

Fall Detection System

By Emily Lukuta

Student No. 20079889

Abstract

A fall detection system is a device designed to help the elderly and disadvantaged individuals. This device will help the individual in the case that they may fall, in order for the individual to be helped on time reducing the time the individual may have been left unattended.

It alerts concerned friends, family or carers of the individual. The detection is due to an accelerometer /gyro sensor to detect a person's movements. The accelerometer sensor gives detection of sudden speed directions in three dimensions and gives signals. The device may be mounted on the individual's person. E.g. Hand

Table of Contents

Introduction	1
Fall Detection Device	1
Raspberry Pi 3 (model B).....	3
SenseHat	4
Wia	5
Code.....	6
Conclusion.....	9

Introduction

The Fall Detection System is a device designed to specially detect the impact of +momentums which are at rest, walking, standing and fall. The system is programmed to alert certain personalised individuals through a tweet.

The device's main intuitive is to send a tweet to concerned close family, friends or guardians of the monitored individual. The device is able to track the movement data of the monitored individual with a gyro-sensor/accelerometer.

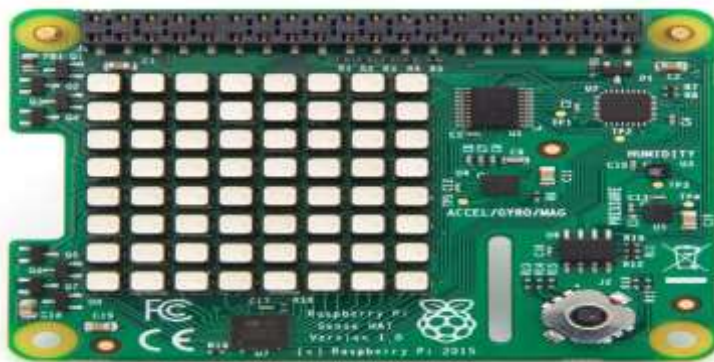
The device will be of great help to the elderly and to those who are most likely to suffer from any kind of fall impact.

Fall Detection device

The fall Detection System is composed of a RaspberryPi and a Sensehat.



Raspberry Pi 3 Model B.



Raspberry Pi Sense HAT.

Sense Hat

The Sense HAT is an add-on electronic board for the Raspberry Pi computer. It contains :

- A gyroscope sensor
- A Accelerometer
- A Magnetometer

- Temperature, Humidity ,barometric Pressure sensor
- A Joystic
- 8*8 LED Matrix

The fall detection System will be based on the accelerometer sensor on the SenseHat.

The Accelerometer detects motion in 3 axial directions X, Y and Z. The Accelerometer will programmed to detect the axial directions during the events of walking, standing and at fall. The main research on the principles of fall detection focuses on the changes in acceleration that occur when a human is falling.

Changes in acceleration that occur when (a) walking downstairs, (b) walking upstairs, (c) sitting down, and (d) standing up from a chair. The fall detector Will be mounted to a belt on the individual's body. The Y-axis (vertical) acceleration is -1 g equilibrium. X-axis (forward) and Z-axis (sideways) accelerations are both 0 g equilibrium.

Wia

This is a lot cloud platform that helps developers build and connect things through the internet.

