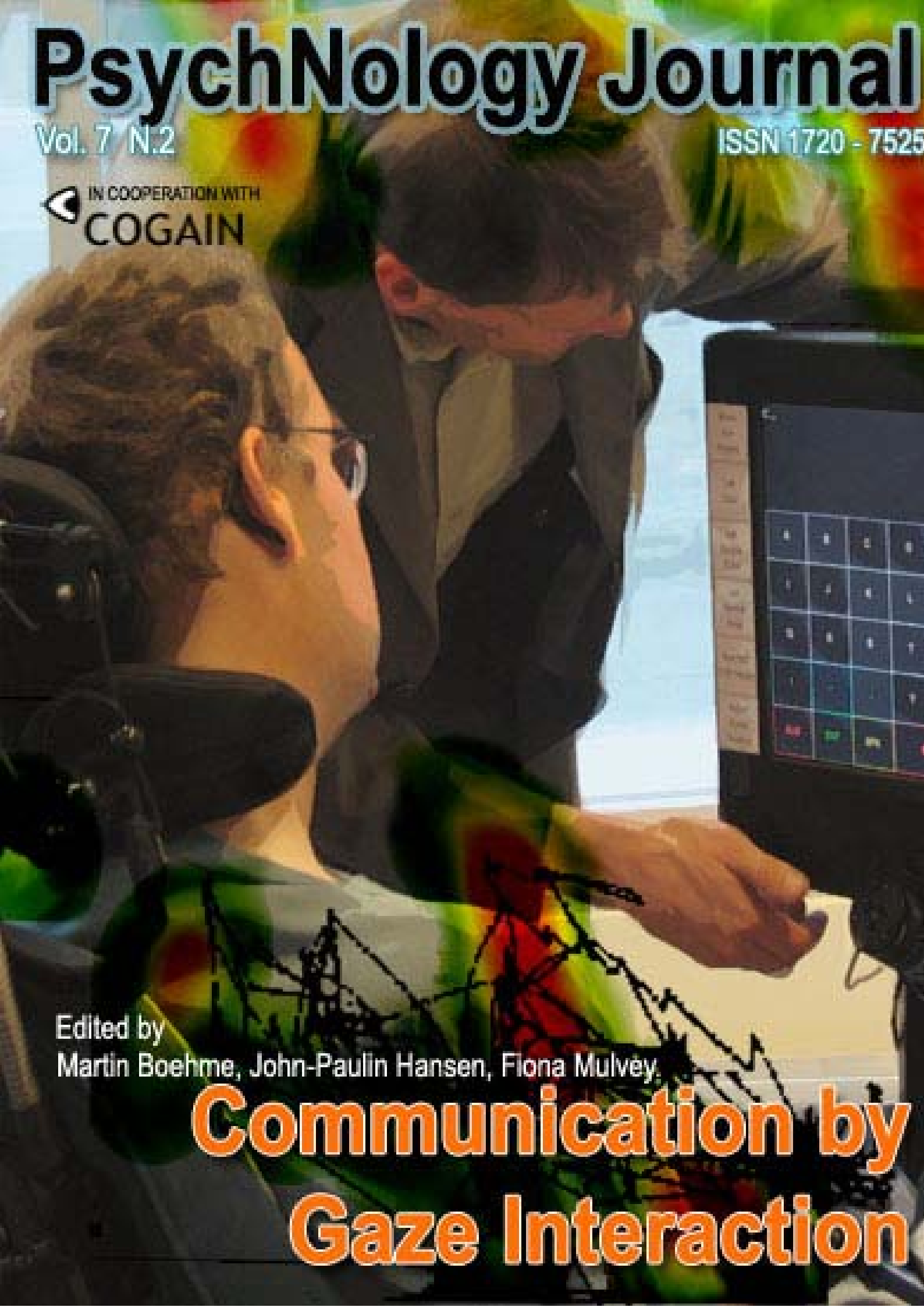

Edited by
Martin Boehme, John-Paulin Hansen, Fiona Mulvey.

# Communication by Gaze Interaction

# PSYCHNOLOGY JOURNAL
The Other Side of Technology





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## Editorial Preface

In many motor disorders, such as Amyotrophic Lateral Sclerosis (ALS), the eyes are among the last parts of the body to retain voluntary motor control. Eye tracking technology, which measures the direction of gaze, is one way of assisting people with these kinds of motor impairments to communicate and to access modern information technology.

COGAIN ("Communication by Gaze Interaction") is a European Network of Excellence (NoE) aimed at developing new eye tracking technologies and applications for people with disabilities, as well as establishing standards and disseminating information about existing systems to those who may need or want them. COGAIN also aims to research and develop the potential of gaze as a viable input modality for non disabled users as well as a rich source of information on the attention and intention of users in human computer interaction in general.

