

CS6750 – Assignment M4

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Abstract—For multitasking individuals that engage in physical activities while listening to MOOC lectures the iPhone Udacity application demands constant, physical user interaction. To bridge this Gulf of Execution while maximizing user safety, attention and information retention, this project shall explore supplemental interface features for effective studying while multitasking.

1 QUALITATIVE EVALUATION

Evaluation Plan (One method, one prototype)

The qualitative evaluation plan will consist of a survey evaluation, due to the textual prototype presented in Assignment M3. The prototype of interest will be the NLP enabled software solution presented in M3 as a textual prototype. This prototype is a software piece focused on Natural Language Processing. This application has no advanced Artificial Intelligence software. Only by learning and analyzing the voice commands from the user, the system adapts to better capture each command. Otherwise, the application simply exposes all possible Udacity functions such as navigation, playback controls, and video capture controls. Additionally, the application allows for interfacing with 3rd party applications like Piazza or notes taking in order to provide the user all the tools necessary for productive learning environment without having to switch context of usability or control.

Participants will be recruited from among the OMSCS student populous as well as a minority of relatives, acquaintances and/or co-workers. Recruitment will occur through the survey website <http://peersurvey.cc.gatech.edu> which can be shared with both OMSCS and non-OMSCS individuals alike. Consequently, both the location and storage of the survey will be hosted online, on the peer survey website. It is feasible that there may be multiple versions of the survey if the prototype designs undergo improvement during the process according to initial survey results.

Content

The survey will be conducted as an asynchronous session of a textual representation of a single prototype as a post-event protocol by many individuals. The questions surveyed are as follows:

1. Does the interface grant access to all necessary tools and applications which enable successful learning?
2. Do the available controls adequately cover all of the required operational needs?
3. Are there certain modes of operation which must be continuously re-entered but are not easily accessed from the controls available?
4. At any time, is there ever a presence of repetitive or unnecessary actions required by the interface?

Requirements from M3

1. The interface should implement a user interaction which requires no physical interaction and/or allow for basic task enabled functionality.
2. The interface should contain no visually demanding functions and minimize required tactile functionality as much as possible.
3. Any implemented commands or tactile controls should be intuitive or maintain a low Gulf of Evaluation/Execution in order to perform the necessary task.
4. Since a redesign of current existing applications used by the users is out of scope for this project, the interface must include the capabilities to interact with any and all necessary applications that the user is required for proper material absorption.

Addressing the Requirements by Qualitative Evaluation

The Qualitative evaluation addresses the first requirement by inquiring into the available controls and ease of use of the interface. The second requirement is addressed by querying the user for failed attempts, repetitive steps and coverage of functionality. The third requirement is covered by fulfilling the justification for the first two requirements, as fulfilling them would also ensure fulfilling of the third requirement. The fourth requirement is fulfilled by the first question, inquiring whether all necessary tools are easily accessible. If the answers

gathered from the participants tend towards the required features of the new interface, then the requirements are fulfilled.

2 EMPIRICAL EVALUATION

Defining experimental conditions

The prototype used in this evaluation would be the Hardware Control Accessory from the M₃ Assignment. This prototype is a hardware controller, created specifically for control of the application user interface. This controller can be mounted on the steering wheel, dashboard, bicycle steering wheel, or even directly on the wrist. The device would connect to a mobile phone, tablet, or laptop through Bluetooth interface and provide all necessary functionality described by the requirements.

