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IoT and Raspberry Pi based Smart Mirror

Kajal Panda[1], Prof. Pradnya Mhatre[2]

Department of Computer Application, Viva School of MCA, VIRAR

Abstract - *This paper demonstrates the working of a smart mirror and how it can be used to make our life more interesting and easier. Smart mirrors are the future mirrors where we would be able to see current date and time, current temperature and outside weather conditions, traffic, reminders, to-do-list, news and many such informations displayed on the mirror itself just while looking and grooming in front of mirror. This can be implemented by using raspberry pi board, IOT circuit, sensors and chips. Here raspberry pi board will act as the interface between user and the entire architecture and raspberry pi board would be connected to internet using IOT circuit for fetching the details from internet through wifi and displaying it on mirror. The entire logic behind this would be coded on the chip using python programming language. As the mirror is transparent so we would also use a specialized glass with a back frame which would be fitted at the back of the mirror so that the data would be visible properly with the desired effect. Thus in this way we can demonstrate a smart mirror and live a smarter life.*

Keywords – back frame, chips, glass, internet, iot, raspberry pi, sensors, smart mirror.

I. INTRODUCTION

In today's world everyone of us needs a comfort life i.e we want everything to be done very easily and fast and thus we use technology in every sector whether household or industrial purpose to get our work done easily. Everyone of us wants to be connected all the time and access information easily whether it is through newspapers, television, internet or any other source. We want to always stay tuned with all the current affairs happening around the world. Internet of Things (IOT) makes this interconnection possible. Using IOT we can do all those tasks which seems like a dream. IOT allows the smart devices to interact with each other in same way as humans interact. There are many such smart devices made using IOT and other such technologies, one of them is smart mirror. Smart mirrors are the future mirrors where we would be able to see current date and time, current temperature and outside weather conditions, traffic, reminders, to-do-list, news and many such informations displayed on the mirror itself just while looking and grooming in front of mirror.

In 2012, smart mirror based on android was invented in japan science and technology exhibition. This smart mirror was able to display all the details on mirror itself and also perceive user gestures. So that was basically from where the smart mirrors originated. Then in august 2017, new york, united states developed smart mirror eve with a fully customizable user interface screen. Although research on smart mirrors has been going on, the penetration rate of smart mirrors is not high. The main problem is high cost, insufficient pertinence of functions and poor integration of smart mirror with the overall smart home. In order to solve this problem smart mirror based on IOT and raspberry pi was made. This mirror makes it possible to fetch all the details from the internet with the help of IOT and display it in mirror. However raspberry pi board will be the main interface between the user and the entire architecture.

The structure is organized as follows. Section 2 describes the overall framework, hardware and software used, the overall architecture, block diagram, flow chart. Section 3 describes various methodologies that can be used for developing smart mirror that can be used for providing security. Section 4 describes various test cases to perform system testing. Finally Section 5 would concludes the overall research and summarizes the advantages of smart mirror and further work.

II. OVERALL FRAMEWORK AND SYSTEM IMPLEMENTATION

This paper demonstrates the working of a smart mirror which would allow us to see current date and time, current temperature and outside weather conditions, traffic, reminders, to-do-list, news and many such informations displayed on the mirror itself just while looking and grooming in front of mirror. For implementing such type of mirror we require unidirectional mirror, back infrared frame, display screen, raspberry pi board, IOT circuit, driver board, power supply, sensors, chip which would be

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programmed using python programming language, dropbox etc. Apart from this we can interface camera, speaker, mircophone with the raspberry pi board for implementing security. So let just list down the hardwares and softwares required for implementing a smart mirror.