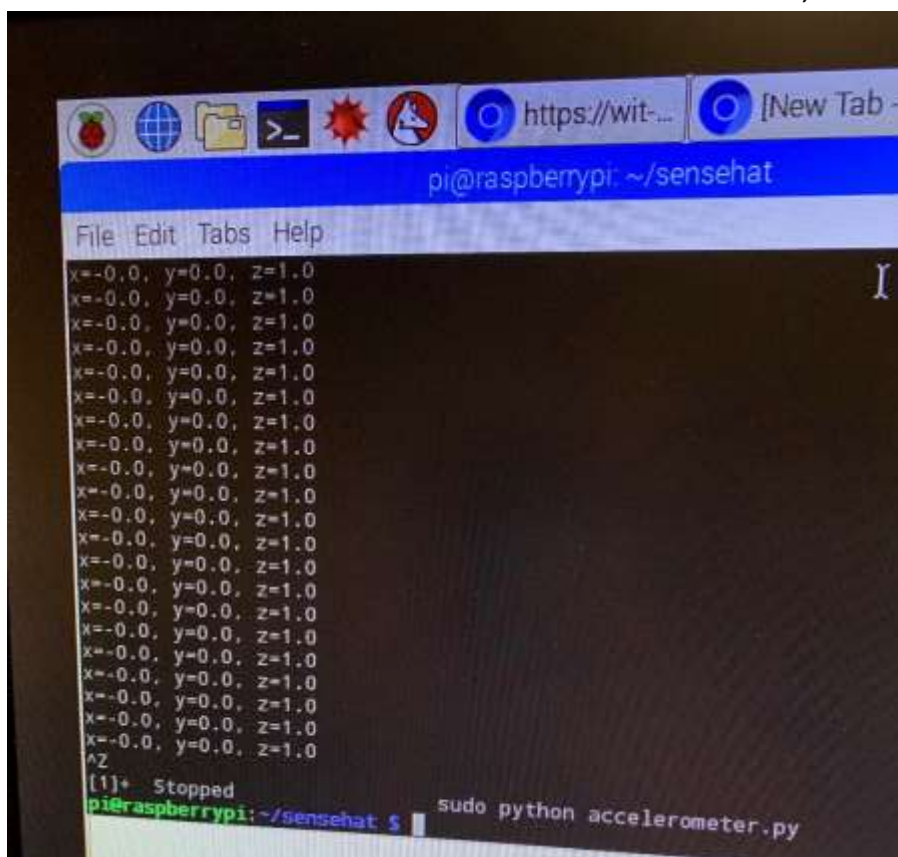
This is the lot Platform in which the data will be stored which will then be exported onto another platform called twilio which will then help send a tweet to a programmed individual.

Code

A screenshot of a code editor window titled 'accelerometer.py'. The editor has a menu bar with 'File', 'Edit', 'Search', 'Options', and 'Help'. The code is as follows:

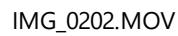
```
from sense_hat import SenseHat
sense = SenseHat()
while True:
    x, y, z = sense.get_accelerometer_raw().values()
    x = round(x, 0)
    y = round(y, 0)
    z = round(z, 0)
    print("x: %d, y: %d, z: %d" % (x, y, z))
```

This is the code I Used to demonstrate and see the X, Y and Z

A photograph of a terminal window on a Raspberry Pi. The terminal shows the command 'sudo python accelerometer.py' being executed. The output consists of multiple lines of 'x=-0.0, y=0.0, z=1.0'. The terminal window has a title bar with icons for a Raspberry Pi, a globe, a folder, a terminal, a red star, and a terminal icon. The address bar shows 'https://wit-...' and '[New Tab -'. The terminal prompt is 'pi@raspberrypi: ~/sensehat'.

```
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
x=-0.0, y=0.0, z=1.0
^Z
[1]+  Stopped
pi@raspberrypi: ~/sensehat $ sudo python accelerometer.py
```

Accelerometer at equilibrium.



The data was then supposed to be imported onto wia.

[illegible]

The screenshot shows a Raspberry Pi desktop with a standard Ubuntu desktop environment. The top panel displays various system icons and the date/time (2014-07-24 12:01:40). The desktop background is a dark blue pattern.

Two terminal windows are open:

