Highly sensitive CPC material based wearable eye tracker sense eye movements and blinking for fatigue analysis

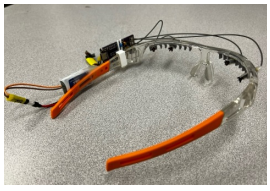
CPC material based wearable human eye tracker for non-contact eye tracking and fatigue analysis.

INTRODUCTION

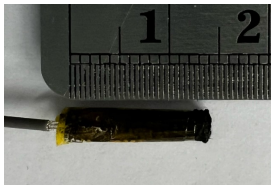
- Latency in gaze and increases in blink frequency have shown a correlation to fatigue level
- Eye response can be monitored by imaging systems, requiring heavy calculation and electric powers, which is a challenge for point-of-care (POC) testing.
- A capacitive sensor using carbon-nanotube composite is studied for fatigue analysis. The sensor demonstrates extreme sensitivity and specificity due to a high electric field.

METHODS

1. Carbon-nanotube suspension was infused into the tissue paper to create a composite of conductive carbon-nanotube papers (CPC). CPC was fractured along a drawn water line to expose individual cellulose fibers.
2. Packaged CPCs were installed on eyeglass frames in a location above the eyes. Two were installed outside of the eyes; two were above.
3. Subjects were asked to do assigned tasks for 15 minutes, and eye movement was measured.

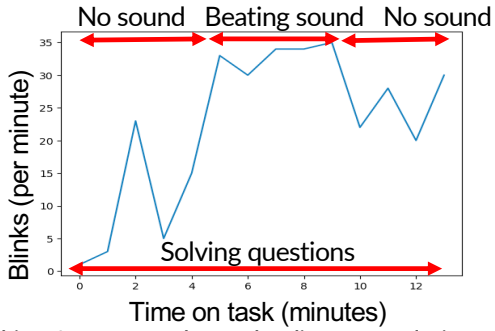


Eye Tracker

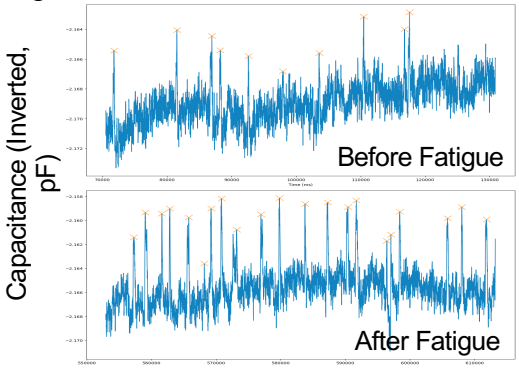


Cylindrical sensor with fibers at the end.

RESULTS



- Blinking frequency showed a direct correlation with fatigue level.



- Sensor reading before and after fatigue, the blink is marked orange. (Before: 10 count, After: 21 count)

DISCUSSION

- The lightweight and non-contact nature of the capacitive eye tracker allowed real-time eye tracking.
- The behavior of eye movements and blinks showed a high correlation to fatigue level.
- The eye tracker will be further tested for fatigue monitoring for different ages, sexes, and chronic syndrome fatigue (CFS) patients.

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