

Raspberry Pi Groupwork

During this module you will work in small groups to develop a simple gesture detection system using a Raspberry Pi equipped with a range finding sensor. You are provided with a simple Python program that continuously reads the range finder and prints the distance it is reporting.

Your task as a group is to develop a more complex program as follows:

With the range sensor laid on its back and pointing at the ceiling, the program should monitor the values it reports. This should be reporting something like 200 centimetres, depending on the height of the ceiling and the desk you are using. As soon the value reported has falls less than a threshold of 100 centimetres the program should start recording the values until the value reported goes above 100 centimetres again. The recorded values will need to be added to a list, and once the recording is complete it needs to be interpreted as a movement.

Movements:

- LowPass: sweep your hand across the range finders' beam at about 10cm height.
- HighPass: sweep your hand across the range finders' beam at about 30cm height.
- LowHold: hand held in the beam at a constant height of about 10cm for about one second.
- HighHold: hand held in the beam at a constant height of about 30cm for about one second.
- PullUp: hand enters the beam low down and then raises up to some distance above it (eg 20 cm).
- PushDown: hand enters the beam high up and then pushes down some distance (eg 20 cm).

Version 1

The program should print out the name of the detected movement.

Version 2

The program should store the name of each detected movement in a list.

Version 3

The program should detect specific sequences of movements.

To do this, the program needs to count the time between movements, and once a gap between movements of greater than a given threshold (for example 2 seconds) occurs, it should assume that a *sequence* of movements has been recorded. At this time the list of movements should be examined to see if it matches any particular sequences of movements. If it does, the name of the corresponding command should be printed. If it does not the message "Unknown sequence" should be printed, along with the list of movements to show what it was. The list of movement names should then be cleared, ready to record the next sequence.

Your program should detect all of the following sequences. Note that the first sequences are just single movements, later sequences consist of two or three movements.

Important. Your program should use a **dictionary** to map sequences to command names (the keys of the dictionary would be tuples of strings being the movement names), the values would be the command name. You should iterate through the keys of this dictionary and test the recorded sequence against each one, printing the corresponding value if it matches. This means that it will be

able to detect ANY sequence that is added to the map, without needing any extra code (so this long list of sequences is easy to implement).

Sequence	Command
LowPass	Start
HighPass	Resume
LowHold	Stop
HighHold	Pause
PullUp	Louder
PushDown	Quieter
LowPass, LowPass	Skip forward
HighPass, HighPass	Skip backward
LowPass, LowHold	Power off
HighPass, HighHold	Reset
PullUp, HighPass, LowHold	ActivateAutoMode
PushDown, LowPass, HighHold	DisableAutoMode

Although you are only required to identify the sequence and print out the command name we could imagine these commands to be operating a music or video player, or some other application (albeit with a rather cumbersome control method!).

Coursework Assignment

This group work itself is not assessed, but you must write an individual report on this exercise that is assessed. The details of this report are specified in the actual coursework assignment specification.