- Left Terminal Window:** Displays the following Python code:


```

File Edit Search Options Help
from via import via
import time
import random
import requests
from sense_hat import SenseHat

sense = SenseHat()

via = VIMC()
via.access_token = 'd_rk_yfmpg0kpb0Uckq0h0vY'
while (1):
    x, y, z = sense.get_accelerometer_raw().values()

    x=round(x, 0)
    y=round(y, 0)
    z=round(z, 0)

via.Event.publish(name="Accelerometer Values",data="x=%d"%x())
via.Event.publish(name="Accelerometer Values",data="y=%d"%y())
via.Event.publish(name="Accelerometer Values",data="z=%d"%z())
      
```
- Right Terminal Window:** Displays the output of the code, showing module imports, variable assignments, and a loop that prints and publishes accelerometer data:


```

File Edit Table Help
~/bin/venv/bin/python -u sense_hat.py
import sys
import time
import random
import requests
from sense_hat import SenseHat

sense = SenseHat()

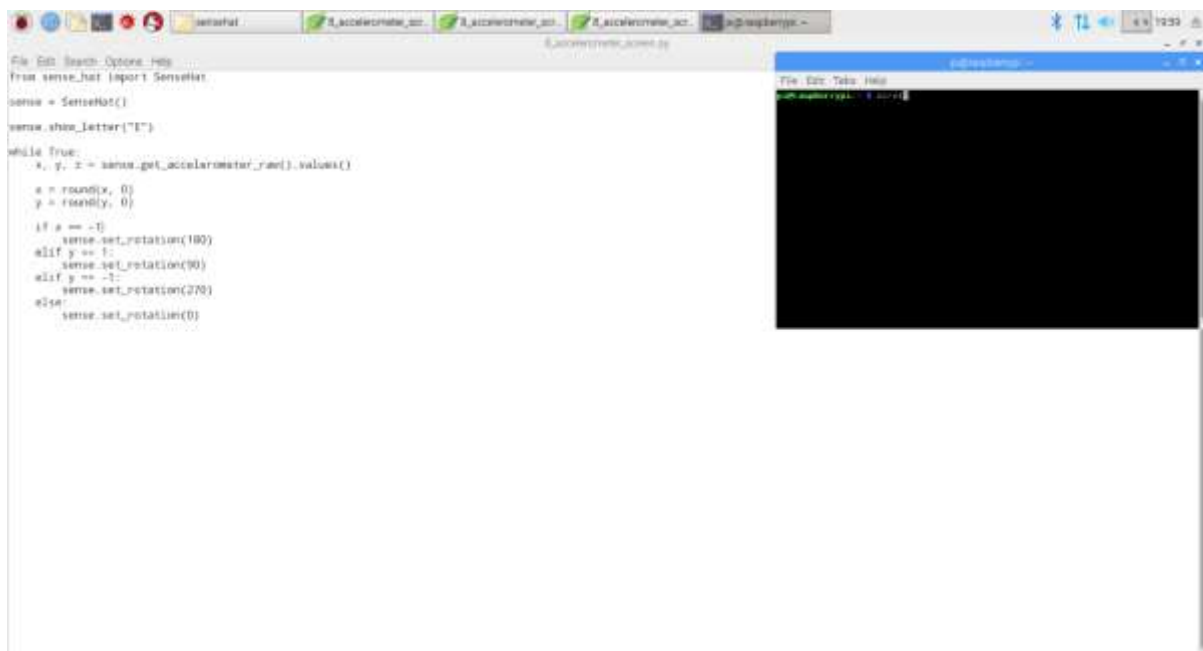
via = VIMC()
via.access_token = 'd_rk_yfmpg0kpb0Uckq0h0vY'
while (1):
    x, y, z = sense.get_accelerometer_raw().values()

    x=round(x, 0)
    y=round(y, 0)
    z=round(z, 0)

    via.Event.publish(name="Accelerometer Values",data="x=%d"%x())
    via.Event.publish(name="Accelerometer Values",data="y=%d"%y())
    via.Event.publish(name="Accelerometer Values",data="z=%d"%z())
      
```

Theres an error , in which inhibits for the data to be sent over to wia .

This then became an alternative option , When the accelerometer value drops beside equilibrium the LED Matrix Will Print A letter E to say that The individual may not be okay.



Conclusion

The fall Detection System Uses an accelerometer from a Sense hat , which has three axial dimensions.

When the axial values are below or above a certain point this may trigger the program to send a message to those concerned about the individual.

The accelerometer readings were a success but getting data from sense hat to the pi was not a success therefore taking the data from Wia to Twilio was not successful. The accelerometer worked well with the RaspberryPi.