Ira A. Fulton Schools of Engineering
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CSE 535: Mobile Computing

SmartHome Gesture Control Application
Project Part 1

Purpose

Gesture-based SmartHome devices have the ability to increase convenience, but also create more accessible SmartHome devices for the elderly and those with disabilities. In this project, you will develop an application service that will control SmartHome devices with gestures, and then develop a RESTful application service for classifying the SmartHome gestures. This project provides hands-on experience developing a mobile application and provides an excellent opportunity to gain further exposure to topics and applications in the areas of mobile computing and machine learning.

Objectives

At the completion of this individual project, learners should be able to:

- Develop an application service that will control SmartHome devices with gestures.
- Develop a mobile application using Android Studio.

Technology Requirements

- Android Studio
  - Download instructions resource: Install Android Studio
- Either MatLab or Python
- YouTube account for video submission

Project Description

To complete Part 1 of this project, you will develop an application service that will control SmartHome devices with gestures. You will gain hands-on experience developing a mobile application using Android Studio.

SmartHome Gesture Control Application Project Part 1 is partly **peer-graded**, and it is also reviewed by the course team for fairness and accuracy. The overall project accounts for 40% of your grade.

Directions

Functionality

For Part 1 of this project, you will develop a mobile application with the listed functionalities:

A. The user is shown a video of a gesture.
B. The user can replay the video at least three (3) times.
C. Upon clicking the "**PRACTICE**" button, the user can capture his or her own video through the smartphone's front camera for a period of at most five (5) seconds.
D. The videos are uploaded to a server.

Note:

- You may also use fog/cloud server. Please make sure to show your video is successfully uploaded in your demo video.
- You may use your webcam if you do not have or do not want to use a physical Android phone.

The mobile application should have **three (3)** screens.

Screen 1

A drop-down menu of 17 different gestures will be shown on this screen. Once a single gesture is selected, the user will be taken to Screen 2.

- Gesture list: {Turn on lights, Turn off lights, Turn on fan, Turn off fan, Increase fan speed, decrease fan speed, Set Thermostat to specified temperature, gestures one for each digit 0,1,2,3,4,5,6,7,8,9}

Screen 2

The video of an expert performing the gesture will be shown on this screen. Screen 2 will have another button that says "**PRACTICE**". Once this button is pressed, the user will be taken to Screen 3.

Screen 3

In this screen, the camera interface will be opened for the user to record the practice gesture. The video will be captured for five (5) seconds, and the video will be saved with this filename format:

- [GESTURE NAME]_PRACTICE_[practice number]_[USER LASTNAME].mp4

Use the **Gesture - Action** and **Gesture - Number** tables for gesture names:

Gesture - Action	Gesture Label
Turn On Light	LightOn
Turn Off Light	LightOff
Turn On Fan	FanOn
Turn Off Fan	FanOff
Increase Fan Speed	FanUp
Decrease Fan Speed	FanDown
Set Thermostat to specified temperature	SetThermo

Gesture - Number	Gesture Name
0	Num0
1	Num1
2	Num2
3	Num3
4	Num4
5	Num5
6	Num6
7	Num7
8	Num8
9	Num9

Screen 3 will have another button that says "**UPLOAD**". Once this button is pressed, the user will be able to upload the gesture to a local server. Moreover, clicking this button will take the user back to Screen 1.

Expert Videos

The file **Expert-Gestures.zip** contains video clips of the gestures that you will use for the example shown on Screen 2. This zip file is available in your course in the "Project Overviews and Resources" page in the *Welcome and Start Here* section.

Gesture Creation

You will create **at least three (3)** correct video versions of **each gesture** for a total of 51 videos. You will use the best of these as the expert gesture to be shown on Screen 2 of the application. You can practice as many times as you want. You will upload a zip file of your gestures. Follow these naming conventions for your files:

- [GESTURE NAME]_PRACTICE_[practice number]_[USER LASTNAME].mp4
- Videos_[Full Name].zip

Video guidelines:

- Videos should focus only on showing the gestures. **Do not show your face**. Surroundings should be kept out or kept to a minimum in the videos.
- Use the front camera for recording. However, you can activate the back camera in your app by default and manually switch to the front camera.
- Your APP needs to provide functions to open and use the camera. You cannot quit the APP and open the camera manually for recording.

