Gestures all around us: user differences in social acceptability perceptions of gesture based interfaces

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ABSTRACT

Gesture based interfaces provide a new way for us to interact with mobile devices, but also require us to make new decisions about how we feel about this new technology and which gestures we decide are usable and appropriate. These decisions are based on the social and public settings where these devices are used on a daily basis. Our ideas about which gestures are socially acceptable or not are an important factor in whether or not these gestures will be adopted. The ways in which users evaluate social acceptability is not only highly variable, but with drastically different results amongst different users. These differences are not dependant on factors such as age, gender, occupation, geographic location, or previous technology usage. Future work into the social acceptability perceptions of users will focus on personality traits as a new way of understanding how social acceptability is determined.

Categories and Subject Descriptors

H.5.2 [User Interfaces]: *Input device and strategies*

General Terms

Human Factors.

Keywords

Social Acceptability, Gesture Based Interfaces, Mobile Interfaces.

1. INTRODUCTION

In social situations, we constantly evaluate how others might perceive us and adjust our actions for the current context [5]. For example, at a party individuals will notice if their continually ringing phone is attracting negative attention. If this is the case, then they will adjust their phone settings in order to maintain a positive atmosphere at the party. If the party is loud enough to cover the sound of a ringing phone, individuals might use this aspect of the setting to allow the ringing to continue. In many aspects of our lives, we use our awareness of others and the affordances of the setting to help us decide how we will present ourselves. With respect to technology, we need these cues even more because devices such a mobile phones and music players integrate with and interrupt our social interactions. Because of this, we must begin learning a new set of social rules that for the usage of novel technologies in order to avoid embarrassment in public settings.

Technologies that are either more disruptive or require us to change our actions have an even higher need for consideration of the consequences of public use. Gesture based interfaces are a new technology that might provide a user with a more intuitive

interaction, but also require them to adopt strange behaviors. For example, it could be very convenient to switch the track on your music player by sticking out your tongue, but this behavior might elicit negative reactions from others. Because the set of gestures that can be reliably recognized may be quite different from the set of gestures that users are willing to adopt, the social acceptability of using any given gesture must be evaluated before time and effort are spent implementing them. The social acceptability of using gesture based interfaces in public is an issue that has had little attention in multimodal research, but has a large impact on the future of these interfaces being adopted in the real world. Without the consideration of social acceptability and user willingness to adopt gestures, implementations of these interfaces may have high reliability but no real world usability.

2. SOCIAL ACCEPTABILITY

Social acceptability is determined when the motivations to use technology compete with the restrictions of social settings. Those restrictions are determined using ideas developed through experience and general knowledge in social situations [4]. These ideas change over time as individuals gather memories and exchange information with others. The internal thought process of determining social acceptability incorporates all this information given the current motivations and social context. Therefore, saying that using a gesture to interact with a mobile interface is "socially acceptable" simply because it is inoffensive or subtle is not enough. The social acceptability of a particular interaction with a mobile interface is dependant on the individual within the current social context.

Social acceptability is an important factor to consider during the design of gesture based interfaces in order to create real world usable systems. While significant work has been completed on the technical side of gesture based interfaces with gesture sensing algorithms and devices, the usage of gestures in the real world has had little attention. The set of desirable gestures must be identified so that implementation and development efforts will not be spent on unusable gestures. Gesture based interfaces should not be built based only on state-of-the-art gesture recognition, but should also consider the limitations of user willingness to perform gestures.

3. THE GESTURE SURVEY

In order to examine some of the factors that determine social acceptability, an Internet survey was developed to examine the social settings where gestures might be used. The survey examined a set of eighteen gestures chosen for their previous usage or possible future usage in mobile interfaces. For example, shaking [6], wrist rotation [2], device tap [5], and device whip [1] have all been used in existing interfaces. The names and descriptions of these gestures are given in Table 1.

