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Situationally-Aware Mobile Automation

Mobile computing has become a key technological advancement in the twenty-first century. With the advent of "smart" phones with considerable computing power and better, cheaper sensory technology, humans are now able to harness the immense power of ubiquitous computing. Given that the cost of computation has decreased significantly and an ever-increasing list of online services offer free data processing, the barrier to entry into ubiquitous, mobile computing is low. What once cost a fortune can now be achieved by a $200 device that can fit into one's pocket. This truly mind-boggling advancement has given rise to a new opportunity: situationally-aware mobile automation.

Situationally-aware mobile automation is defined as the ability for mobile devices to react to changes in their internal and external environments, as they can perceive them, without the need for much or any input from a human user. "Situationally-aware" refers to the ability of the mobile device to sense various aspects of its environment and itself, ranging from location on the Earth (detected through Global Positioning System technology) to ambient noise level, to its own screen brightness. "Mobile" refers to the automation being on-the-go and with the user at all times. This allows the mobile device to align its environment with its owner, such that it can act on behalf of its owner, based on its and its owner's shared environment. "Automation" refers to the ability for the

mobile device to perform operations on its own, without the need for user input at the time of the operation. While the operation in question does not require human input, it does not discount the possibility that, in order for it to function properly, it may need some prior configuration input from the user. Given that automation does not presuppose any lack of previous user interaction, any automated task which requires some pre-configuration is not excluded in this definition.

The importance of situationally-aware mobile automation is vast. Take, for example, automated mobile messaging. In this case, the communication has moved from computer-mediated communication (CMC) to a strictly one-way computer-to-human interaction between one's mobile device and human user who receives the message. Much research has been conducted regarding the effects of moving communication from face-to-face communication (FtF) to computer-mediated communication (CMC). For example, Hancock and Dunham (2001) found that users who interacted through CMC rated their interlocutors statistically significantly different than those who interacted FtF in three areas: extraversion, agreeableness, and, in particular, neuroticism. Additionally and somewhat contrarily, Hancock and Dunham found that individuals using CMC methods tended to make "more extreme attributions than did partners communicating FtF" (p. 339). As even more information about the interlocutor is stripped out of these messages in our example, we should find that social impressions of the user are only formed due to the sender's use of the automated technology, but not from the content of the text message itself. The limiting of information in these text messages to strictly that for which the message is explicitly sent (i.e. information about

location, not about sender's mood or personality traits) may very well affect the communication of interlocutors, as regular messages will commingle with the automated ones.

Society may also find itself transformed by situationally-aware mobile automation. If one were to imagine a mobile application that contained all of an individual's banking information and could act based on this and location data, one could also imagine a scenario in which a shopper who uses this application were out buying Christmas presents. Once the cashier has rung up all the items, the user would present his or her mobile phone for the cashier to scan. The mobile device would choose the best account from which to draw the funds (based on expected income and expenses, and relative funds) and handle the entire transaction automatically. The societal impacts of such a "mobile wallet" are unclear. Shin (2009) suggests that the existence of such a device will lead to further social determinism in technology, as a subjective social norm heavily impacts adoption of this kind of technology. Shin concludes that there will be a need for "vendors [to] establish user trust in mobile wallet security by ensuring that their services are conducted in accordance with users' expectations—namely, that their services are reliable, and that promises and commitments are kept" (p. 1353), or social pressures will lead to decreased adoption and trust in mobile computing, affecting societal adoption of such technologies as a whole.

New technology ideas spark new social issues. Technological automations bring a new level of intelligence to computing, and with intelligence comes power. As devices become smarter they are able to vastly outperform human function. In order for humans

to adopt these systems, they must trust the technology is smart enough to make the correct decisions. Beyond trust, a user must be able to fully manipulate the intelligent tool and understand the implications it may have on their interactions.

Ubiquitous computing needs trust between participants in order to support collaborative activities (Shand, Dimmock, and Bacon, 2004). A user must fully trust a device with ubiquitous capabilities if they are to share personal information with networks and other humans. One solution for a user trusting their smart device is to give them complete control over the configuration of the automations. If a person can alter settings of a device, they are likely to feel in control of the system, and may be more inclined to using its functionality. However, if the device exploits the user's privacy, then the trust will be lost. In other cases, users may not feel a technology is mature enough to be used. Given the theme of mobile banking, research shows the mobile wallet may still be immature and a subjective norm would likely increase adoption and use (Shin, 2009).

Another issue in automated design is the effect it has on social behavior. By making some normal person-to-person interactions automated through a phone, it raises concerns that those interactions may no longer take place face-to-face. Although, researchers from Ohio State argue that by making devices do more work, we have richer social interactions (Teng et al., 2011). In some instances, a lack of minor communication between people can cause problems. Teng et al. (2011) argues that socializing can be much easier with the use of dynamic computing. If a user's location is frequently being shared, and those who are networked with the individual know their phone is low on

battery, there is going to be more communication between the group. Although there are other effects that mobile automation has on social behavior, digital technologies can be designed to increase physical interaction and increase communication.

Deception is one aspect of social behavior in which situationally-aware mobile automation would aim to combat. A study by researchers at Edinboro University shows that over 80 percent of participants in their experiment admitting to lying via text message, many of which were reportedly sent a close friend (Walker and Gatesman, 2011). Our ideas of, "Location-Based Automated Messaging," and "Automated Device Information," both have a unique way highlighting contextual truth by displaying a user's location, their battery life, and who is currently holding their phone.

A problem with some some artificial intelligence (AI) techniques is that they require a good deal of common sense in order to use (Lieberman, 2008). Users often have goals for using a device or interface, the best AI techniques try to understand these goals and contextually respond. However, in some instances the technology can be too advanced for the user. There is a constant usability struggle when designing new technology. On one hand it is important to create new things, but often times new things can be hard for users to comprehend. Users need to understand how new technology will benefit their goals and everyday life, but it's important for adoption that they are not turned off by technical characteristics (Kaasinen, 2005). Likewise, a user must have motivation to use the service in the first place. The research of Kassinen (2005) shows that even if a user has a moderate amount of motivation, they still may not put much effort into installing and configuring an automated device or interface. This is precisely

why our automation ideas, “Volume Automation,” and “The Omniscient Wallet” intend to configure themselves. The ideas are contextually-aware in that they learn from themselves and from the user’s behavior. These ideas would also respond to external input such as sound and location to internally react and adapt.

Technology is moving toward mobile devices, interfaces, and interactions. By creating contextually-aware phones and apps, we can create better social interactions through automated technology. Our four mobile automation ideas all reflect on ways to change social behavior, while making things more convenient for users. The ideas are futuristic, but may be implemented with the proper resources and technology.

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