The Big Picture: Preserving Context in the Decomposition of Complex Expert Tasks

Alex C. Williams
University of Waterloo
Waterloo, ON N2L 6E5
Canada
Alex.Williams@uwaterloo.ca

Timmy Tse
University of Waterloo
Waterloo, ON N2L 6E5
Canada
Timmy.Tse@uwaterloo.ca

Josh Bradshaw
University of Waterloo
Waterloo, ON N2L 6E5
Canada
Josh.Bradshaw@uwaterloo.ca

William Callaghan
University of Waterloo
Waterloo, ON N2L 6E5
Canada
William.Callaghan@uwaterloo.ca

Mike Schaekermann
University of Waterloo
Waterloo, ON N2L 6E5
Canada
mschaeke@uwaterloo.ca

Edith Law
University of Waterloo
Waterloo, ON N2L 6E5
Canada
Edith.Law@uwaterloo.ca

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Author Biographies

Edith Law is an assistant professor in the School of Computer Science at University of Waterloo. Previously, she was a postdoctoral fellow at Harvard University. She holds a Ph.D. in Machine Learning from Carnegie Mellon University, M.Sc. in Computer Science at McGill University, and B.Sc. in Computer Science at the University of British Columbia.

Alex Williams is a Ph.D. student at the University of Waterloo. Before joining Waterloo, he was a researcher at the University of Oxford where he worked on the Zooniverse's Ancient Lives project. He holds both a M.Sc. and B.Sc. in Computer Science from Middle Tennessee State University.

Josh Bradshaw is a Systems Design Engineering co-op student at the University of Waterloo. In prior co-op terms, he's worked on developing preclinical instruments for medical imaging applications at Toronto's Hospital for Sick Children.

William Callaghan is a M.Math student at the University of Waterloo where he studies active learning with crowds. He holds a B.Sc. in Computer Science and Microbiology and Immunology from the University of Western Ontario.

Tim Tse is a M.Math student at the University of Waterloo where he studies crowdsourced music transcription. He holds a B.A.Sc in Computer Engineering from the University of Toronto.

Figure 1: A deteriorated papyrus fragment from the Oxyrhynchus papyri collection, the largest known aggregation of deteriorated ancient Greek papyrus fragments in the world. We thank the Egyptian Exploration Society for providing access to this image.

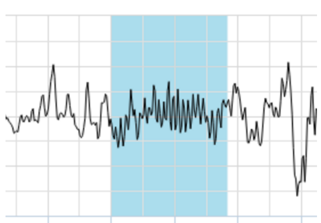

Figure 2: A clear spindle in an EEG signal from the DREAMS database.

Mike Schaekermann is a M.Math. student at the University of Waterloo. His current research focus is at the intersection of crowdsourcing, EEG analysis and playful interaction. Prior to this, he received a B.Sc.E. from Salzburg University of Applied Science and a medical degree from the University of Marburg where he worked in a brain imaging group.

Discussion

In recent years, the central dogma of task decomposition has centered around breaking down large macro-tasks into series of small, context-free microtasks [2]. In addition, new research has shown that utilizing task decomposition with the crowd leads to higher quality work, makes the task easier, and supports recovery from interruption [1]. In this position paper, we argue for the importance of preserving context in the decomposition of complex expert tasks. We formally define such a task as one that both requires an arbitrary level of expertise and can be divided into any number of micro-tasks that are contextually interdependent.

One example of a complex expert task is transcribing deteriorated papyrus fragments. Each fragment is uniquely deteriorated through physical tearing and contains partially visible letters or symbols (see Figure 1). In practice, expert papyrologists utilize highly legible characters in the fragment as referential material for correctly identifying letters on a damaged area of the manuscript. In some cases, the task is made even more difficult as some fragments are written in now-extinct languages (*e.g.*, Coptic).

An additional complex expert task is identifying sleep spindles, or bursts of oscillatory brain activity, in electroencephalographic (EEG) data (see Figure 2). The presence or lack of sleep spindles can be indicative of sleep-stage and mental or sleep disorders, such as schizophrenia or insomnia. Due to their sensitive methods of recording, EEG measuring devices often contain an unpredictable amount of noise. Expert technicians often examine multiple channels and signals at once, aiming to distinguish noise from sleep-spindles in order to correctly identify the latter.

Lastly, music transcription is a complex expert task that is defined as the process of transforming an acoustic representation of a music piece into a music score or a score-like notation. This task is generally performed only by experts who are adept in music theory. Experts leverage fundamental methods and techniques from music theory in order to extract globally relevant context from the music and create a more accurate transcription. Such methods include determining the key signature, measuring tempo, identifying the chord progression, and defining rhythm.

In conclusion, we argue that context preservation is intrinsic as a first-step toward effectively crowdsourcing complex expert tasks. Collectively, the inherent nature of the described tasks point to a model of task decomposition that aims to not eliminate, but preserve context as it is not only relevant, but critical for performing each task correctly. Such a model raises exciting new research questions concerning interfaces, workflows and training procedures that enable workers to perform these tasks that demand explicit context.

REFERENCES

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