2.1 Hardware required

- Unidirectional mirror
- Infrared frame
- Display screen
- Raspberry Pi board
- IOT circuit
- Sensors for example: for getting temperature based data we need temperature sensor
- Driver board
- Chip
- Power supply
- Wifi
- Camera
- Speaker
- Microphone

2.2 2.2 Software required

- Raspbian Jessie
- IOTGecko
- Python 3 Compiler
- Programming language: Python
- Dropbox

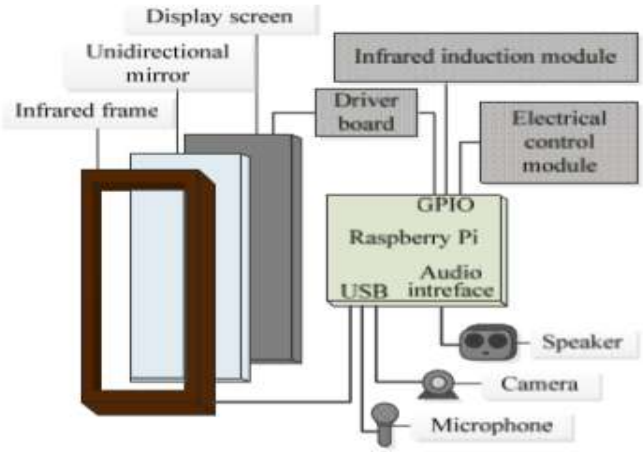

Fig. 1. Hardware Configuration diagram

Here raspberry pi board will act as the main interface between user and the entire architecture and raspberry pi board would be connected to internet using IOT circuit for fetching the details from internet through wifi and displaying it on mirror. The entire logic behind this would be coded on the chip using python programming language and that chip would be inserted inside raspberry pi board which would instruct the raspberry pi board to fetch the data from internet using IOT circuit and display it on the mirror. Here we can make use of various API available on google like for example weather cloud API for fetching weather details. As the mirror is transparent so we would also use a specialized glass with a infrared back frame which would be fitted at the back of the mirror so that the data would be visible properly with the desired effect. For details to be displayed on mirror we

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would attach the display screen on front of the mirror. For fetching temperature based data temperature sensors can be used which would be interfaced with raspberry pi board and thus the temperature will be displayed on mirror. We would integrate the mirror with the raspberry pi using driver board. That driver board would be integrated inside the GPIO port of Raspberry pi. Similarly the infrared frame would be inserted inside the USB port. The microphones, camera would be also connected to the USB port. The speaker connection would be given to the audio interface [1].

The diagram given below shows the entire smart mirror architecture and the flow of modules [3].

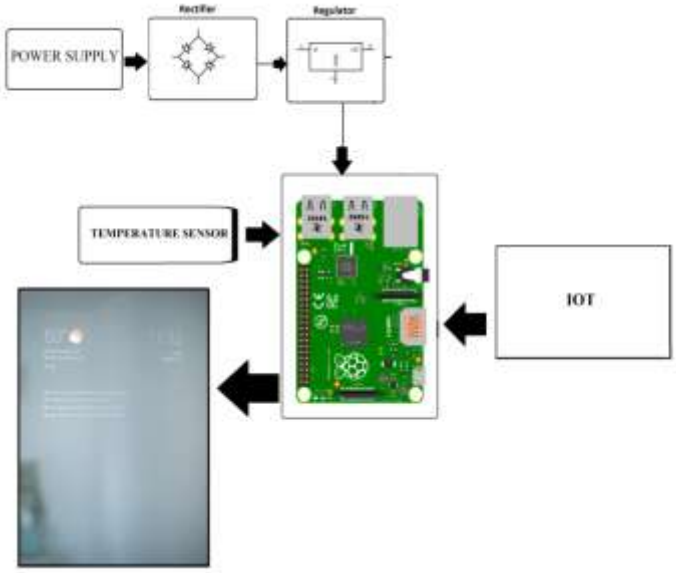

Fig. 2. Block Diagram

Once the smart mirror is implemented users can pass an instruction to see the list of available commands. They can then give the voice commands via microphone for the mirror to perform the instructions [2].