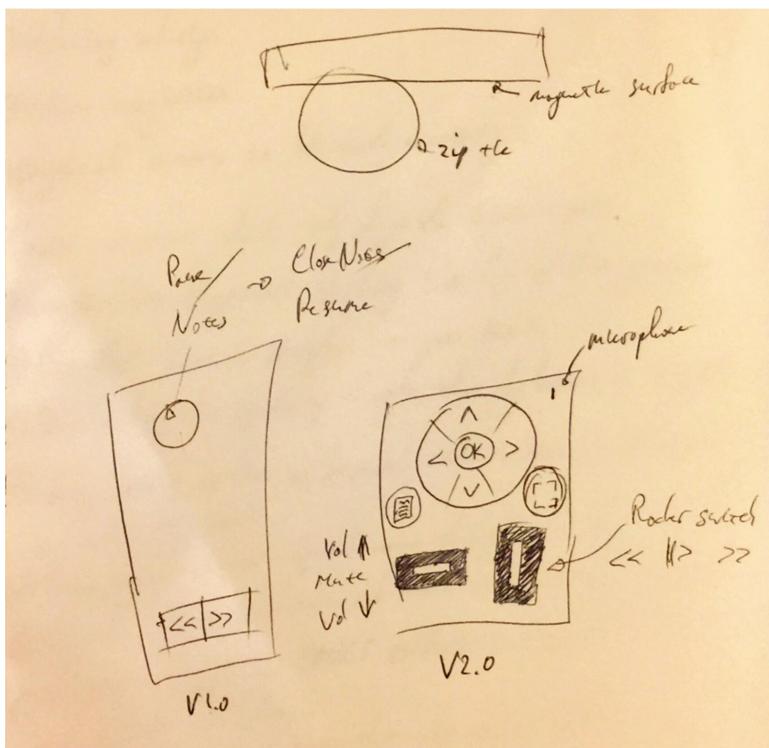


Figure 1: Prototype Design

For this experiment, the control would be the main interface of the Udacity application while the Device Under Test would be the hardware controller.

Defining null and alternative hypotheses

Null hypothesis – The time and complexity of navigating the Udacity interface using the hardware accessory controller requires the same amount of time, attention, and cognitive load as navigating the application in the traditional way of computer, tablet or phone screen interaction.

Alternative hypothesis – The time and complexity of navigating the Udacity interface is much simpler and faster using the hardware accessory controller rather than the traditional computer, tablet or phone screen user interaction.

Experimental Method

The experiment will consist of within-subjects which are randomly assigned to groups. As part of the experiment, each subject will be asked to interact with a piece of the interface while quantitative measurements are recorded about their experiments. The measurements taken will include the time taken for users to complete certain actions, the number of missed button clicks and number of clicks taken to get to the correct destination. Additionally, the user's cognitive load and task complexity will be rated on a satisfactory scale. Since only two "treatments" are tested, the Chi-squared test and the t-test will be primarily used to analyze the information gained.

Lurking Variables

Some lurking variables may be the order in which the participants interact with each interface. To deal with this issue, all participants will be randomly assigned to groups and randomly presented with the interfaces, either one or the other. Since the actual Udacity functionality is not being redesigned or new features added, the only functionality under test is the user interaction.

3 PREDICTIVE EVALUATION

The prototype selected for Predictive Evaluation is the same as the one selected for Qualitative Analysis. The prototype of interest will be the NLP enabled software solution presented in M3 as a textual prototype. This prototype is a software piece focused on Natural Language Processing. For this analysis, a cognitive walk-through will be implemented. This evaluation will address the tasks navigating the Udacity website, operating video playback functions, and accessing peripheral applications using voice commands. As part of this experiment, the prototype can be presented as a textual or paper prototype as fully

coded user interface is not necessary to make logical interface traversal decisions.

The user's goals will be to complete the tasks given to them in the fastest time with the least amount of errors, or incorrect commands. The only operators available to the user throughout this exercise will be verbal commands, as that is the only way to interact with the interface. The goals provided to the user contain both, previously established execution paths, as well as newly developed paths that exist as part of this interface. As an example, playing a specific video lecture would be a goal that the user would already know how to accomplish. However, taking a note during a video lecture would be a new feature previously not available to the user in the traditional interface. Additionally, as new features are developed, the user would have to learn from scratch the vocabulary required to operate the new designs. For example, an interface to the Piazza forums would require the user to be made aware of such capability, as it was not present before.

4 PREPARING TO EXECUTE

The two evaluations to be performed will be the Qualitative Evaluation and the Predictive Evaluation. The reason these two evaluations are selected is due to the stage of the prototype development and the inability to empirically test all the needed functionality of the prototypes at this point. The Qualitative test can, at this point, be made from a textual prototype and the Predictive analysis can also be conducted as part of a textual or even paper prototype.