MINI PROJECT Report on

API Embedded and AI Driven Autonomous Task Manager

Submitted in partial fulfillment of the requirements
of the degree of

BACHELOR OF ENGINEERING

in

INFORMATION TECHNOLOGY

by

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CERTIFICATE

This is to certify that the MINI PROJECT entitled **"API Embedded and AI Driven Autonomous Task Manager"** is a bonafide work of

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Examiners

1.----------

2.----------

Date:
Place:

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Date:

Acknowledgement

It is our pleasure to present this project on API Embedded and AI Driven Autonomous Task Manager.

First of all, we would like to thank Prof. Dr. G. T Thampi , the principal of Thadomal Shahani Engineering College, Bandra. We express deep gratitude and sincere thanks to the Head of the Department and our project guide. Dr. G. T. Thampi for his encouragement and support throughout the project, also the honest feedback and constructive criticism provided helped a lot to improve and eliminate flaws.

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We hope our work will have a significant impact and make people's lives easier.

Thank you.

Tanvi Navani (87)

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1. INTRODUCTION

API Embedded System and AI driven Autonomous Task Manager are a brand new addition to the IoT product family that has been obtaining a great deal of attention in recent years by each industrial makers and hobbyists. This project describes the planning associated implementation of a voice controlled wall mirror, referred to as “Magic Mirror” with Artificial Intelligence for the home environment [1]. It is a mirror, which can display real time content like time, date, weather and news at the same time. These Task Managers consists of functionalities like real time information and data updates, voice commands, and face recognition. The user can control the magic mirror by voice commands.

These Task Managers are straight from science fiction. They’re part of an optimistic vision of the future that imagines a world where screens and data are everywhere, ready to feed you whatever information you need at a moment’s notice. Basically, the mirror looks like a normal mirror but when someone stands in front of it the scene changes. The mirror provides a functional, user friendly and interactive UI to its user for current weather conditions, Time, Events, Latest News Headlines. These Task Managers would help in developing smart houses with embedded artificial intelligence, as well as finding its applications in industries. Switching home appliances becomes easy with mirror. Virtual dressings, a smart way of having trials with your fashion sense make things quite easy in malls. Having such intellectual mirror will only surge the beauty of home. The raspberry pi is programmed using python and connects to a monitor with inbuilt speaker so as to provide an onscreen interface and voice assistance as well.

1.1 Problem Statement and Proposed Solution

The world we live in today has become a place of the fiercest competition, whether it is in sports, entertainment, or the job market. In order to be the best, one needs to allocate an extraordinary amount of time to their goals with little distraction. However, the advent of information technology tends to act like a dual-edged sword when it comes to work productivity; sometimes one can use the ease of information to help them complete a task, but it can also provide significant distraction. Ultimately one strives to be their best, but the interruption of keeping up with the daily news, or preparing for incoming weather can hinder one’s progress. Taking time throughout the day for these various activities can be extremely distracting and greatly cut into performance. Along with information, people greatly value their appearance, spending approximately an hour a day in front of the mirror during their morning and night routines. This is a significant amount of time where important things are taking place, but the mind is not working. It would be extremely useful to spend that time on the phone or computer completing any of the tasks mentioned above, but unfortunately it is difficult to do so while preparing for the day. A product is needed that can allow a person to

efficiently complete everything they need to do to prepare for the day, all in one place and at the same time.

The goal of these Task Managers is to provide a single easy to access location for a person to receive all the information that could affect how they prepare for the day. Through the use of LCD displays and a two way mirror, weather, time and date, and news are available at a glance. Additionally, a user friendly interface, accessible from any WiFi enabled device, allows the user to easily setup the connection to their home WiFi, change the location from which they receive the weather, and select a source from which to receive the day's headlines. By building these features into a task manager, which most people will already be using in their morning routine, it is possible to present this information in such a way that it will seamlessly blend together with the task of morning grooming.

2. LITERATURE REVIEW

While implementing a smart mirror, the first question which arrives is “What is the need of these Task Managers?” In the recent years technology has become an integral part in day to day lives. Technology has been incorporated in many electronic devices. But the motive of designing a ‘API Embedded and AI driven Autonomous Task Manager’ is to bring technology in a traditional household mirror and making it smart. This brought in a new definition of an API Embedded and AI driven Autonomous Task Manager: “an API Embedded and AI driven Autonomous Task Manager is a mirror with additional features and functions, with the aim of introducing capabilities for human interaction”. There was always a need of designing a device which would help in planning for a day’s activities by doing other household activities. A mirror is one such place where we visit often and thus can get basic details such as time, daily news and events, etc.

