Visualizing Gaze Information from Multiple Students to Support Remote Instruction

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Technologically-mediated learning environments often lack important interpersonal cues that are leveraged in effective co-located learning. Recently, researchers have addressed this by integrating gaze information into remote environments to support learning and instruction [1,2] and computer science concepts [3]. However, these studies have largely focused on supporting remote pairs.

In this study, we design and evaluate a system that supports real-time gaze visualizations for multiple students and one teacher in a remote learning task.

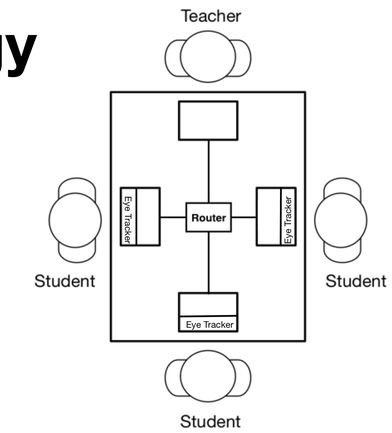
Methodology

Setup

Three Tobii 4C remote eye trackers.

Participants

Three groups of a single teacher and three students.



Task

Ten minutes of instruction on C++ concepts and fifteen minutes of debugging.

Teachers lead sessions with/without visualizations.

Gaze Visualization Design

Each student's gaze is visualized by a circle with a 70 pixel radius and is assigned a unique color.

Real-time colored indicators.

Buttons to quickly jump to location of each student.

Drop shadow indicates direction.

Additional information in the scroll bar.

Implications for Design

Gaze Clustering

Having students work together allowed for natural clustering of gaze to relevant areas of code.

Privacy

Students did not feel uncomfortable with teachers being able to see where they were looking.

Results

Confirmation/ Feedback

Immediate feedback confirms response.

Aggregations show students following along.

Monitoring

Teachers gauge classroom status.

Noted it was easier than in physical classrooms.

Scroll bar provided a global view of all students.

Not Distracting

Relatively easy to acclimate.

Visualizations act as a tool rather than obstruction.

References

[1] Bertrand Schneider and Roy Pea. 2013. Real-time mutual gaze perception enhances collaborative learning and collaboration quality. International Journal of CSCL 8, 4(2013), 375–397

[2] Kshitij Sharma, Sarah D'Angelo, Darren Gergle, and Pierre Dillenbourg. 2016. Visual Augmentation of Deictic Gestures in MOOC videos. In ICLS'16. ACM.

[3] Randy Stein and Susan E Brennan. 2004. Another person's eye gaze as a cue in solving programming problems. In Proceedings of the 6th ICMI. ACM, 9–15.

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