The COGAIN project hosts a yearly conference on eye gaze interaction, and this special issue of PsychNology Journal (7.2) contains extended versions of selected papers from the 2007 and 2008 conferences. COGAIN 2007 was held on September 2 and 3, 2007, at De Montfort University, Leicester, UK; the theme of the conference was "Gaze-based Creativity, Interacting with Games and On-line Communities". For COGAIN 2008, the theme was "Communication, Environment and Mobility Control by Gaze", and the conference was held in Prague, Czech Republic, on September 2 and 3, 2008.

A call for extended papers based on the material presented at the conferences was published. From this call, we present five papers in this special issue. The first paper, "Predicting preference from fixations" by Mackenzie G. Glaholt, Mei-Chun Wu and Eyal M. Reingold, examines the relationship between personal preference for certain items (faces and mock company logos) and gaze fixation on those items. The authors show that there is a strong positive correlation between total fixation time and preference. Moreover, they show that fixation time can be used to infer preference for individual features of an item (for example, the font, shape or texture of a logo) and demonstrate how this information can be used to predict preference for new, unseen items. The authors suggest that these insights could be used to assist users in selecting items from a large array and to create smart applications that automatically adapt their appearance to the user's inferred preferences.

The second paper, "Scrollable Keyboards for Casual Eye Typing" by Oleg Špakov and Päivi Majaranta, presents a novel interface for eye typing, i.e. for inputting text using an eye tracker. Instead of presenting a full keyboard on screen, from which characters are typically selected using dwell time, the idea of a scrollable keyboard is to show only one or two rows of the keyboard and allow the user to access rows that are currently not visible using special scroll keys. Compared to a full keyboard, the scrollable keyboard saves space or, alternatively, allows larger keys to be displayed in the same space. Špakov and Majaranta compare typing speeds on a full keyboard with 1- and 2-row scrollable keyboards. They show that, for a 2-row keyboard using an optimized layout, the reduction in typing speed is less than 20%, which, they argue, is entirely tolerable for casual typing, such as filling in web forms.

The next paper, "Hands Free Interaction with Virtual Information in a

Real Environment – Eye Gaze as an Interaction Tool in an Augmented Reality System" by Susanna Nilsson, Torbjörn Gustafsson and Per Carleberg, examines eye tracking as a medium for interaction in medical applications, where traditional user interfaces may not be practicable because of the need to keep the hands sterile. The authors describe two applications where an eye tracker is integrated into a head-mounted augmented-reality display. In the first application, gaze interaction is used to set up an "electrical knife" for surgery. The second application displays instructions on how to assemble a surgical tool, and gaze interaction is used to move from one step of the procedure to the next. The paper presents the results of user trials on the two systems and closes with a discussion of possible modifications and improvements.

Gaze interaction in gaming applications is the topic of the two remaining papers. The first of these, "Gaze beats mouse: A case study on a gaze-controlled Breakout" by Michael Dorr, Laura Pomarjanschi and Erhardt Barth, compares the performance of gaze and mouse input for the computer game Breakout, where players have to move a bat to hit one or several balls against a wall of bricks. The authors compare the performance of the two input options by pitting a gaze player against a mouse player; in two thirds of the rounds that were played, the gaze player won, demonstrating that gaze can be a superior input option even for able-bodied users who might otherwise use a mouse.

The final paper, "Evaluation of the Potential of Gaze Input for Game Interaction" by Javier San Agustin, Julio C. Mateo, John Paulin Hansen and Arantxa Villanueva, also compares gaze to other input modalities, but on the level of individual tasks (target acquisition and target tracking). In the first of two experiments, two eye trackers are compared against a mouse, a touch screen, a head tracker and a joystick. Gaze is shown to be superior to the head tracker and the joystick; it is also superior to mouse and touch screen for large target sizes, though not for small ones. The second experiment combines gaze for pointing with an electromyographic (EMG) facial signal for selection and shows that this combination outperforms the mouse. Interestingly, unlike for traditional pointing devices, the completion time for the gaze-EMG combination does not seem to increase significantly with distance to the target.

These papers were chosen based on anonymous review and with the aim of presenting a broad spectrum of topics from the COGAIN conferences. We would like to thank our reviewers and authors as well as the editors-in-chief of PsychNology Journal for their time and work, and encourage interested readers to follow the research results of the COGAIN network through the COGAIN Association (see www.cogain.org).

**Martin Böhme**
University of Lübeck

**John Paulin Hansen**
IT University of Copenhagen

**Fiona Mulvey**
Technical University of Dresden

Guest Editors