M. M. Yusri et al. created Smart Mirror system which allows users to access information and also control the lights in the house. Relevant information can be traced such as time and date, weather, warning, traffic, and location map. The system applies Sonus technology as a medium of interaction between people and systems. So, users need to provide instructions to the system orally to acquire the system's response. Sonus is a speech to text library that can quickly and easily add a VUI (Voice User Interface) to any hardware or software project. With this Smart Mirror system, users can manage their daily activities at ease as well as solving many problems in managing some house chores.

Vaibhav Khanna, Vash Vardhan, Dhruv Nair and Preeti Pannu proposed the interactive mirror with proper embedded intelligence for offering enhanced features such as weather of the city, latest updates of news and headlines and local time corresponding to the location. The Smart Mirror would help in developing smart houses with embedded artificial intelligence, as well as finding its applications in industries. Ambient Artificial Intelligence (AmI) is technology used in proposed smart mirror.

O. Gomez-Carmona and D. represent the design and implementation of a multi-user smart mirror system conceived to promote wellness and healthier lifestyles in the work environment through persuasive strategies. The interactive mirror recognizes different users through their personal corporate ID card, which allows them to have access to their personalized user-interface. The smart mirror provides workplace's indoor environmental conditions (thermal, humidity and light); personal physical exercise data obtained from wearable devices and general purpose information (e.g. weather and daily news). Additionally, motivational advice related to physical performance is supplied through request by applying speech-based recognition techniques [2].

Chidambaram Sethukkarasi et al. (2016) created an intelligent mirror which identifies the user using facial recognition technique and provides services such as recognizing emotions, progress representation of measured health parameters, height identification, identify

garments, suggest garments with suitable colour, and reminds important events. Their paper does not go in-depth on any of its subjects, but rather try to unite the ideas under the concept of an intelligent mirror.

At the 2014 International Consumer Electronics Show (CES) Toshiba showcased their smart mirror concept. Toshiba showcased their smart mirror in different home environments. Their idea was that the smart mirror would be customized for the purpose it would serve in each room. The bathroom smart mirror would show information such as weather forecast and a personal fitness monitor. Technique used: It utilized gesture control as an input method [3].

2.1 Internet of Things (IoT):

The concept of these Task Managers revolves around the development of Internet of Things (IoT). IOT is a network of physical devices, having electronic or software functions connected together to exchange data. The main aim of IoT is to create a virtual path for connecting all the devices connected to it. It provides a way of communication between people and things and between the objects itself. Home automated Task Managers is another domain which has IoT applications. Though applications of IoT are diverse, but this helps in using IoT for making life easier. The mirror has the ability to display date and time, news updates, weather conditions, to-do lists, reminders, traffic conditions, etc. With the help of IoT, a mirror can be upgraded to perform as browsers. We can get access to news or even watch YouTube videos. The machine required for computing is a raspberry pi which does not require large space.

3. Operation and Design of On/Off Subsystem

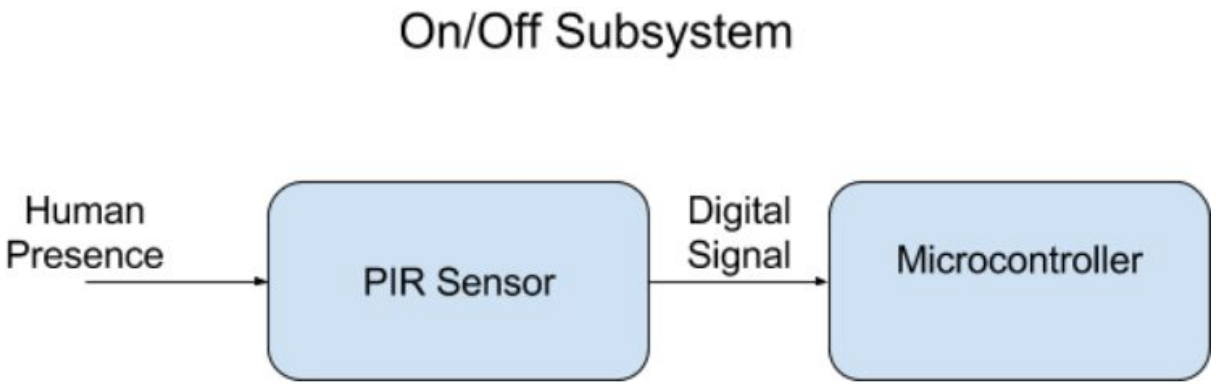

Figure 3.1: Flow Diagram of On/Off Subsystem

This system overall deals with determining whether or not there is a person in front of the mirror or not. As of right now the group plans to use HC-SR501 PIR Motion Detector to detect a human movement. We chose the PIR Motion Detector over other options such as a photocell because of a PIR Motion Detector is not too aesthetically displeasing, while triggering a high or a low voltage rather than current. We plan to interface the PIR Motion Detector with the Arduino Uno but could be interfaced with an ESP microcontroller. All of these choices would suffice as they are examples in the Arduino IDE to help us get through any potential roadblocks along the way.

