Detecting Deception in Online Environments: Measuring Fraud Through Mouse Cursor Movements

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The rise of the Internet has given rise to a variety of ways for individuals to engage in unethical or outright fraudulent activities. Such activities can range from omission or misrepresentations in online forums to inputting false or fraudulent information in online forms, such as when applying for benefits, filling out job applications, or filing insurance claims. Such behaviors can have a sizable financial impact on organizations and society as a whole. Whereas the Internet offers much perceived anonymity, organizations have the possibility to observe various behaviors of their online users, for example by monitoring the ways in which users fill out online forms. The aim of this research-in-progress is to develop a prototype that uses easily observable mouse movement data as an indicator of potential fraud in online form submissions. To this end, we bring together research from human-computer interaction, psychology, and neuroscience, so as to hypothesize about and test ways in which fraudulent behavior can be detected by monitoring users' observable behavior in online environments.

It has been argued that lying is more cognitively demanding than telling the truth (Vrij et al., 2006). Specifically, a liar faces a number of cognitively challenging tasks, including planning what is said and avoiding contradictions, all while monitoring the reactions of the listener (Sporer and Schwandt, 2006). Whereas people telling the truth are able to *retrieve* (or reconstruct) events from memory, liars will have to *construct* plausible events (Walczyk et al., 2013). All of these tasks put a load on people's working memory (Baddeley, 2000), competing for the resources available. As a result of this cognitive load, people may not be able to effectively suppress the leaking of cues (Burgoon & Buller, 2008), and the higher cognitive load may also manifest in the way bodily movements are performed. For example, Duran et al. (2010) have shown that when asked to point with a Nintendo Wii remote control to either a truthful statement or a lie, lies manifested in slower and more disorderly hand and arm movements.

Given these findings, it stands to reason that this increased cognitive load is also likely to manifest in observable differences in mouse cursor movements. We conducted an experiment to test the possibility of detecting fraudulent behavior in online contexts. Specifically, following design science guidelines in Neuroscience (vom Brocke et al., 2013), we developed a mockup of an online insurance claim form, and implemented a mouse cursor tracking systems to record the x/y-position of the users' mouse cursor at each millisecond. This enabled us to compute several mouse cursor related variables such as cursor distance and cursor speed, as well as deviations from the direct path toward the target or movement corrections. Preliminary results of a pilot study (n= 54) indicate that various movement parameters differ between known truthful and fraudulent responses (see Table 1). As a next step, we will create characteristic movement profiles, which we will further validate using psychophysiological measures (such as Galvanic Skin Response and eye-tracking).

Table 1. T-Test of Pilot Study (Extract)

	No Fraud	Fraud	t	p
Speed (px/ms)	0.13	0.12	1.78	0.077
Distance (px)	1322.08	1584.14	-2.09	0.038

We believe that this study has important implications. Specifically, from a NeuroIS perspective, the results will provide us with further insights about potential correlates of fraudulent behavior in online contexts, and about ways to detect such behaviors in real time.

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