CS6750 – Assignment M3

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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 BRAINSTORMING PLAN

In order to conduct thorough brainstorm, individual brainstorming will be the first step. Multiple ideas will be generated and recorded without constraint or evaluation. Any and all ideas will be summarized concisely and presented abstractly as possible solutions to the given problem. After 15-20 initial ideas, a time break to regroup and reevaluate the problem will be undertaken. Next, the list of if ideas will be filtered in order to group, discard, and re-combine ideas into 3-4 solid, realistic and feasible possibilities. In order to narrow down the list of possible ideas, the methods of creating various user profiles and scenarios in order to further refine and reduce the valid concepts.

2 BRAINSTORMING EXECUTION

1. Windshield with safety indicators
2. Autonomous vehicle
3. Udacity redesign
4. Voice recognition
5. Physical buttons as Bluetooth accessory
6. Smart assistant which only plays important parts of lectures
7. Google Glass augmented reality with facial gesture control.
8. Download lectures straight to your brain
9. Develop drug which speeds up brain function to play vides at 10x speed.
10. Change audio content to visual content and back depending on context.
11. Smart content presentor. Space out content throughout the day.

12. Algorithm that scans social media and relates content to user.
13. Carpool students and switch who watched lectures.
14. Overlay lectures over music that the student likes
15. Pull out laptop in car dash board
16. Rewards base application that earns rewards for successful learning.
17. App with stupid question generator, to explain material as if to kid.
18. Personalize videos with different language translations
19. Develop app to recognize external distortions.
20. Develop headphones with manual controls.