Moving forward with this system we will need to consider how to effectively put a current-draining resistor on the mirror in order to get rid of static voltages. We also need to consider the time-delay and sensitivity adjustments as seen on top of the figure below that are available with this PIR Motion Detector as well as a repeat or single trigger option that is in the red box in order to provide the most pleasant user experience.

So far we have tested the PIR sensor in the Arduino IDE by digitally reading the voltage level from the middle prong at the bottom of figure below and outputting whether there is motion detected accordingly. After seeing that the voltage level changed based off if one's hands had passed the capacitors on the PIR Motion Detector or not, we concluded that the PIR Motion Detector works.

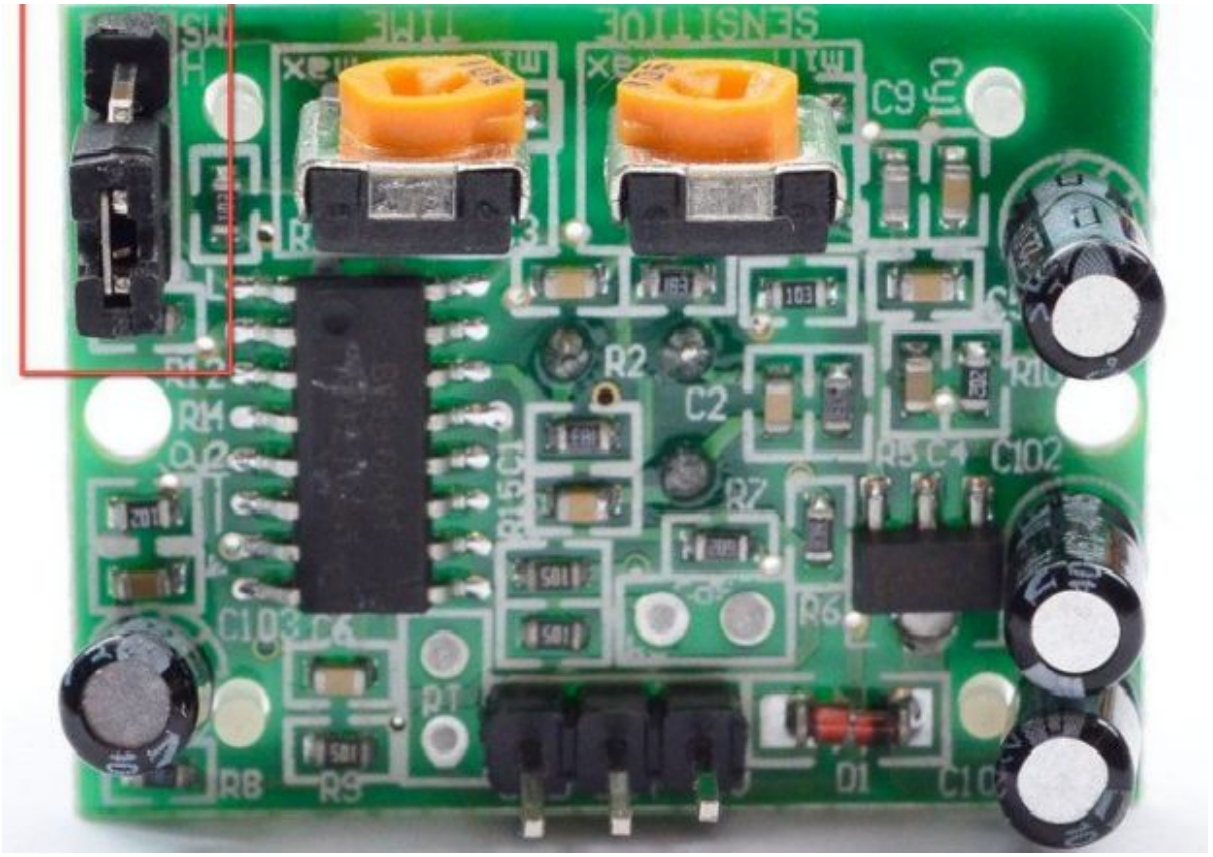

Figure 3.1.1: PIR Motion Detector

3.2 Internet Subsystem

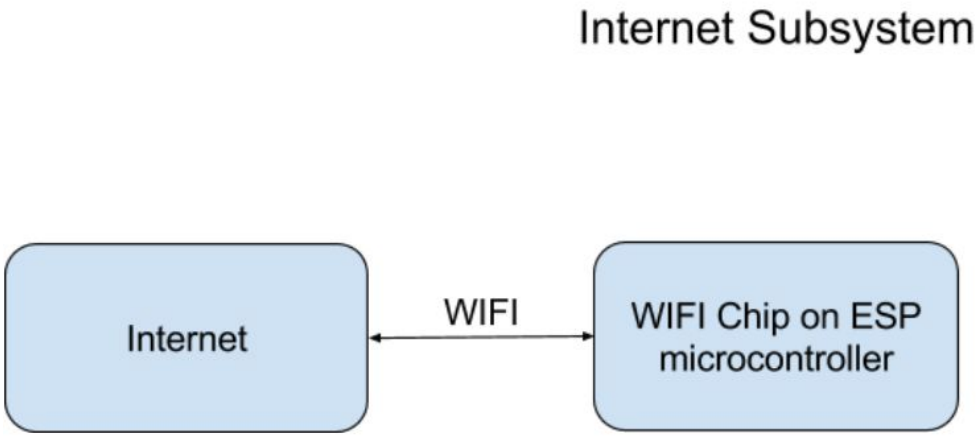

Figure 3.2.1: Flow Diagram of Internet Subsystem

The internet subsystem deals with being able to retrieve information such as weather, time, news or any other applicable information from the internet to be displayed on the mirror. An

ESP microcontroller or similar device will be the device pulling the data over a WiFi signal and communicate via I2C/SPI to the LCDs on the mirror.
Our choice for considering both of these device is because of their ability to connect to the internet while still have the capability of communicating with I2C/SPI to the mirror. We choose to use the Arduino IDE for this subsystem, as it is flexible in ways to retrieve information with either using get http functions or parsing with JavaScript. For instance in order to retrieve the time, we are able to connect to a Network Time Protocol that would give us the Greenwich Mean Time, and would translate from the time accordingly based on the user's location.
We also wanted to retrieve the local weather data, so we decided to use API for any location that is based off the user's inputted zip code. API provides a webpage of the data relevant to the user's needs including the location, time, and weather in JavaScript. Arduino allows us to use the "ArduinoJson.h" library that allows one to easily parse data from character arrays using JavaScript. Although ideally we plan for the zip code to be read from the user's setting on a website, to test the subsystem we hard coded the zip code to be one of South Bend's zip codes 46617. An illustration of the software program for this
Subsystem, Pull_Data.no, can be seen in the Figure below.

