



ERCIM "ALAIN BENSOUSSAN"
FELLOWSHIP PROGRAMME



Scientific Report

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Nationality	Turkey
Name of the <i>Host Organisation</i>	Norwegian University of Science and Technology (NTNU)
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Period of the fellowship	01/04/2019 to 31/03/2020

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

The research conducted during the fellowship period can be summarized in two broad categories:

1. Medical Informatics and Eye Tracking
2. Eye Tracking for Education Purposes

1. Medical Informatics and Eye Tracking

- a) In medical care, software has an important role such as achieving more critical functions with the goal of enhancing the quality of care for patients and populations with a reduced cost. Although, Software Engineering has a substantial part in Medical Informatics, there are many debates on software quality, systems interoperability, user interfaces and other concerns familiar to software engineering. Hence, existing literature was explored to provide insights into the current Medical Informatics literature. The findings were presented in a conference to provide an initial knowledge for new Medical Informatics studies.

- b) In an ongoing association between Department of Computer science, NTNU, Gjøvik and Professor Tor Arne Strand, Research Department, Innlandet Hospital Trust, Lillehammer , the previously recorded eye movement data from 600 Nepal children with the age between 18 and 23 months was extracted from SMI REDn eye tracker. The data was recorded to understand the children's cognitive development from their eye movements. While various photos and videos are shown to children their eye movements were recorded for measuring joint attention and evaluating gaze following behaviours. The extracted data from the eye tracker was pre-processed and prepared for the analysis.
- c) The Faculty of Medicine and Health Sciences (MH), NTNU, Gjøvik was looking for improvement about the evaluation of nurse trainees progress during their education program. The experts were evaluating trainees' performances by watching them while trainees are performing the tasks. Therefore, as an innovative assessment tool the eye tracking technology adapted video recordings can be a possible solution. As a part of a team, visited the MH to observe the evaluation procedures. Afterwards, the possible application of eye tracking technology in nurse education and evaluation was discussed and the following aspects were offered and documented.
- For keeping track of how a trainee peer reviews other trainees' performance, an eye tracker can be used to record eye movements. From this data it is possible to gather information about which specific areas of the video recordings taking more attention. Also, the cognitive processes of the trainees and experts while investigating the videos can be assessed from the eye movements which was recorded by an eye tracker.
 - The mobile eye trackers give flexibility to track eye movements in real environments. Therefore, for investigating the eye movements of trainees in live environment procedures such as hand sterilization procedure and breathing assistance mobile eye trackers can be used to record eye movements for training and evaluation purposes.

2. Eye Tracking for Education Purposes

- a) Participated in an already ongoing research study with a team of five researchers for understanding the effect of social status and cognitive processes on the behaviours of participants' in a group discussion. In this study two groups of students were observed while they were working on their group project by using their own laptops and sitting around a table. The observation setting was a kind of blended face-to-face discussion and the Computer Supported Cooperative Work (CSCW) environment. Therefore, in this study it was aimed to gather information about communication and other related issues in a small group setting in which participants, engaged in a collaborative group work with shared visual information and work together. During the observations a video camera was used to capture technology usage, eye gaze, participant signals, and back-channels. From the video recordings participants speaking durations, gaze patterns, gestures and nodes were

analysed for understanding their roles and behaviours in a group discussion environment.

- b)** In the above-mentioned study (Part I 2.a) one of the participants from each group asked to wear a mobile eye tracker during the discussions. Eye movement data of these two participants in their groups were recorded Pupil Labs mobile eye tracker. The eye movement data was analysed to better understand the cognitive processes of participants from their eye movements in a group discussion. The eye movement events such as fixations, blinks and pupil dilations were assessed to investigate the effect of group role/status and mental workload while speaking and listening in a group discussion environment.
- c)** Participated in another eye tracking study in a team of three researchers which was conducted for education purposes. In this context, a project proposal was prepared and submitted. This was then accepted as a mini project under Centre for Excellent IT Education (ExcITED). In the literature, eye tracking technology have been used for a long time to better understand human behaviour from their eye movements. There are several studies conducted with eye tracking technology in different fields of education. Therefore, this study was performed to investigate the understanding of SQL and XPath concepts in a database course. Students from different study programs taking database course participated in this study. The aim of this study was then to determine the differences in the approaches of students while analysing the SQL and XPath statements. Their eye movement data was recorded with SMI RED250 eye tracker device while they were shown SQL and XPath tasks. Recorded data was classified into eye movement events. Currently, eye movement events are being statistically analysed to better understand the areas they paid more attention and task difficulty level effect on their cognitive process.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

Conference Publications:

1. Menekse Dalveren, Gonca Gokce; Mishra, Deepti. (2019) Software Engineering in Medical Informatics: A Systematic Literature Review. Proceedings of the 9th International Conference on Information Communication and Management (ICICM 2019) ([See Part I 1.a](#))

Journal Publications:

1. Investigating the Behaviour of Participants during Group Discussions. (*in Progress*) ([See Part I 2.a](#))
2. Assessing Mental Workload from Eye Movements in a Group Discussion. Authors: Deepti Mishra, Gonca Gokce Menekse Dalveren, Frode Volden, Sashidharan Komandur, Aditya Suneel Sole, Carly Grace Allen. (*Submitted to Sage Open*) ([See Part I 2.b](#))
3. Using Eye-tracker to investigate students' approaches to scrutinize SQL solutions. (*in Progress*) ([See Part I 2.c](#))

4. Using Eye-tracker to investigate students' approaches to scrutinize XPath solutions. (*Planned*) ([See Part I 2.c](#))

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

1. A Practical Introduction to Eye Tacking Course, Lund University Humanities Lab at the joint Faculties for Humanities and Theology at Lund University, Lund Sweden on November 27-29, 2019
2. 9th International Conference on Information Communication and Management (ICICM2019), Prague, Czech Republic on August 23-26, 2019.
3. EU's Framework Programmes for Research and Innovation, at NTNU in Gjøvik on June 14, 2019.
4. International Open Access Week at NTNU, Gjøvik on October 21, 2019.

IV – RESEARCH EXCHANGE PROGRAMME (REP)

I have visited Centrum Wiskunde & Informatica (CWI), Amsterdam, Netherlands, for one week to perform REP under the supervision of Assoc. Prof. Pablo Cesar in the Distributed and Interactive Systems team. I have given a talk about current research studies and discussed the research activities with the group members for the possible future collaborations.