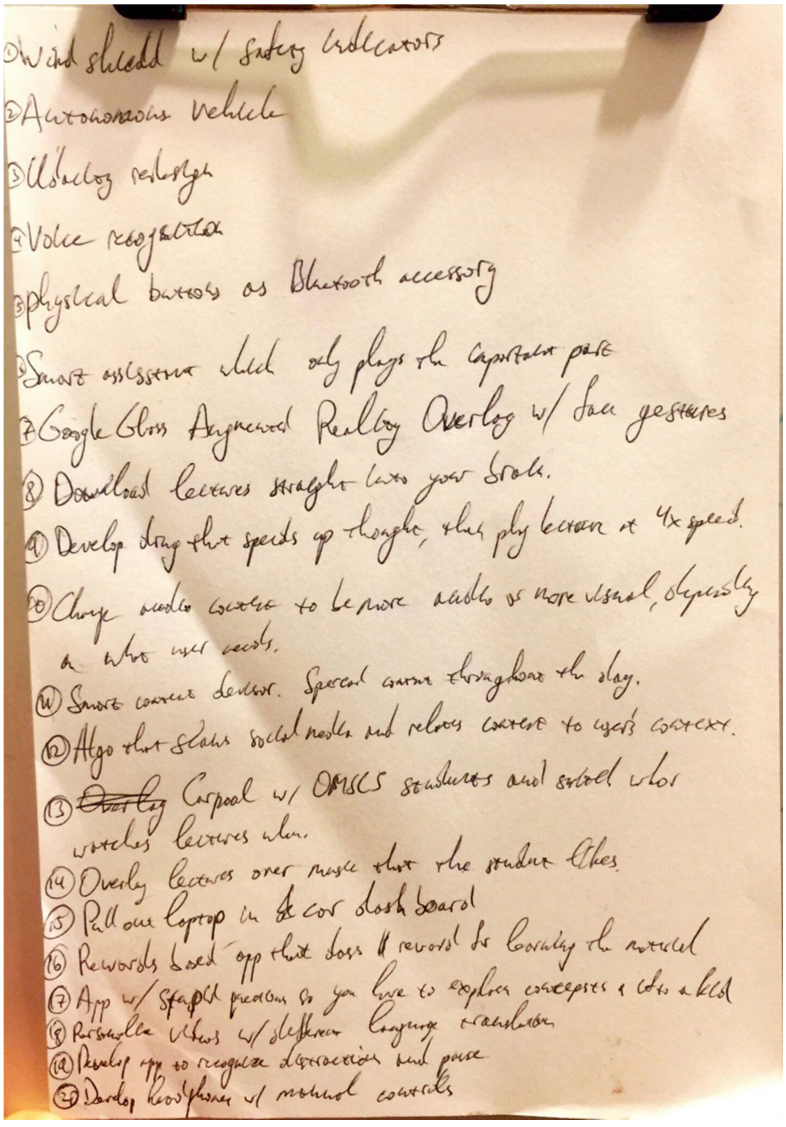

Figure 1: Individual Brainstorming

3 SELECTION CRITERIA

The requirements from the need-finding exercise, determined in the previous assignment, are summarized as follows:

1. The interface should implement a form of Artificial Intelligence which requires no physical interaction to control and 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, then the interface must include the capabilities to interact with any and all necessary applications that the user is required for proper material absorption.

To flesh out the number of ideas from 20 to 3, a number of selection criteria will be implemented. Firstly, three user profiles are generated. One is a profile of a 20-year old college student. This user does not have a set daily schedule, studies at random times of the day and attends the gym, while also using the bicycle as the most common mode of transport. The second user is a young working professional. This user drives a car, attends the gym and maintains an unbalanced daily occupational schedule, often working late nights or weekends. This user may have relationships in their life but does not yet have any children. The third user is a middle-aged parent. This user drives a family car, enjoys an occupational schedule of 9AM to 5PM but uses the rest of their time on house chores and time with children. Sometimes this user may go to the gym, but only to maintain basic health and stamina.

Secondly, in order to flush out the ideas further, scenarios are implemented. The multiple scenarios used to evaluate each idea are listed as the following:

1. User is working out at the gym with weights (hands are busy).
2. User is outside or inside jogging.
3. User is driving a vehicle while also using GPS.
4. User is using a bicycle on even or uneven terrain.

5. User is physically busy with child (holding, playing or watching).
6. User is busy with household chores (Cleaning, organizing, cooking).
7. User is predominantly mentally preoccupied with work or other task.

The 1st requirement is covered by the 1st and 3rd user profiles as well as the scenarios 1-6. The 2nd requirement is covered by the 2nd and 3rd user profiles as well as the scenarios 3, 5 and 7. The 3rd requirement is covered by all user profiles and scenarios as the 3rd requirement is a general rule of simplicity and minimalism which should be present in every user interface design. The 4th requirement is best suited for the 3rd user profile as well as the scenarios 1, 3, 5, 6 and 7.

4 PROTOTYPE 1 – HARDWARE CONTROL ACCESSORY

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.

