Microsoft Research Connections Blog

SenseCam Documents Daily Life for Patients with Memory Loss

Microsoft Research Connections Team   10 Feb 2011 2:28 AM   💬 0

Human memory is all too fallible. We all misplace items or forget to run an errand occasionally; our memories of specific events can fade with time as well. But severe memory issues can have a devastating impact on quality of life for individuals with clinically diagnosed memory disorders that are related to acquired brain injury (for example, an accident) or neurodegenerative diseases (for example, Alzheimer's disease).

There is no cure for memory loss. In the past, neuropsychologists had to rely on fairly primitive devices (such as photo albums, diaries, and electronic reminders) to help patients cope with memory conditions. Technology is rapidly evolving, however, and providing new opportunities to help patients.

A notable development in the field is the SenseCam, a memory-enhancing camera developed by Microsoft Researchers at the Cambridge campus and subsequently licensed to Vicon. Vicon sells the SenseCam as a medical device, the Vicon Revue, which has been named one of the 100 best innovations of 2010 by *Popular Science*. The SenseCam uses a wide-angle lens to document the patient's day—including places visited and people seen—creating visual "memories" through pictures. The camera, which is worn around the neck, takes a photograph:

- Every 30 seconds
- When movement is detected
- When a lighting change is detected

At the end of the day, the patient downloads the images to a computer. These images create visual reminders of events from throughout the day—essentially, they are digital memories. These SenseCam images appear to stimulate the episodic memory of patients who view them. Unlike staged (or posed) photographs, which tend to change the nature of the very moment being captured, SenseCam images are recorded passively, with no conscious effort or intervention. Combined with the relatively large number of images, this seems to have a powerful effect on recall. Numerous patients have benefitted from true autobiographical recall through this technology; typically, a handful of images stimulates the same feelings and emotions the wearer had when they occurred.

Ultimately, we hope that SenseCam will have the potential to alleviate the onset of Alzheimer's disease in at-risk patients. Multiple studies around the globe, funded by Microsoft External Research, have helped us understand how SenseCam can help patients with a variety of memory-loss conditions. These studies include:

1. **Addenbrookes Hospital and the Medical Research Council (MRC) Cognition and Brain Sciences Unit, Cambridge, United Kingdom**
   Researchers at Addenbrookes used functional Magnetic Resonance Imaging (fMRI) to identify how SenseCam affects neurological activity in different areas of the brain. Participants used SenseCam in their daily lives. Researchers then asked them to answer questions about the images that were captured by SenseCam. By tracking brain activity through fMRI scans, researchers demonstrated that patients were recalling true memories—and not just reciting information from the SenseCam.
2. **Adam Zeman, Professor of Cognitive Neurology, Exeter University, United Kingdom**
   Epilepsy is the most common chronic neurological condition; as many as 50 percent of epilepsy patients report significant memory problems. Professor Zeman, a leading cognitive neurology researcher, has tested SenseCam with transient epileptic amnesia (TEA) patients who have reported severe autobiographical memory problems as a result of temporal lobe epilepsy.
3. **Professor Phil Barnard, Medical Research Council (MRC) Cognition and Brain Sciences Unit, Cambridge, United Kingdom**
   Professor Phil Barnard, internationally renowned in the field of cognition, led a study to determine how SenseCam can help patients with Alzheimer's disease.
4. **Professor Ron Baecker, University of Toronto, and Professor Yaakov Stern, Columbia Medical School, United States**
   This joint study evaluated the therapeutic value of SenseCam in patients who are in the early stages of dementia (Alzheimer's disease). It showed that patients' personal well-being, including enjoyment; sense of identity; memory of people, places, and events; and their conversations with family were enhanced through reminiscence by using SenseCam pictures and other imagery.
5. **Professor Roberto Cabeza, Duke University, United States, and Professor Martin Conway, University of Leeds, United Kingdom**
   This research study focuses on healthy adults under the age of 30 and above the age of 70. All participants use written diaries, audio recording, and SenseCam to record daily activities. Subsequently, each subject will be stimulated with a selection of these records while they are in an fMRI scanner. The resulting fMRI images will allow researchers to measure the effect that viewing SenseCam image sequences has on participants' neural activity, and to compare these results between different age groups and between different forms of stimulation (for example, image sequences versus audio recordings versus written diaries). The study will reveal any differences between the effectiveness of SenseCam in the young versus older populations. It will also demonstrate whether SenseCam use has the ability to improve cognitive ability in the healthy population.

The SenseCam was recently featured in TIME magazine and is currently on display at the Science Museum in London. For more information, see the Introduction to SenseCam.

—*Steve Hodges, Principal Hardware Engineer, Microsoft Research, and Kristin Tolle, Director, Natural User Interfaces Team, External Research division of Microsoft Research*

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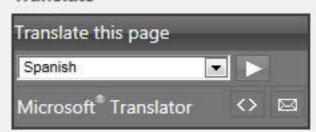### Twitter Feed

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