

Workshop on Understanding, Predicting, and Mitigating Error in Routine Procedural Tasks

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What is known about error

Although infrequent, slip errors can have disastrous consequences, particularly in safety-critical environments such as busy hospital wards. It is for this reason that there has been a growing body of research focused on understanding, predicting, and mitigating error in routine procedural tasks. The aim of this workshop is to bring together researchers with an interest in the area of error with the aim of consolidating what is known and identifying the next set of major challenges in the area.

There is growing interest in investigating factors that affect the likelihood that people will make a slip error while performing a routine procedural task. Ament et al (2009) have shown that errors are more common on particular kinds of steps in a task structure. Interruptions have been shown to increase error-rates (e.g., Li et al., 2008; Altmann & Trafton, 2007), while various methods have been shown to reduce error-rates (e.g., Altmann & Trafton, 2002; Back et al., 2007; Chung & Byrne, 2008; Hodgetts & Jones, 2006; Li et al., 2008; Ratwani & Trafton, 2008). Just-in-time visual cues have been shown to be particularly effective at eliminating errors in certain circumstances (Chung & Byrne, 2008), but there is concern that these cues might not always be noticed under high workload conditions (Lavie et al., 2004). Back, Brumby, & Cox (2010) have recently demonstrated that introducing an enforced lockout period following an interruption can also significantly reduce error rates. An alternative approach to mitigating error might be to develop a real-time system that can predict the likelihood of an error being made (Ratwani, McCurry & Trafton, 2008). Thus, there is a developing body of knowledge that can advance our understanding of the causes of slips and how they might be reduced.

Goals of the workshop

By bringing together researchers who are currently engaged in this topic the workshop aims to consolidate the current knowledge base and identify the next set of grand challenges in the area. This will be achieved by reviewing and making progress on the following questions:

- To what extent can existing theories of routine sequential behavior explain the range of empirical results?

- How can the theoretical understanding of error be applied to the design of tasks and systems?
- What are the directions for future research in this area?

There are a number of accounts of routine sequential action (Altmann & Trafton 2002, Botvinick & Plaut 2004, Cooper 2003, Cooper & Shallice 2000, 2006, Norman & Shallice 1986) which all address some aspects of the causes of slip errors (Norman 1981, Reason 1990). One theme of the workshop will be to discuss the extent to which these theories can account for the causes of slips and the factors that influence slip error rates, and identify where further theory is needed.

A second focus will be on how the results of Cognitive Science research can be applied to reduce errors in practical settings and safety-critical environments. Previous research has shown that cognitive slips cannot be eliminated through simple training or practice, and therefore need to be addressed through good task design (Byrne & Bovair, 1997). In particular, while there are a number of design recommendations aimed at reducing the probability of slip errors in interactive systems (e.g., Blandford, 2000), it is not always straightforward to transfer Cognitive Science theory into design solutions, particularly for safety-critical devices.

Topics of particular relevance to this workshop therefore include: which design factors increase or decrease the likelihood of capture errors when transferring between similar tasks; which compensatory strategies do people adopt to manage interruptions; how can changes in demand or stress affect strategy adaptation; and whether design interventions such as the introduction of salient, just-in-time cues (Ratwani, 2008) or opportunities for reflection (Back *et al.*, 2008, Back *et al.*, 2010) can significantly reduce errors.

Workshop format

This will be a full day workshop structured around the three goals of the workshop. Members of the program committee will lead each session, which will include an invited research presentation followed by discussion with the workshop attendees.

Justification

There are a number of current projects focusing on this topic (e.g. Rice University <http://chil.rice.edu/projects/error/>), the

U.S. Naval Research Laboratory, <http://www.nrl.navy.mil/aic/iss/aas/errors.php>, and the 'CHI+MED' project in the UK, www.chi-med.ac.uk. The topic of error is of interest to a large number of Cognitive Scientists, not only because it is useful to understand why slips occur and the factors that increase or decrease error rates, but also because it is the same cognitive system that yields both errorful and error-free behaviour. Study of error therefore provides new insights into the study of human cognitive processes.

Organizers

The workshop will be organized by Anna Cox, Duncan Brumby and Jonathan Back. All are members of the CHI+MED project and are actively engaged in the study of human error.

Additional members of the Program Committee

Maartje Ament, UCL
Ann Blandford, UCL
Rick Cooper, Birkbeck, University of London
Wayne D Gray, Rensselaer Polytechnic Institute
Simon Y. W. Li
Raj Ratwani, GMU
Greg Trafton, NRL
Richard M Young, UCL

All members of the program committee have already conveyed their intention to contribute to the running of the workshop. We would hope to attract additional participants once the workshop is advertised.

Plans for publicity

Details of the workshop will be circulated on a number of mailing lists. Program committee members will also directly approach those working on related topics and invite them to attend the workshop.

Support for the workshop

We have a small amount of funds available to cover expenses incurred as a result of participating in the workshop. Anyone wishing to apply for financial support should send a statement of need outlining their case (1 page max) to anna.cox@ucl.ac.uk by 30 June 2010.

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