

1. **Title:** Estimating Attention and Interest in Collaborative Tasks using Gaze.

2. **Table of Contents**

- a. Abstract
- b. Introduction
- c. Research Question(s)
- d. Research Design and Methodology

3. **Abstract**

A Collaborative task is the process in which two or more individuals work together to complete a certain task. Coordinating efforts can sometimes pose a challenge when working on a collaborative task such as if a user is trying to link explanations belonging to different documents, it would benefit his/her peers to know which document the user's interest is on. This research proposes the use of the gaze data of individual users to determine the object of interest and make this information available to other users via a projector (highlighting object, interest bar over object). Communicating collective interest in an object in a unique way can help users determine if everyone is focused on the same task and thus ensuring that all users are in the same line of thought.

4. **Introduction.**

Eye tracking technology has gained significant popularity in recent years which has sparked many applications that use a user's gaze-point. This technology has been used as a standalone input device for futuristic devices and environments. One of the earlier applications employing eye tracking was eye-typing; a way for physically challenged people to type using their eyes. This method used fixations to confirm letter selection. A drawback to this method was that it was slow and uncomfortable for users. Majaranta et al. (2009) found that giving the user control over the fixation time required for letter selection increased the typing speed from 6.9 wpm (words-per-minute) to 19.9 wpm. Further progressions in this technology saw applications that were aimed for the general public and researchers. The use of smooth pursuits eye movement to activate/deactivate ambient objects in a smart environment (Velloso et al., 2016) provides a glimpse of what is possible with eye tracking technology.

Eyes are also subtle yet powerful tools of communication that we use in our daily lives without much thought. They can give use cues as to whether we are curious or attracted to what we see, for example, pupil dilation can signify attraction while pupil contraction can indicate anger or dislike. (Hoppe et al., 2015) used curiosity questionnaires and eye movements to determine the curiosity of a user in objects during a shopping scenario.

In collaborative task involving documents, individuals can infer a groups interest by looking where their peers are looking at. Students (the ones who are paying attention) naturally follow their teachers gaze when the teacher is trying to explain a concept on a board/diagram/presentation slide/etc. In these scenarios, the person listening to the explanation knows where the person explaining is looking at, but it is not always the case that the latter knows where the former is looking at, especially when

there are many people involved. This brings to question how an individual trying to explain a concept would be able to benefit from knowing the visual focus of other individuals.

5. Research Question(s).

How can a user benefit from knowing the interest or focus of attention of his/her peers? Will knowing this information allow the user to communicate information better to his peers? Will an individual change his/her approach to an explanation if he/she notices that his peers/students interest is wandering?

6. Research Design or Methodology

In this research we will design a system that allows users to collaboratively work on documents, screens, books, etc. around a tabletop and provides information about the object of interest of their peers. A user study aimed to observe how a user would use this information; such as if a user was giving an explanation, how would the user modify his/her approach if he/she knew that his/her peer's interest was wavering?

References

- HOPPE, S., LOETSCHER, T., MOREY, S. & BULLING, A. 2015. Recognition of curiosity using eye movement analysis. *Adjunct Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2015 ACM International Symposium on Wearable Computers*. Osaka, Japan: ACM.
- MAJARANTA, P., AHOLA, U.-K. & ŠPAKOV, O. Fast gaze typing with an adjustable dwell time. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 2009 Boston, MA, USA. ACM, 357-360.
- VELLOSO, E., WIRTH, M., WEICHEL, C., ESTEVES, A. & GELLERSEN, H. AmbiGaze: Direct Control of Ambient Devices by Gaze. *Proceedings of the 2016 ACM Conference on Designing Interactive Systems*, 2016 Brisbane, QLD, Australia. ACM, 812-817.