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Defeating eye tracking: Examining the robustness of eye tracker lie detection

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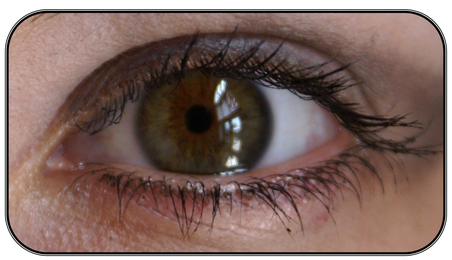
Eyes as deception cues

One of the most important issues in rapid credibility assessment is this: how can we reliably and unobtrusively detect deception? One of the tools currently under investigation for lie detection is the eye tracking camera (Burgoon et al., 2008). Eye tracking cameras can be used for many different purposes in detecting deception. This is due to the wealth of cues offered by the eye. The eye offers at least three different mechanisms that could potentially indicate deception: fixation points, blinks, and pupil dilation.

An analysis of fixation points during a Guilty Knowledge Test was recently demonstrated to be an effective method of distinguishing deceptive participants from truthful ones (Derrick, Moffitt, & Nunamaker, 2010). The fixation patterns of deceptive subjects were significantly different from the innocent subjects.

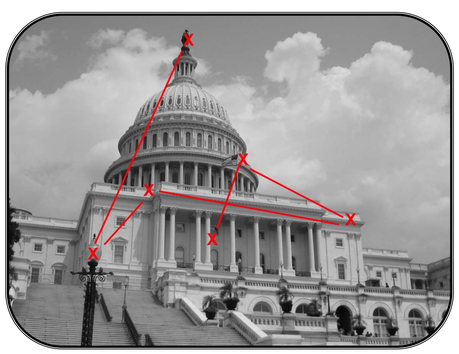
Two other eye-related cues of deception are blinks and pupil dilation. The blink rate was linked to cognitive effort, and blink latency (the time between the presentation of the stimulus and the first blink) was shown to be significantly different for the guilty knowledge than for other objects (Fukuda, 2001). Pupil dilation has also been experimentally demonstrated to be effective at detecting deception (Dionisio, Granholm, Hillix, & Perrine, 2001). Similar to other psychophysiological cues of deception, pupil diameter is theorized to change based on the cognitive effort of the individual. Deceivers undergo additional cognitive processes compared to truth tellers because they must simultaneously think of the true and the false answer (Furedy, Davis, & Gurevich, 1988). This additional cognitive load causes the pupil diameter of deceptive respondents to increase relative to truth tellers (Dionisio, Granholm, Hillix, & Perrine, 2001).

Pupil Dilation



Blink Rate

Gaze Pattern

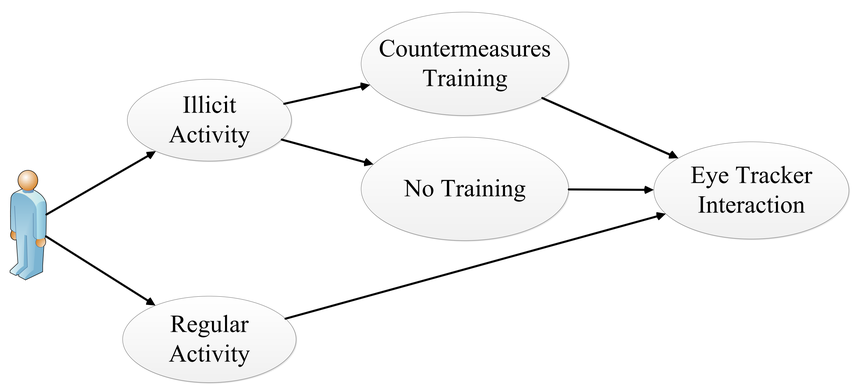


Countermeasures

The ability to reliably detect deception has been a problem significantly complicated by the introduction of countermeasures on the part of the deceivers (Honts, Devitt, Winbush, & Kircher, 1996; Honts, R. L. Hodes, & Raskin, 1985). By simulating the effort necessary for deception during non-deceptive responses, participants were able to cloud the results of polygraph examinations. Using physical processes such as biting the tongue or pressing one's toes against the floor, nearly 50% of guilty participants were able to successfully fool a polygraph examiner into believing they were innocent (Honts, Robert L. Hodes, & Raskin, 1985). Subjects were also able to fool examiners by increasing their cognitive effort during irrelevant responses by counting backward by 7 from a number greater than 200 (Honts, Devitt, Winbush, & Kircher, 1996). All of these countermeasures were employed by students with no more than 30 minutes of training. The ease with which the students were able to pass the polygraph examination draws attention to the need for validation of any psychophysiological measure of deception.

Experimental design

I intend to model my experiment after the bomb-making experiment performed by (Derrick, Moffitt, & Nunamaker, 2010). Participants will be randomly divided into two groups: regular activity or illicit activity. Those in the regular activity will simply participate in an activity and then pass through the eye tracker examination. Those in the illicit activity treatment group will participate in an activity about which they will need to be deceptive. This could be making and smuggling a bomb or another activity. They will then be divided again into two groups: countermeasures and no countermeasures. Those receiving countermeasures training will be taught how to employ the countermeasures described above. in order to deceive the eye tracker.



Conclusion

The ultimate goal of this line of research is to develop rapid, non-contact credibility assessment tools to be incorporated into the AVATAR kiosk being developed at the University of Arizona. By evaluating the effectiveness of mental and physical countermeasures in overcoming eye tracking lie detection examinations, we hope to improve the capabilities of the AVATAR kiosk, improving its accuracy at uncovering deception and hostile intent.

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For more information

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