Real World Eye Tracking - Course Outline

Aims

Students will gain awareness of how measuring the positions of the eyes (which are constantly moving whilst in visual environment) may be useful in gaining insight in visual experience.

Students will become familiar with what eye tracking can tell us about the perception, attention, thoughts and emotions of people when interacting with visual displays. From screen based displays, to real world objects and spaces to virtual reality, different methods of eye tracking can be used.

The course will familiarise participants with the background theory of attention and findings on how eye tracking measures have been found to be informative of internal mental states.

The course will provide technical instruction on how to used eye trackers, giving a participants relevant grounding in the terminology and practical considerations.

The course will provide small group mini-projects giving participants a chance to gain hands- on experience in suing eye tracking as well as analysing the data in such a way as to gain meaningful insight.

Mini-projects:
The hands-on mini-projects are designed for different levels of experience and with different areas of interest in mind. The mini-projects are carried out in small groups and are led by experts who will provide guidance based on content from the taught lectures.

Systems to be demonstrated (with possible further systems): Tobii Glasses 2, TX300 (screen based, using real world examples), Tobii HTC Vive Eye-tracking VR HMD
Eye tracking specific software demonstrated: Tobii Pro lab with VR Integration

Timings: 9am 4 April – 5.30pm 5 April
Please note: Day 1 is a full day with an evening social activity.

Staff:
Dr Szonya Durant, Royal Holloway, University of London
Dr Tim Holmes, Royal Holloway, University of London
Prof Johannes Zanker, Royal Holloway, University of London
Dr Doga Gulhan, Royal Holloway, University of London

Day 1:

Introduction to eye tracking principles and applications

The underlying theory behind using eye tracking to inform us about mental processes such attention and decision making. Using theories of eye movements it will explain how the interpretation of measures such as eye position, fixation frequency/ duration/ location/ trajectory/ dynamics and pupil size can tell us about how people pay attention. It will explain the terminology used and discuss the implications of theories of attention for interpreting eye tracking data.

Practical considerations for different systems and software

In particularly in terms of the limitation in doing 'real world eye tracking' - the capabilities of remote and mobile devices and associated software. Considering the ease of extracting data using 'off-the-shelf' vs bespoke software. We will discuss applications from shopper research, web design and print advertising for example. Participants are encouraged to contribute their own questions thinking about their own areas of research. Aspects relating to integration with other technologies such as virtual reality and separate biometrics measurements will also be explored in this session.

Design and recruitment

This session will discuss the importance of criteria for participants and considerations in designing and eye tracking experiment as well as ethical considerations in recording and handling data. It will address some important considerations for avoiding basic confounding factors in your design, by building on previous psychological research and discuss appropriate metrics for answering specific questions and address some of the problems in dealing with data collection in the real world, building on the extensive knowledge and experience gained over the years working with many companies as well as publishing scientific articles.

Mini projects set up and initial data collection

Before the start of the course, using the registration website we will collect information on. Participants will be split into small groups for the rest of the day according to their interests and level of experience, to run their own experiments. There will be four groups, which limits how well we can match participant's individual focus, but they will get experience of all paradigms and platforms and the focus is on learning non-platform specific application. Each project is led by a different member of staff teaching on the course (Dr Tim Holmes, Prof Zanker, Dr Durant) to further enrich the student-senior expert interaction.

Each group works with one of the expert course tutors to set up and run an experiment on members of the group. The aim of this session is to provide hands-on experience in developing an eye tracking experiment to answer a given question, to gain some insight into issues of design and optimal development as well as an introductory experience using a particular eye tracking software and hardware set-up. Example past projects running in parallel include product placement in cinema and art appreciation.

Project feedback, demos with Q&A

Each group will explain their experimental set-up and data collection to the other groups and the equipment and set up for each demonstrated to all. Additional systems will be demonstrated in this session. This is the chance for participants to ask the course leaders about questions specific to their own interests.

Day 2:

Analysis in groups

Returning to mini-project groups to get hands-on with the data collected, putting it together to a final presentation of results, guided by the group leader from the expert course staff. The aim is to gain familiarity with analysis packages and to understand which measures might be used to answer what questions. This part forms most of Day 2 as we have found that it is worth investing the time to understand what the steps are in analysing data and this is best done by allowing participants to carry this out themselves with enough time.

Presentation and discussion with Q&A

Each of the groups presents their results in turn and there is group discussion about issues arising from the mini-projects. The aim is to demonstrate understanding of the issues and to have built confidence in using eye tracking to get results out. This is also a further chance for participants to ask the course leaders about questions specific to their own interests.

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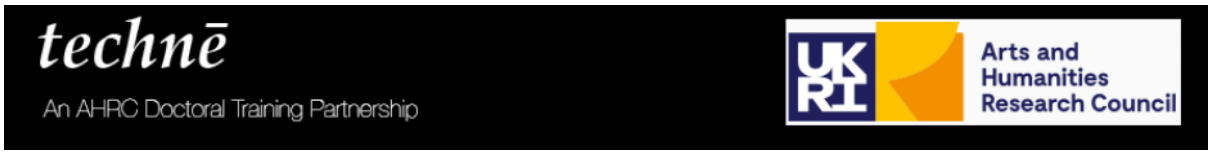

Useful reference books:

Findlay, J. M., & Gilchrist, I. D. (2003) Active Vision: The psychology of looking and seeing. Oxford University Press.

Holmqvist, K., Nyström, M., Andersson, R., Dewhurst, R., Jarodzka, H., & Van de Weijer, J. (2011). Eye tracking: A comprehensive guide to methods and measures. Oxford University Press.

Liversedge, S., Gilchrist, I., & Everling, S. (2011). The Oxford handbook of eye movements. Oxford University Press.

Wade, N., & Tatler, B. W. (2005). The moving tablet of the eye: The origins of modern eye movement research. Oxford University Press.

Useful articles:

Durant, S. (2016) A window to the soul and psyche? *The Psychologist* 29:824-845
https://thepsychologist.bps.org.uk/volume-29/november-2016/window-soul-and-psyche

Carrasco, M. (2011). Visual attention: The past 25 years. *Vision research*, 51(13), 1484-1525.
http://www.sciencedirect.com/science/article/pii/S0042698911001544

Henderson, J. M., & Hollingworth, A. (1999). High-level scene perception. *Annual review of psychology*, 50(1), 243-271.
http://www.annualreviews.org/doi/abs/10.1146/annurev.psych.50.1.243

Itti, L., & Koch, C. (2001). Computational modelling of visual attention. *Nature reviews neuroscience*, 2(3), 194-203. http://www.nature.com/nrn/journal/v2/n3/full/nrn0301_194a.html
Kowler, E. (2011). Eye movements: The past 25 years. Vision research, 51(13), 1457-1483. http://www.sciencedirect.com/science/article/pii/S0042698910005924