For each of the eighteen gestures, participants were shown a short video of the gesture being used and were asked to answer multiple-choice questions about situations in which they would use the gesture as part of a mobile interface. The videos lasted from one to four seconds and were played on a loop while participants answered two questions for each video. First, they were asked to select from a list which locations they would be willing to use the demonstrated gesture. These locations were at home, while driving, as a passenger on a bus or train, on the pavement or sidewalk, at a pub or restaurant, and at the workplace. Second, they were asked to select from a list which audiences they would be willing to use the gesture in front of. These audiences were alone, partner, friends, family, strangers, and colleagues. These questions were designed to address the settings where mobile devices are commonly used and how the social protocols of locations and bystanders influence the thought process in deciding if the given action is acceptable.

Table 1. Names and descriptions of the gestures in the survey.

Name	Description	Name	Description
Shoulder	Rotation of the shoulder.	Hand Proximity	Measuring space between the hands.
Nose Tap	Tapping the nose.	Head	Nodding the head.
Wrist	Rotation of the wrist.	Balance	Shifting the balance of the body.
Clap	Clapping the hands.	Foot Tap	Tapping the foot.
Belt Tap	Tapping the belt.	Finger Proximity	Measuring space between the fingers.
Arm Squeeze	Squeezing the forearm.	Whip	Whip-like flick with the device.
Shake	Shaking of the device.	Pocket Tap	Tapping the pocket.
Squeeze	Squeezing the device.	Table Tap	Tapping the device on a table.
Body Tap	Tapping the shoulder with the device.	Rhythm	Rhythmic movement of the device.

Of the 51 participants, 40 participants completed the questions for all 18 gestures. The participants ranged in age from 22 to 55. 29% of the participants were female and 71% were male. 57% of the participants were students, and 39% were employed. The remaining 4% were retired or did not report their occupation. 98% of the survey participants reported using a mobile phone at least occasionally, with 88% reporting using their mobile phone every day. With respect to gesture based interfaces such at the Apple iPhone, 61% of participants reported using these interfaces at least occasionally with 31% using them daily.

4. USER PERCEPTIONS

Levels of "social acceptability" were determined from the responses using the ratio of positive responses to negative responses for each question. A positive response was counted for any location or audience that a participant selected as one of their acceptable options. A negative response was counted for any location or audience that was not selected as an acceptable option.

In order to understand the difference in acceptability perceptions between users, an overall acceptability percentage was given for the responses from the 40 participants that completed every question. The acceptance rates for individual participants

demonstrated a high level of variance, with percentages ranging from only 7% acceptance to 96% acceptance. The average percentage of acceptance amongst these participants was 64% with a standard deviation of 20%. These results show that individual users had highly different perceptions of what gestures they found acceptable and which they would simply not use. However, this study did not provide information about why these differences were observed. Comparisons for age, occupation, and gender did not explain the variance between users' acceptance rates. Users that reported using a gesture based interface daily or weekly were only 4% more likely to accept gestures than those who had never used one. These results demonstrate that there are other factors besides basic demographics or previous technology usage that determine how willing users are to adopt gesture based interfaces. Future research into the social acceptability of mobile gesture based interfaces will seek to uncover the factors that influence user willingness to adopt these interfaces.

5. FUTURE WORK

The concept of social acceptability with respect to technology is an important factor to consider when developing new gesture based interfaces. Future work will examine the psychological and personality factors that might help to predict a user's willingness to adopt gestures. For example, how much of a role do personality categories such as introversion and extroversion play in users' perceptions of gesture usage? Other factors, such as warmth or competence, will also be investigated. Future studies will not only investigate how psychological factors affect how individuals determine social acceptability, but also investigate how individuals determine social acceptability in real world situations when compared to imagined situations. Since these technologies will be used in everyday situations, user perception of gestures in real world settings is crucial to further investigate socially acceptable gestures.

6. ACKNOWLEDGMENTS

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