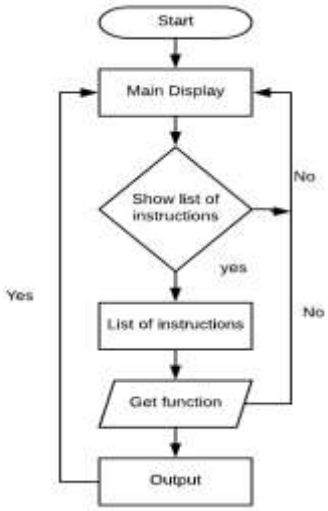

Fig. 3. Flow chart of smart mirror

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III. METHODOLOGY

3.1 Smart Mirror as Mirror

We can see our view in this mirror just like we see in normal mirror with some enhanced effects and filtering. So basically here it recognizes our face and applies filtering accordingly just like we apply filters to our photos in smart phones [4].

3.2 Smart Mirror as Information System

This is where the details to be displayed on the mirror are fetched from the internet using IOTGecko software which connects our system to the internet and thus gets news feed from predefined URL's. We can also get details from various API available free on internet. Example: weather cloud API. We can get the temperature and humidity details from temperature sensors like DHT22. These sensors would be connected to the GPIO pin of Raspberry pi using jumpers [4].

3.3 Smart Mirror as security system

When we are alone or there is no body in room so in that case we can switch the system into VNC viewer which would detect the presence of any human being entering the room. Here we would require PIR sensor. Whenever any human being enters the room the PIR sensor will detect the movement of the person passing by the mirror and captures the image of that person and save it in dropbox. It would then inform the owner by sending the update and captured image. In this way security can be implemented using smart mirror [4].

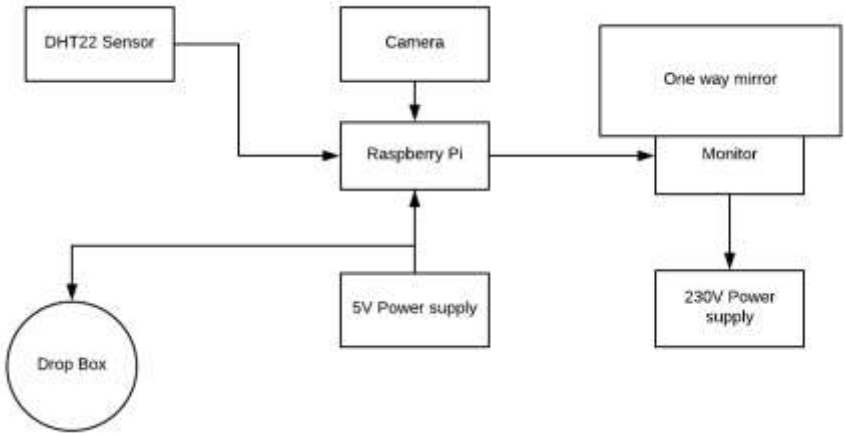

Fig. 4. Block diagram

3.4 Algorithm for Information System

- Step1. Switch on the power supply
- Step2. Fetch the details from respective URL
- Step3. Write down the code using python programming language and deploy it inside the chip. In the code section write down all the compliments you want to display on the mirror.
- Step4. Integrate that chip in the USB pin of Raspberry pi.
- Step5. Display the details on mirror via display screen.
- Step6. Switch to thief detection mode via VNC viewer.
- Step7. Switch off the power supply when it is of no use.

3.5 Algorithm for Thief Detection

- Step1. Start
- Step2. Set up the camera
- Step3. Check whether PIR Sensor output is high or low.

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- Step4. If low go back to step 3.
- Step4. If it is high that means camera is turned on.
- Step5. Whenever any person passes by the mirror PIR sensor detects that movement and captures the image and stores on Raspberry Pi.
- Step6. Connects to wifi and uploads the captured image in dropbox.
- Step7. Notification is updated from the dropbox to the owner.

IV. SYSTEM TESTING

Once the smart mirror is implemented the following testcases can be performed [2].