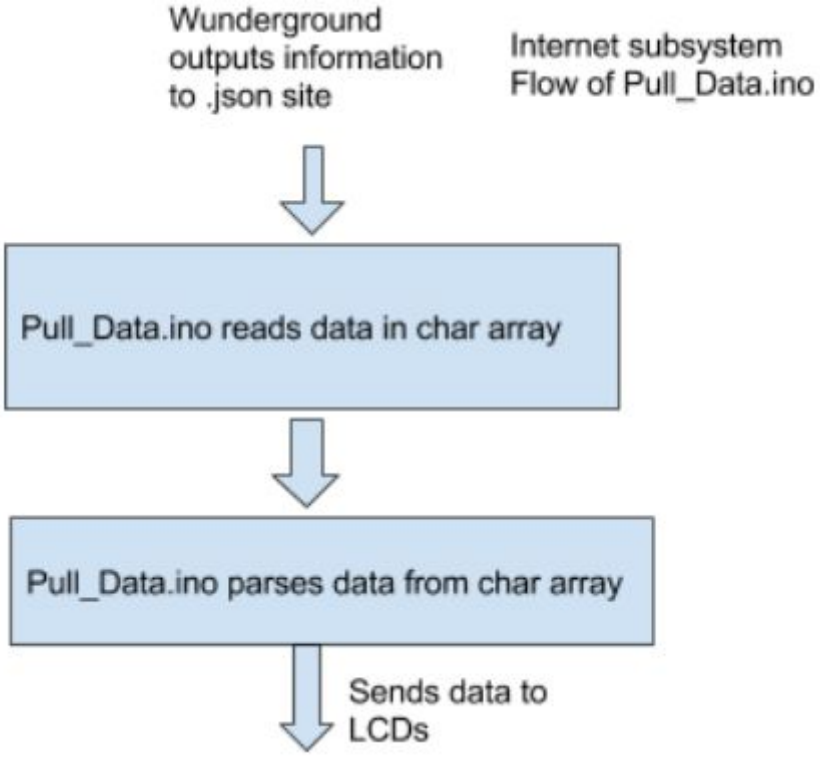

Figure 3.2.2: Flow Diagram of Software for Internet Subsystem

3.3 User Interface

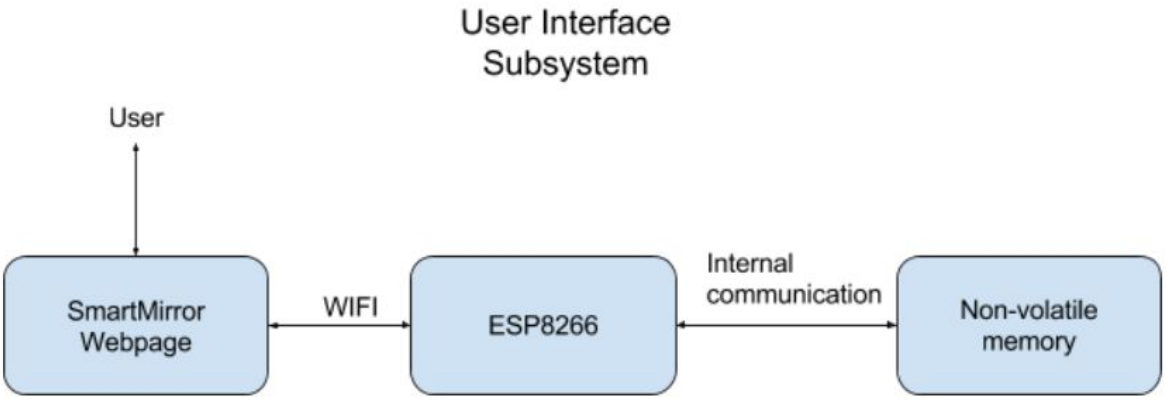

Figure 3.3.1: Flow Diagram of User Interface Subsystem

The user interface subsystem allows the user to update the settings of these Task Managers to connect to their home wifi and display data relevant to their geographical location. The ESP microcontroller must be configured to run as an access point server upon initial boot up as well as when the user desires to edit the settings of the mirror, as well as store the settings in the non-volatile memory of the chip. The ESP microcontroller was chosen due to its ability to be configured as an access point as well as its ability to connect to the WiFi. The user is required to enter the ssid and password to allow the chip to connect with the WiFi as well as the user's zip code. The zip code was chosen as a parameter as it will allow for the weather and time for the user's location to be pulled by the internet subsystem and reduces the risk for the incorrect location to be input. The system is set to act as an access point upon powering the board on. After being powered on, it will check to see if there are valid credentials to connect to WiFi. If there are, then the chip will move on to the main function, if not, it will create an access point to input WiFi credentials. This was chosen as the mirror will be stationary and thus the information should remain the same after the initial boot up. If the location changes, the chip will not be able to connect to the network and will generate an access point to adjust the settings. The ESP8266 was programmed using the Arduino IDE and utilizing the "ESP8266WiFi.h", "ESP8266WebServer.h", and "EEPROM.h" libraries. These were chosen as they are well documented and allow for custom html form data to be added. This enabled the for textboxes and dropdown menus to be added to allow the zip code, SSID, password, and additional information to be input. When access point mode is initiated, a WiFi hotspot starting with "ESP" should become available. When prompted for a password, it is necessary to input the password "password" to connect to access point. Once logged on, the user interface will be available at the chips default IP address of 192.168.4.1. After entering data into the interface, the data will be saved as a string and then written into

EEPROM. Additionally, these allow for a pleasant and user friendly interface to be accessed at the default ip of the chip, as shown below.