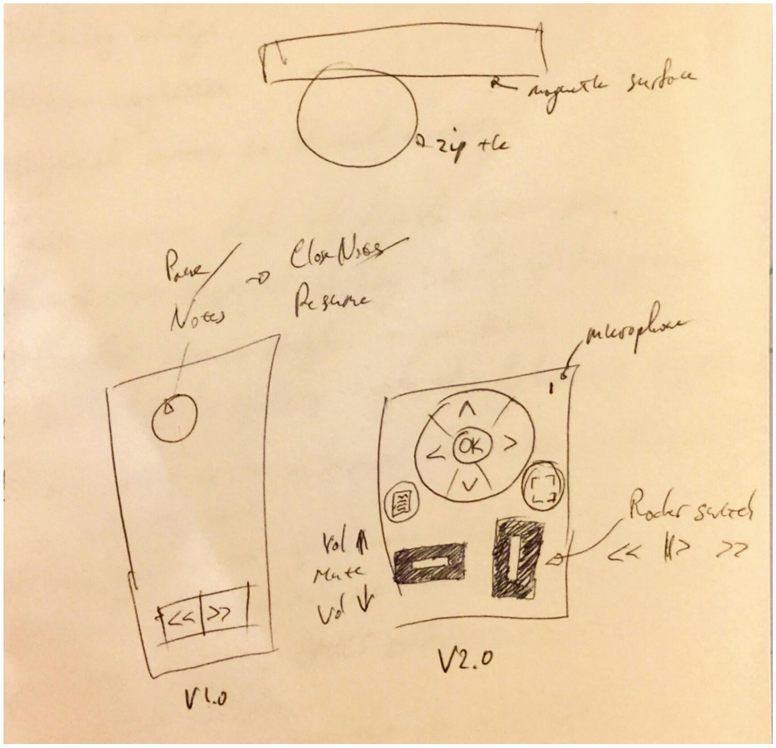

Figure 2: Prototype Design

Two rocker switches at the bottom of the controller would provide the functionality of VolUp/VolDown/Mute on one rocker and FWD/RWD/Pause on the second rocker. A 4-button navigational ring with a central button would provide the functionality to navigate through Udacity menu. Additionally, the controller will have a slot for a microphone, allowing expansion of the applications available to the user for incorporating voice commands. Specialized button may be added to access Notes, for voice note taking or Piazza for accessing the forums for discussion of covered topics.

This interface fails the first requirement as by its very own nature, it requires physical interaction. However, the interface is very simple and after some memorization, interaction with such a device would be left to muscle memory. The device maintains the second requirement by maintaining a minimalistic design with no visually demanding features and minimized tactile requirements. The Gulf of Execution/Evaluation of the tactile controls are very low as the implemented controls are intuitive and give immediate feedback. In order to interact with all necessary dependent applications, the interface is expandable for whichever supplementary applications require control.

5 PROTOTYPE 2 – SMART ASSISTANT APPLICATION

This prototype is a piece of software developed for the smartphone ecosystems implementing a smart assistant used for helping the user conduct common learning functions. The application would utilize Artificial Intelligence and Machine Learning functions. The smart assistant would create a database over a period of time containing a log of behavioral patterns including: time of day when the user is busy, learning, driving, working, exercising, etc. As the smart assistant's learning continues, it would begin to preempt the user and suggest playing certain video highlights, reviews and continuation in order to better promote learning and material retention for the user.

From the requirements perspective, the first requirement is perfectly fulfilled since the human interactions are minimized in favor of Smart assistant feeding the user material when it decides is the optimal time for such a task. The second requirement is also fully fulfilled since there are no visual or tactile interaction required by the interface as all functionality is automated by the intelligent assistant. The Gulf of Evaluation and Execution requirement is difficult to gauge

until the prototype is fully built. Since the virtual assistant is automated, evaluating correct behaviors become very difficult. Without a dedicated user interface, the gulf of evaluation is reliant on the user considering their intended action and comparing it to the action taken by the virtual assistant. Finally, the fourth requirement, again, depends most on the virtual assistant correctly interpreting the needs of the user. Opening Piazza or a Notes application will become a function controlled by the virtual assistant and interlaced within the lectures and quizzes depending on the algorithms used to decide when to switch context to those apps.

6 PROTOTYPE 3 – MANUAL VOICE CONTROL

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.

The first requirement, specifying control type is fulfilled considering the enabling of completely hands free operation. Voice control allows not only for complete Udacity website manipulation, but additionally manipulation of third party applications to enable notes and Piazza interactions. The second requirement is also fulfilled considering there is no visual or tactile interface required for this interface. All functionality is relegated to voice commands which do not require any visuospacial interaction from the user, unless desired. Contrary to the previous prototype, this prototype maintains a low Gulf of Execution and Evaluation. Each command has an expected and direct result. Since there is no artificial decision making implemented in the application, the user expects command to execute exactly, and can determine failed commands or misinterpreted commands immediately for instantaneous feedback. The fourth requirement is also fully realized since the application implements third party application use, allowing the user to manipulate applications like Notes or Piazza simultaneously form the same user voice control interface.