Demo Video

Create a video demonstration of the application being used. For the demo, record an application demonstration of the Functionality (parts A-C). Begin recording from when you start the application and show all of the required functions.

Video guidelines:

- Videos should focus on only showing the gestures. **Do not show your face**. Surroundings should be kept out or kept to a minimum in the videos.

In order to submit your demo video to the course, you should create an account on Youtube, Vimeo, or some other free video hosting service and upload the required video for the assignment to that account. When you create your video, ensure that the settings allow **anyone with the link** to view the video.

Local Server

Develop your own local server on your own computer.

Note: Using Flask as your local server is recommended.

Testing Environment for Grading

Occasionally, a source code will not work correctly when the development environment is different from the listed environments. If this occurs, we are not able to give you the correct grade because it is not easy to find the reason why your application failed. If possible, please use one of the environment settings listed here to avoid receiving the wrong grade:

- Pixel 6 or Pixel 7
- API 29 or above

Submission Directions for Project Deliverables

Submitting SmartHome Gesture Control Application Project Part 1

You are given a limited number of attempts to submit your best work. The number of attempts is given to anticipate any submission errors you may have in regards to properly submitting your best work within the deadline (e.g., accidentally submitting the wrong paper). It is **not** meant for you to receive multiple rounds of feedback and then one (1) final submission. Only your most recent submission will be assessed.

You must submit your SmartHome Gesture Control Application Project Part 1 deliverables in the designated submission space. Learners may not email or use other means to submit any project for review, including feedback, and grading.

Your SmartHome Gesture Control Application Project Part 1 submission includes **three (3)** deliverables:

1. **Recorded videos**: Your recorded videos submission must be a single zip file with the correct naming convention: *Videos_[Full Name].zip*
2. **Source code**: Your project source code submission must be a single zip file with the correct naming convention: *SourceCode_[Full Name].zip*
3. **Demo video**: Your demo video submission must be a direct URL to the video, which must follow the correct naming convention: *Demo Video_[Full Name]*

Submitting SmartHome Gesture Control Application Project Part 1 Demo Video

The demo video is peer graded. Please only submit your video URL **once**. When you create your video, ensure that the settings allow **anyone with the link** to view the video.

You must submit your SmartHome Gesture Control Application Project Part 1 Demo Video deliverable in the designated submission space. Learners may not email or use other means to submit any project for review, including feedback, and grading.

Your SmartHome Gesture Control Application Project Part 1 Demo Video submission includes **one (1)** deliverable:

1. **Demo video**: Your demo video submission must be a direct URL to the video, which must follow the correct naming convention: *Demo Video_[Full Name]*

Evaluation

Your project submission will be reviewed and graded by the course team. Your demo video will be reviewed and graded by your peers. Please review the rubrics for how each part of your project will be graded. Submissions will be evaluated based on each criterion and will receive a total score.

Submissions missing any part of the project will be graded based on what was submitted against the rubric criteria. Missing parts submitted after the deadline will **not** be graded.

Review the course syllabus for details regarding late penalties.

Rubrics

SmartHome Gesture Control Application Project Part 1 Rubric

This part of the project is worth a total of **121 points**. The "Points Possible" column represents the number of points that will be awarded based on the condition in the "Criteria" column.

Recorded Videos Criteria	Points Possible
Individuals will perform each gesture three (3) times and upload three (3) correct versions of each gesture for a total of 51 videos each.	**40**
Source Code Criteria	**Points Possible**
The user is shown a video of a gesture.	**20**
The user can replay the video at least 3 times.	**20**
Upon clicking the "**PRACTICE**" button, the user can capture his or her own video through the smartphone's front camera for a period of at most five (5) seconds.	**20**
The videos are uploaded to a server.	**20**
Demo Video Criteria	**Points Possible**
A link to the demo video was submitted. (Y/N)	**1**

SmartHome Gesture Control Application Project Part 1 Demo Video Rubric

This part of the project is worth a total of **30 points**. Your Demo video will be scored by your peers. Each video only requires three (3) peer reviews.

Criteria	Meets criteria ("Yes")	Does not meet criteria ("No")
Is the user shown a video of a gesture?	10 pts	0 pts
Can the user learn the gesture?	10 pts	0 pts
Upon clicking the "**PRACTICE**" button, can the user capture his or her own video through the smartphone's front camera for a period of five (5) seconds (at most)?	10 pts	0 pts