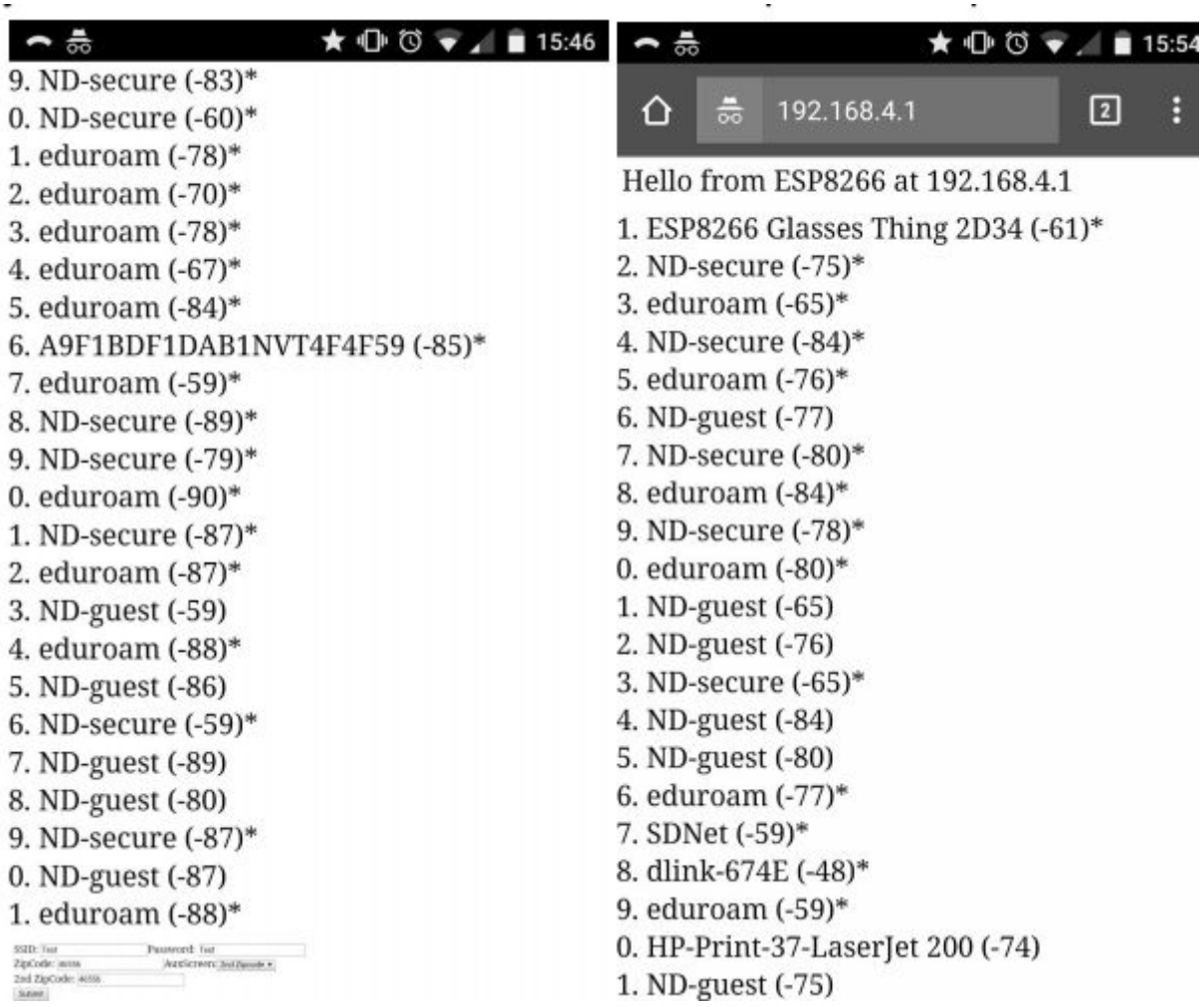

Figure 3.3.2: User Interface Web page

To test the system, the code was uploaded to the chip and the web page was accessed from a mobile device. After the data was input, as the data was being input into EEPROM, what was being written into EEPROM was printed to the monitor. The chip was then powered off and then powered back on and the string was read out of EEPROM. To ensure the correct data was saved, the strings from EEPROM were printed to the monitor.

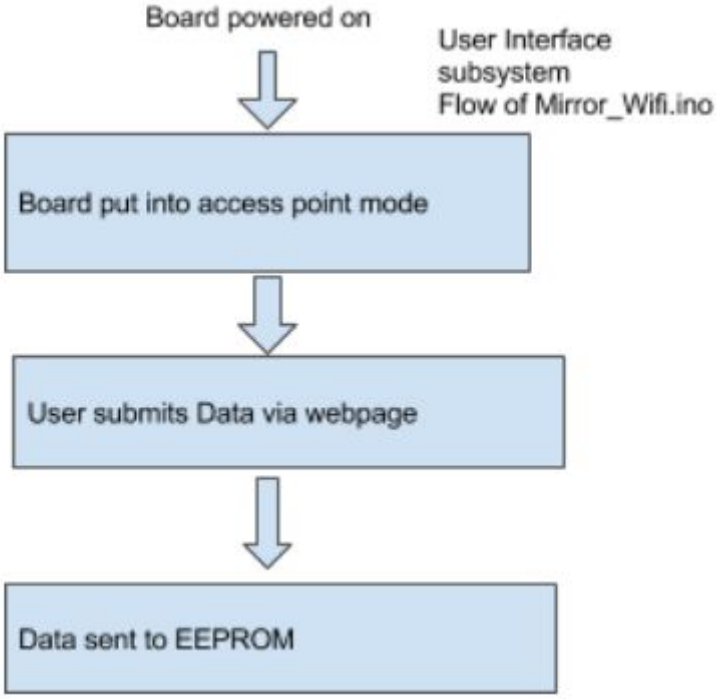

Figure3.3.3: Flow Diagram of Software for User Interface

3.4 Subsystem and Display Subsystem:

This subsystem takes information retrieved by the Internet Subsystem, creates the appropriate textual outputs, and sends the desired information via SPI to each of the LCD screens. The settings used to organize the display of data will be based on the user's last input to the user interface subsystem. The system will continually exchange data with the internet subsystem to update the displays regularly. The displays will be controlled from the ESP microcontroller. Connection with the display hardware will be done with the ST7735 library and ILI9341 library for the 1.8" and 2.8" displays respectively, and graphics functionality will be achieved with the Adafruit GFX library. All three libraries have been modified to reduce the memory requirements of the microcontroller, as many of the functions included are not used. Each display has five wires running to it: power, ground, chip select, MOSI, and clock. The only unique wire for each is the chip select, all others are shared. The microcontroller sets which board will be communicated with via the chip select pin [4]. Diagrams of the subsystem connections and display subsystem are included below.

