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Experiences from eye tracking chat-communication using the INKA-SUITE

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1 Introduction

Eye tracking is a common way for analyzing the usability of applications (e.g., Duchowski, 2007), stationary single user systems (e.g., Shneiderman & Plaisant, 2010) and websites (e.g., Nielsen & Loranger, 2006). Existing eye tracking systems are limited to static content like websites. In these applications the content is placed at the same position for all participants and can be easily compared. If this area of interest (AOI) is not static, but changes its size, shape or position, the evaluation becomes more complex and requires an amount of manual analysis. This is especially the case in cooperative applications like chats. The difficulty is, that you cannot predict the time of change, because it is caused by user input (e.g., new chat message, scrolling) - the dynamics of the AOI cannot be foretold. Existing eye tracking software is therefore not suitable in situations of changing AOIs. Therefore a new approach is needed to overcome these problems.
The paper is structured by introducing you to the INKA-SUITE itself, followed by the description of a first experiment with its results. At the end there is an outlook.

2 INKA-SUITE

The INKA-SUITE is a platform that integrates the application and the analysis of eye tracking dynamic AOIs (e.g., Kienle et al., 2013). The base of the INKA-SUITE is the connectivity to Tobii eye trackers (http://www.tobii.com). With a direct connection between the eye tracker gaze data stream and GUI, the INKA-SUITE identifies AOIs at runtime, regardless of size, shape and position. Every gaze data record is complemented by the underlying GUI element, identified by names, ID's and/or references to other database tables such as chat messages or users. A subsequent manual work is eliminated and the evaluation can be started immediately. This profound cross-linking between analyses related functions and user software cannot be adapted by existing eye tracking analysis software.

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The components of the INKA-SUITE are:

(a) A **server** to control and manage clients as well as providing templates for the clients. Using templates enables researchers to conduct A/B tests.

(b) A **client application** for user interaction, which is connected to an eye tracker and presents the chosen template.

(c) An **analysis component** for managing projects and analyzing the collected data. Because fixations are represented by GUI elements, further information, such as fixation length and underlying AOI, can be retrieved through tooltips.

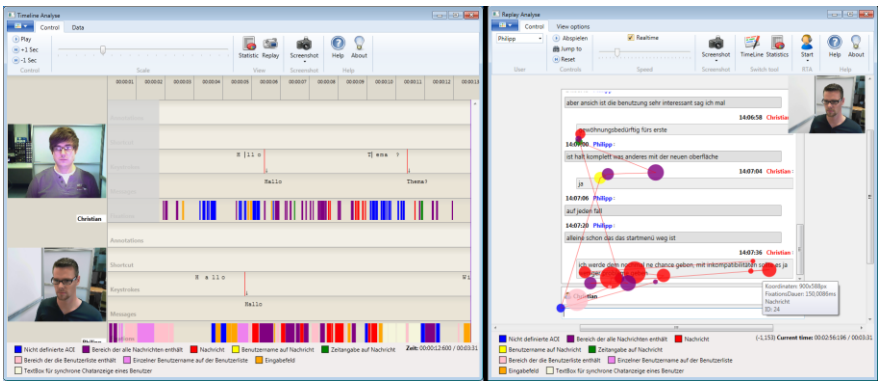

Fig. 1: INKA-SUITE Timeline (left) and Replay (right) as part of the analysis component

The analysis component processes the recorded data and is divided into three parts:

(a) In the **statistic tool**, general information about the chat session and also about each user is presented. For example these are duration of chat, keystrokes per minute, time to first message and messages per minute.

(b) Within the **timeline tool,** the entire chat session is presented on a timeline for each user (see Figure 1, left). This ensures the comparability between users. Shortcuts, keystrokes, chat messages and fixations of the users are listed separately for each user. Using annotations, important areas can be marked. The displayed output is fully dynamic and can be adapted to the current problem. The presentation of the collected data in form of the timeline, is oriented at the table structure of Beißwenger (2007) and the presentation of fixations by Stellmach et al. (2010).

(c) The **replay tool** shows a replay of the chat from the user's point of view (see Figure 1, right). This tool is chronology replaying the chat, similar to a screen recording, but with options to select and deselect the data that is output at runtime, also showing fixations and saccades as a scanpath (e.g., Mealha et al., 2012).

3 Experiment

To test the INKA-SUITE, an experiment in cooperation with the Institute of German language and literature of the TU Dortmund was accomplished. In this study the usability of the INKA-SUITE should be tested at first. Secondly questions from the linguists with respect to the influence of different user interfaces in chats for the structure of discussions should be answered.

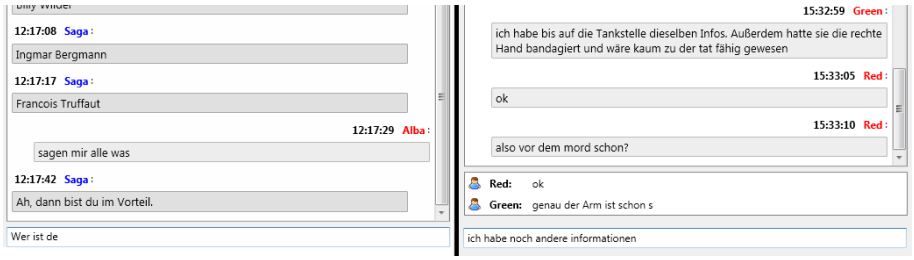

Fig. 2: Two templates: Standard Chat (left) and Talk (right)

By using the templating feature two templates were created (see Figure 2). One template (Figure 2 left) represents a Standard-Chat-Environment (SCE) (e.g., Beißwenger, 2003) with an input field and a chat protocol. Template two (Figure 2 right) is designed as a so called Talk layout similar to the Unix Talk. It contains the same features as the SCE but in addition a synchronous user list, which shows all connected chat partners and a live view from their text input fields.

Day 1 - Chat	**Groups of two**	**Groups of three**
Movie jury - scenario	2	1
Murderer - scenario		2
Day 2 - Talk	**Groups of two**	**Groups of three**
Movie jury - scenario	2	1
Murderer - scenario		2

Tab. 1: Study organization

The table above offers an overview about the experiment organization. In the study, 26 participants were recorded while chatting in two different scenarios. To solve the problems given by the scenarios, the participants have to exchange their information which differs to each other.
The using of the INKA-SUITE while collecting and analyzing the data provides no problems. All ten chat-communications were completely recorded and supply a wide database for the analysis by the linguists.

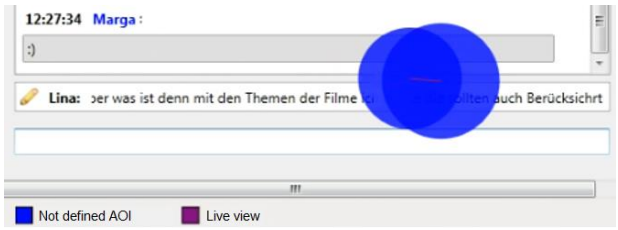

Fig. 3: Study result – eye tracking inaccuracy

The study revealed that the inaccuracy of the eye trackers is a problem (see Figure 3). Some gaze plots do not land on the AOI which is fixated. Therefore a manual effort is needed in some cases. A solution could be repositioning and larger scaling of the AOIs. The analysis by the linguists is still ongoing.

4 Outlook

The INKA-SUITE is basis for further research like automatic pattern recognition (e.g., revisions), contextualized communication and extension of simultaneous chats. A planned project called Chat++, enabled by real-time AOI identification, could therefore support features like reading awareness, eye tracking-based referencing and activity and context-awareness.

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