Boston University
Electrical & Computer
Engineering

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EC463 Senior Design Project

First Prototype Testing Plan and Report

ICHI

By

Team 10

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Required Materials

Hardware:

- Arduino Nano
- Joystick
- 3 push buttons
- 2 switches
- Op amp (LM741CN)
- Electret Microphone

Software:

- Google Speech-to-text
    - Python
    - Transcribe local files
    - Transcribe microphone input
    - Transcribe punctuations

Hardware Pinout

Arduino Pin #	Usage/Description
RX	Receive pin from HC-05
TX	Transmit pin to HC-05
D2	Right push button input
D4	Left push button input
D12	Joystick select button
A0	Microphone input
A1	Joystick vertical movement input
A2	Joystick horizontal movement input
5V	5V connection for all components
GND	Grounding connections for all components

Setup:

The external microphone should be plugged in and connected to the laptop. The user will then run a Python program which accesses the Google Speech-to-Text API. The microphone will take audio input and the audio will be transcribed in real time. The transcribed text will appear in the terminal for the testing stage. The Arduino Nano should be plugged into a power source. The user will open a Tera Term terminal from their device, which is different from the connected power source. The hardware inputs (buttons, joystick, microphone) will be wirelessly transmitted over Bluetooth to the user's Tera Term terminal.

Pre-testing Set up Procedure:
Software Side:
      Speech-to-Text
1. Set up virtual environment and external microphone
2. Run python script
      Bluetooth Communication
1. Run Tera Term
Hardware Side
1. Make sure Arduino Nano is plugged into PC
2. Compile and upload code from Arduino IDE onto Arduino Nano

Testing Procedure:
1. Connect Arduino to computer and compile and upload to program from the Arduino IDE
2. Run Tera Term
3. Test each component (buttons, joystick, microphone)
4. Open up the Python script that implements Google Speech-to-Text API.
5. Compile program and speak into laptop microphone
6. View text on screen

Measurable Criteria
The criteria for successful running and output is as follows:
I. The Arduino should successfully detect hardware inputs:
    A. Push button inputs will be printed to the Tera Term terminal as "Left Click" and "Right Click:
    B. Joystick inputs will be printed to the Tera Term terminal as X and Y coordinates representing joystick movement
II. Push to talk button should mute microphone input unless pressed, and switches should keep power from buttons and components
    A. Microphone inputs will be printed to the Tera Term terminal as the minimum, maximum, and delta values when push to talk button is pressed

III.   The Python script should accurately transcribe microphone input from specified device index into text with correct punctuations in the terminal.

Degree of end-to-end completion achieved and demonstrated by this testing

Demonstrated by this testing, we have completed half of the entire scope of our project. The remaining steps include refining the hardware design and 3D printing the shell and buttons of the controller. In addition, We have to refine the eye-tracking component of the product and build the communication between the hand-held controller and computer actions.

Discusses conclusions based on test data

Based on our results, we were able to successfully register the button clicks and joystick movements.Additionally, we were able to demonstrate the microphone picking up noise only when the push-to-speak button is pressed. Further, the speech-to-text function accurately transcribed audio input from a defined microphone. Thus, we can conclude that we have several features working appropriately, but separately. We now need to work on integrating all of our functions together as well as building the eye-tracking component of the project.