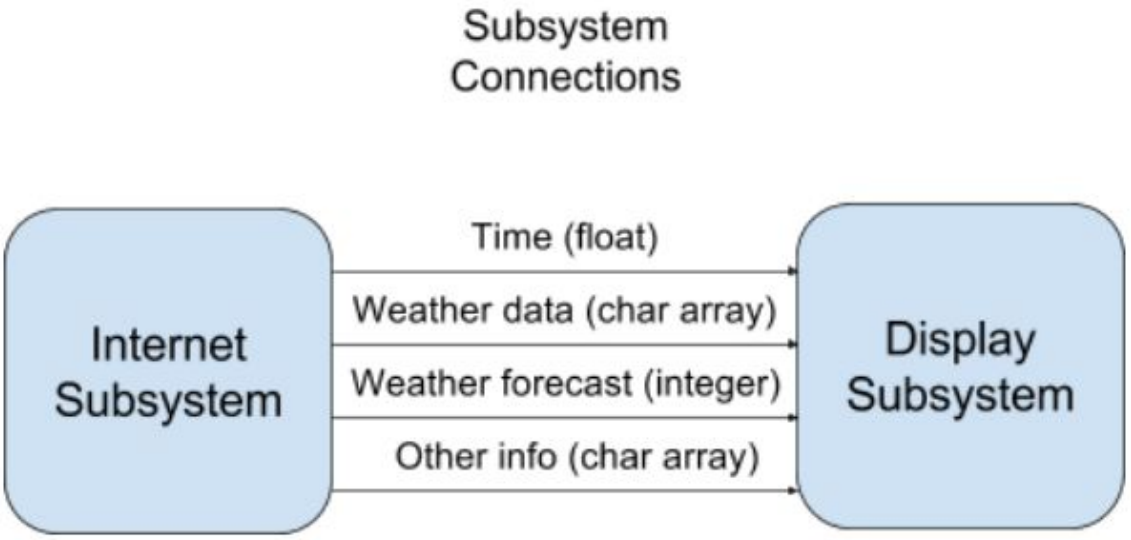

Figure 3.4.1 Subsystem Connections

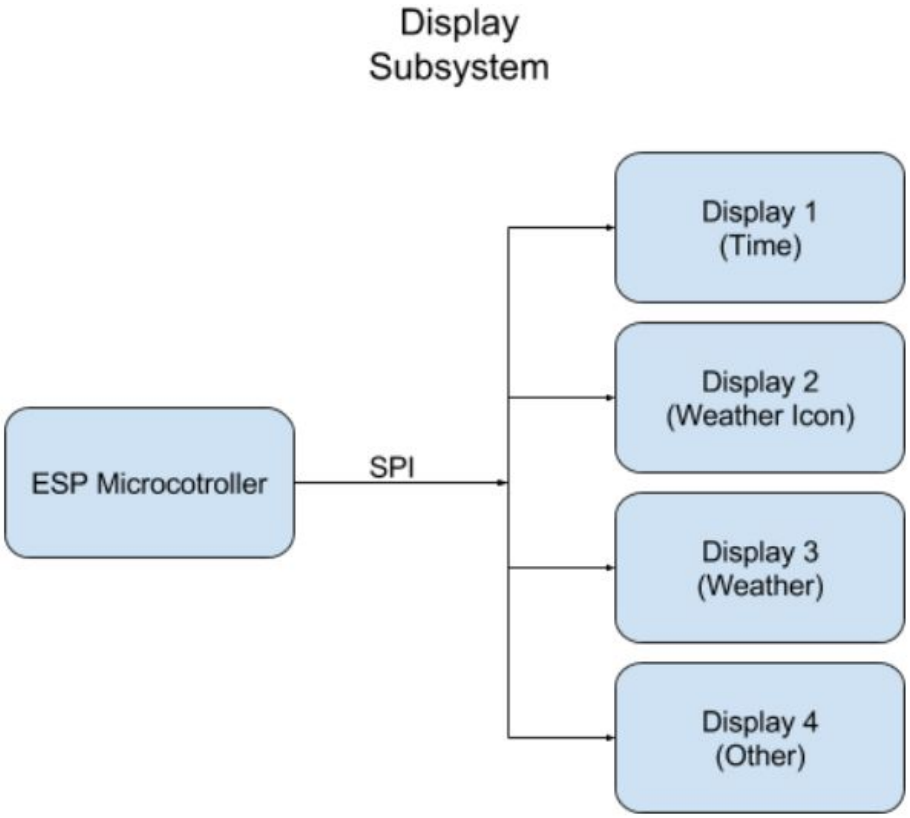

Figure 3.4.2 Display Subsystem

4. SYSTEM TRAINING

The implementation of IoT involves training through making an account on forecast.io and the forecast API under developers and if you register Create an account, it will display an API token which is just a string value and so once you get that, you can come back to your smartmirror.py and then replace this token here with your API token. Once you've done that, you can just hit, uh, escape and then capital ZZ to save. Okay, now you can go back to my console and we'll need to do one more thing before we start this , we need to install one more thing and is python-imaging tk So you can install that with sudo apt-get install python-imaging.tk and after I run this, I can run python smartmirror.py And depending on how slow your network connection is it might take a few seconds to start up Okay, so now it's loaded and if I click on the window and press enter, it goes full screen and we have our very own smart mirror set up!

