

CEN 4725/5725 Natural User Interaction

Project Part 1: Group Project Outline Template

Introductions***Group Members:***

Name	Year	Major
Manika Monga	8 th Semester	Computer Science Engineering
Siddharth Gupta	2 nd Semester	Masters in Computer Science
Poornima Kumar	2 nd Semester	Masters in Computer Science
Dilip Kunderu	2 nd Semester	Masters in Computer Science

Project Idea:

KINECTed LIVING is a gesture and speech-controlled system wherein a user can control the lights and fans in a living space. We were inspired by the “Put that there” application which empowers the user to employ both gesture and speech simultaneously to interact with the system. This would be the most natural way of interaction with our system as well. The speech command would be responsible for changing the state of the device whereas the gesture would aid in identification of the device. Additionally, the users would have the choice of performing the same commands with either gesture or speech solely. Some use cases of our application include but are not limited to turning lights/fans on or off, changing their brightness or speed to a desired level. The devices would be controlled centrally via an Arduino Uno board.

Group Expertise:

- Manika Monga- Has previously worked on some JAVA projects and has built a traffic light system using the Arduino board.
- Siddharth Gupta- Has experience with MCU programming, particularly Arduino and BeagleBone Black. Has done projects on speech recognition on Android previously.
- Poornima Kumar- Has developed projects on C# and has worked on projects integrating Microsoft Speech API.
- Dilip Kunderu- Has experience in Java and speech recognition via CMUSphinx.

Technical Considerations

1. Establishing communication between Microsoft Kinect and Arduino Board.
2. Each LED connected on the Arduino board represents a section of the room. Selecting the best approach to partition the room to represent each of the LED will be a challenge.
3. Integrating gesture and speech commands to accomplish a single task.
4. Eliminating misdetection of homophones and rhyming words.
5. Ensuring that the latency is low between the user giving the command and execution of the command.

Evaluation Plan

Our aim is to develop an interface that facilitates users' interaction with the system. Therefore, a user study will be conducted in two phases. The first phase will be executed before the development of the first prototype. Here, we plan to employ the guessability methodology to gather a set of speech commands and gestures from the users. Twenty participants will be asked to perform a gesture and give a speech command to accomplish the following tasks: -

- Selecting the device that needs to be turned on/off.
- Switch ON the LED.
- Switch OFF the LED.
- Increase brightness of the selected LED.
- Decrease brightness of the selected LED.

The result of this survey would be a set of all feasible gestures and speech commands. We plan to get feedback from users of different age groups and experience with technology. Each of the participants would be given credit in our project report for providing their valuable feedback.

User Distribution	Age < 30	Age > 30	Total
Technical Users	9	3	12
Non-Technical Users	5	3	8
Total	14	6	20

Then based on the results of the study, we will use the most common gestures and speech commands for our project. The user study will be conducted at two locations to include people of all age groups and technical experience. Feedback from technical users would be gathered at UF campus and for non-tech users at an apartment complex.

The first prototype includes parallelly implementing gesture detection and speech detection independently for the most common gesture and speech commands in the data set that was gathered from the users. The final step of the first prototype would be to turn on/off one LED using a switch button on the Arduino board.

Subsequently, the second phase of the user study will be done similarly as described above. Users will be asked to interact with the prototype that has been developed, however this time the goal would be to understand whether the system is easy to use and to validate whether the system is correctly identifying the speech commands and gestures.

Concerns or Questions

- Our system only requires hand gestures. Therefore, is it a better approach to use half body gesture recognition compared to the full body gesture recognition?
- Since there is restriction on the use of hardware, we would be portraying the LEDs and fan on one Arduino board. Is it an appropriate representation of the project? If not how else can we improve?
- A concern with regards to the Kinect is that none of the group members have prior experience with Kinect SDK.