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*Software Design with Artificial Intelligence in Cloud Computing*

# Introduction

My goal in this project is to create an electronic dice using Python Language and then running it on Raspberry PI and Sense Hat board (or Sense Hat Emulator). Each side of the dice will contain different country flag image. If the user rolls the same number/country twice, a special effect of a Smiley Emoji will pop up followed by the flag image.

# Specs

The user will be able to roll the dice by using one of the external sensor data (pressing and releasing middle button of Raspberry Pi or hitting Enter button on the keyboard if Trinket Emulator is being used). At the beginning, user is given the instruction to do so, by displaying a “Press Button” message on the Sense Hat screen.

# Design

## Hardware

Raspberry Pi is an extraordinary device, it is known as a single board computer which means exactly what it sounds like: it is a computer just like a desktop but built on a single printed circuit board. Raspberry Pi is very small - roughly about the size of a credit card. Found at the top of the edge of Raspberry Pi’s circuit board and looking like two long rows of metal pins, the GPIO (General - Purpose Input/Output) header is how you can connect hardware like LEDs and switches to Raspberry Pi for control. In my project I made use of GPIO header by connecting Sense Hat to my Raspberry Pi. This enabled me to display images on the Sense Hat screen and make use of its sensors.

Sense HAT is an add-on board to Raspberry Pi that can be connected using the GPIO header mentioned earlier. It is made of 8x8 RBG LED matrix, six different sensors as well as a mini joystick. Some of the sensors it includes, but is not limited to, are accelerometer and temperature.

To further develop and test my application outside of college hours, I have used Trinket. Trinket is a page where you can write and run code in any browser on any device. Trinket introduced Sense Hat Emulator which I took advantage of to test my code changes when I did not have access to Raspberry Pi device.

Diagram

Description automatically generated

## Software

Python is a scripting high-level programming language. Python supports libraries and packages, which encourages program flexibility and code reuse. To be able to control the Sense Hat add-on board I used a Python library called sense\_hat. This API allowed me to control RGB LED matrix and read the inputs from the mini joystick.

# Build

## Hardware/Software

At the beginning of my Python program, I have imported all necessary libraries (sense\_hat, random, time) and created an instance of SenseHat object. Afterwards I created seven tuples to represent different RBG colours needed for my images that I will display on the matrix. Once I had my lists done (six flags and one special effect) I proceeded to methods that are needed to roll the dice.

I implemented an infinite loop that waits for the user to press the button to roll the dice. If the user presses the joystick (or keyboard arrows) in any other direction than middle (or enter) it will print message with instruction.

Text

Description automatically generated

I created a dictionary called “flags” that contained key:value pairs representing country name as a key and a picture of a flag as a value. I needed it to then print what country user has rolled by creating a method to retrieve the key from dictionary based on passed value.

Text

Description automatically generated

Once the user presses the button, the screen will flash twice with all flags. I achieved this by declaring flash\_screen method that uses nested for-loops to go through all my flags and display them on the screen. I used random.choice method to select a random value (flag) from my dictionary every time I would roll dice (press button). I keep track of last rolled flag to check whether the same flag has been rolled twice in a row (or more). Once the random choice has been made, I am printing the rolled country name to user along with its picture on the SenseHat screen. If the randomly chosen flag is the same as the one rolled last time, special effect of a smiley face will show up for one second before displaying the flag.

Text

Description automatically generated

Graphical user interface, text, application

Description automatically generated

# Test

Firstly, I have pressed arrow-up button to see if user will be prompt with correct message and to make sure my dice will not be rolled. Once that was tested, I hit “Enter” few times until same flag was drawn twice. My bonus effect was displayed on the SenseHat screen and correct message was printed to the console. Then, once again I hit “Enter” to make sure my code runs as it is supposed to.

Graphical user interface, text, application, chat or text message

Description automatically generated

# Conclusion

Making this project was very challenging as I have never used Raspberry Pi in the past, nor I was writing codes to control other devices. Creating the lists and then putting them into dictionary let me achieve what I wanted to display in output. The most challenging part was bonus-effect. At the start, I wanted to create an effect of flashing screen in pink and purple colours but instead I was getting it every time I would roll the dice. As an add-on, I decided to make use of it before the image is displayed by flashing the screen with all – six – possible flags I created. With some help of Raspberry Pi Guidebook, I made the special effect (smiley face) to show up only once the same country is rolled twice. Python is an amazing programming language that I am hoping to keep expanding my knowledge in. It is extremely strict for indentation, which I learnt the hard way while making this project.