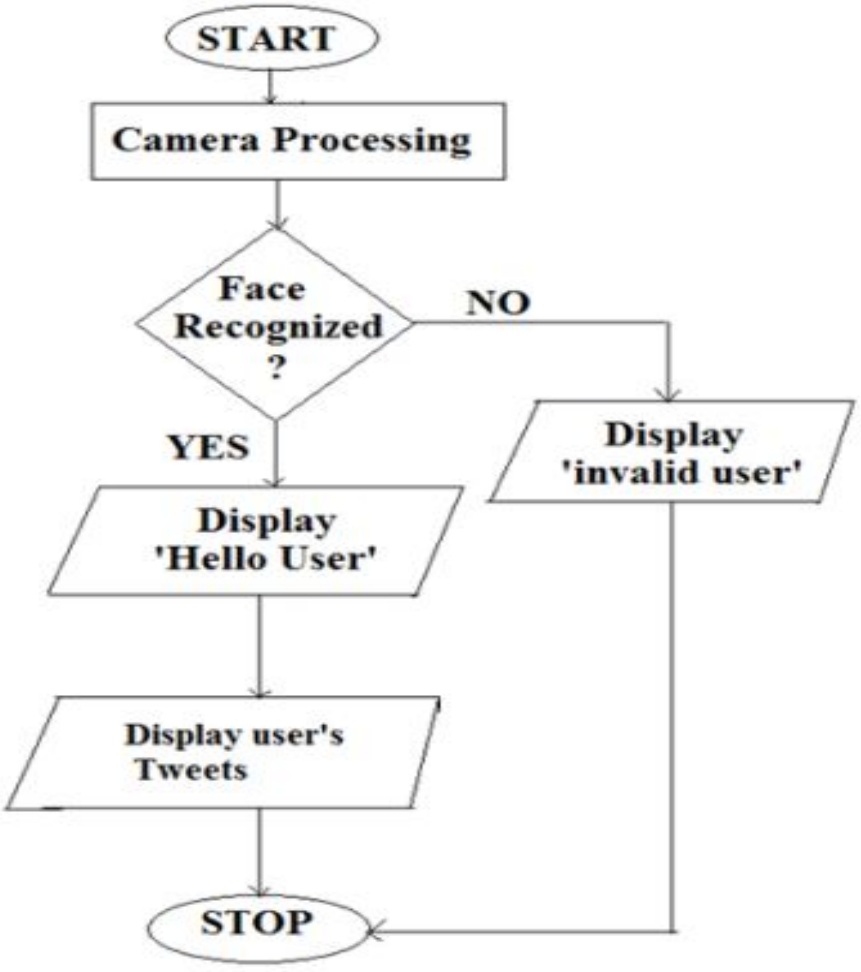

Figure 4.1: Facial Recognition

The implementation of A.I technology involves facial-recognition model which is used for detecting faces so when we have our webcam hooked up this is basically just a bunch of data

points that help the computer vision code which determines if there's a face in the image. We'll use that for our facial recognition module where there's also a wit training data zip. Wit AI is what we are using for natural language understanding and we use it for our smart mirror because it's very useful and easy to work with. So what we are going to want to do is use this training data to set up a new app. So we've already had a few apps up here but you will need to create an account with Wit AI and then setup your own app so that you can get an API key and then use that with your application. Hence when you come to wit and after making an account you'll see the plus button up here for a new app [5].

5. CONCLUSION AND FUTURE WORK

With the help of this literature survey we aim at designing this Task Manager that provides an ambient environment between users and the internet. It will help the users in their daily activities. The smart mirror can also be implemented in various industrial and home applications. Hence IoT proves out to be an important technology for making household appliances smart. The facial recognition technology used in the smart mirror proves out to be an important means of security. Smart mirrors can be connected to home appliances and smart phones. The mirrors can detect face and provide access to personalized services. The mirror can also be implemented to recognize emotions. With the help of emerging technologies, smart mirrors can be advanced to touch screen modes. The mirror can be better enhanced to be deployed in beauty parlours, cloth shops, hotels, etc. With better advancements in technology, mirrors can be used in many other fields.

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