Table. 1.
Test Cases

TEST CASE	STEPS TO BE CONDUCTED	EXPECTED RESULT
Running the system	• Running smart mirror	Success
Configure PI	• Rotate monitor • Disable screen saver and remove panel • Hide the mouse during inactive mode.	Success
Configure sound	• Audio input and output configuration	Success
Configure voice	• Setting up speech recognition	Success
Control lights and allow enabling motion detection	• ConfigUI to configure and enable motion detection.	Success

V. CONCLUSION

From the overall research we can conclude that how easily smart mirrors can be build using raspberry pi and IOT and other modules as discussed above. These smart mirrors tells us that mirrors can not just be used for looking or grooming in front of mirror but we can also access quickly the details about the current affairs going on all around the world, temperature data, weather, traffic, reminders and so on. We can also provide security, thief detection, face recognition, speech recognition by switching the system in VNC viewer. Thus we can demonstrate the future smart mirror and live a smart life.

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Clickbaits are headlines that exaggerate facts, and its primary goal is to gain attention and encourage visitor to click on a link to a webpage. The term 'bait' itself means to lure. Users are lured to click on titles which intend to create a curiosity gap. Users generally click on those over promising clickbait headlines or titles to fill their curiosity gap. Clickbaits can be categorized into eight types namely exaggeration, teasing, inflammatory, formatting, graphic, bait-and-switch, ambiguous and wrong [3]. Certain text formatting such as use of exclamations, upper case letters, adjectives and asking questions, make the titles look more appealing. It is vital to detect to detect and classify clickbait titles. This paper focuses on various techniques involving Machine Learning algorithms such as Support Vector Machine (SVM) [4] [15], Decision Trees [3], Random Forest [9] [12], Natural Language Processing [10], and Deep Learning algorithms such as Recurrent Neural Network (RNN) and Long Short-Term Memory (LSTM) [5][7], Parallel Neural Network [11] and Convolutional Neural Network (CNN) [6][2].

VI. LITERATURE STUDY

In the papers given below, various techniques that are used to classify text and to detect clickbait are summarized. Each algorithm has different accuracy with different dataset. Most datasets are pre-processed and word embeddings are done with techniques like Word2Vec and GloVe. The techniques used for classification can be broadly classified into machine learning and deep learning based approaches.

6.1 Machine Learning based Techniques:

Machine learning algorithms have the ability to learn information based on past data. For the purpose of text classification, supervised machine learning algorithms are primarily used. In the following papers, different supervised machine learning algorithms such as Decision Trees, Random Forest, and Regression are studied.

6.2 Deep Learning based Techniques:

Deep Learning based approaches are inspired by the working of neurons in the human brain. A collection of such neurons forms a neural network. Deep Learning based approaches usually provide better accuracy as compared to machine learning algorithms. Convolutional Neural Networks (CNN) is mainly used for image classification has also shown remarkable accuracy in text classification. The following papers utilize various deep learning algorithms such as CNN, RNN, R-CNN, C-CNN for classifying text.

VII. ANALYSIS

The following table is the summary of various research papers on Clickbait Detection and Deep Learning.

The various algorithms used for text classification and clickbait detection are summarized in the above analysis table. From the table it can be seen that CNN and RNN present better accuracy as compared to the machine learning approaches.

VIII. CONCLUSION

With the increase in online advertising and revenue generation through clicks, clickbait headlines have been growing on all social media platforms in order to increase revenue. Various Machine Learning and Deep Learning algorithms are effective in detecting clickbaits Deep Learning approaches such as CNN, RNN, and LSTM networks have shown to be more accurate in classifying the headline as clickbait as compared the machine learning models. In this paper, different machine learning and deep learning techniques have been studied and analysed. Here, large dataset of headlines consisting of clickbait and non-clickbait are used. It is evident from the studied papers that increasing the window sizes in CNN and utilizing LSTM networks have increased the accuracy of detecting clickbaits. In future, contextual classification of clickbaits may help in further increasing the accuracy.

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