

Smart Mirror: A Reflective Portal To Increase Productivity

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Abstract: In order to effectively prepare for the day while staying updated with the necessary information and still maintaining a timely schedule is a perplexing task. This mirror provides an efficient way to manage all tasks by combining different services such as weather updates, time, date, news feed and to-do-list. When compared, the mirror will be much more efficient and faster way to gain information than other devices. Face recognition is used to allow access to authorized users and secure the mirror. The news feed uses web service-based communication to extract data packets offered through various different APIs that are made available by websites. All the required computing power is handled and managed by the raspberry pi. Additionally, the LCD display is used which is raspberry pi and placed behind the two-way mirror. Secondly, add-ons such as an assistant may require a microphone that will be used to control the mirror functionalities through voice, joysticks can be used to interact with the screen and many more.

Keywords – Smart mirror, raspberry pi, Magic mirror

I. Introduction

The smart mirror is the modern-day integration of accessing services hands-free while doing daily chores; thus, increasing productivity substantially. The smart mirror automatically recognizes that there is a user present and becomes active using the web camera inside the two-way mirror. A pool of applications has been incorporated in the mirror and it is protected with the wooden frame which allows it to be hanged on the wall. The applications in the mirror include weather, social media, news feed, to-do list, time and date. The smart mirror is powered by Raspberry pi 3B+ and along with that different component is used such as webcam, a two-way mirror and a computer LCD monitor. The Raspberry pi is well equipped and its ports are sufficient enough to satisfy the connections to the necessary components. Secondly, the raspberry pi comes with pre-defined libraries that will further help in the development of the smart mirror. Additionally, face recognition system is implemented to provide security to that data that is displayed on the mirror. Instead of using different devices to gain daily information, the smart mirror will provide all the necessary information while the user is finishing their daily grooming tasks.

a. Present System

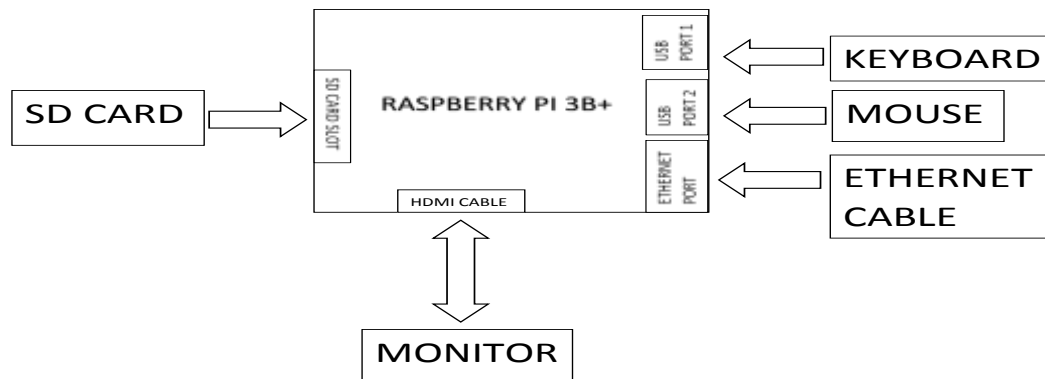
II. System Analysis

In project created by Derrick Gold, David Sollinger, and Indratmo[1] consist of a mirror which supports plug-ins written in any languages. In the smart mirror developed by derrick gold users can use a touch screen to write notes or control the smart mirror.

In project created by Muhammad Mu'izzudeenYusri, Shahreen Kasim, RohayantiHassan[2] had a concept of smart home-based Internet of Things (IoT). This system will allow users to access information and control the lights in the house. Relevant information such as date and time, traffic, weather updates and maps. The system applies Sonos technology as a medium of interaction between people and systems.[2]

Project by BiljanaCvetkoska, Ninoslav Marina, DijanaCapeskaBogatinoska, ZhankoMitreski[3] have proposed a new Smart eHealth Mirror model, that consists of a smart mirror which works on its own algorithm and behaves as smart assistant.

b. Proposed System



The proposed system utilises the Raspberry pi 3B+ for the operation of the smart mirror. The Raspberry Pi 3B+ consist of ports that allows us to connect various different components such as web camera, microphone, speakers and many more. These components are attached and the Raspberry Pi is connected to the computer monitor. After finishing with all the connections, it is now time to set up the raspberry pi. The raspberry pi is connected to the computer and the Raspbian OS is installed. After the installation the pre-defined libraries are downloaded and the coding is done to create an application or an interface that will be able to display the data fetched from the modules.

Raspberry pi runs on a custom OS called as Raspbian OS; all the necessary modules or applications code are coded in this OS using JavaScript and other languages. The substitution to the Raspbian OS can be Linux OS, an open source operating system which is compatible with the raspberry pi. In the proposed system the Raspbian operating system is used for better performance. The modules of various applications such as time, date, newsfeed and weather forecast are installed in the next step. After the installation of the required modules, their placing is done. All the data is displayed in such a manner that it does not interfere with the central part of the mirror. This is done so that the displayed data does not act as a distraction or hindrance to the user. Once the data is placed in an appropriate position, the working of facial recognition system is started.

The idea behind the facial recognition system is to protect the integrity of the user's data. Facial recognition works using the Giant OpenCV library data which is open source and free to use. Firstly, the user's face is captured using the webcam. The captured image is processed i.e. it is aligned and facial landmarks are computed. Secondly, it compares the distinctive details of the face with its database and calculates an 'similarity confidence' which tells basically how confident the system is in its identification process. If the similarity confidence is above a certain threshold, it will identify the person from its database. This similarity threshold maybe specified by the user it self but care must be taken to not use a very low value as it may mistakenly allow access to slightly similar looking people.

The facial recognition has to be trained before it can be used. This is done via facial recognition tools. This program first asks the user if he/she wishes to use the webcam to capture their images or use images in the SD card for the image database that will be used in order to calculate the similarity confidence. Once the user makes the choice, the images are collected and stored in a folder using the username the person has specified for the collected image data. Next the training program is used to create a database of the images that have been captured using a python script. This step involves the use of OpenCV as it is used to study the faces and understand landmarks on the face that will be used later in the facial recognition of any person. Note, multiple user data can be stored and simultaneous facial detection may also be possible. Once the training script has been executed, a xml datasheet is created. Now the facial recognition data is ready and this module is integrated into the main JavaScript config file of the smart mirror.

After the working of the facial recognition system is done the final step comprises of the consolidation of the entire components into a single fully-functioning device. The facial recognition system is then integrated with the normal modules and the interface and the final testing is carried out to eliminate any bugs or issues. In

case of bugs, all the stored image data has to be deleted and the facial recognition tools scripts have to be executed again to build a new dataset. Once the system has begun to perform efficiently, the two-way mirror is placed in front of the monitor and then the wooden framing is done. The Wooden framing will provide better resistance towards any external damage and keep the monitor in place behind the mirror so that it shows reflection as well as the output of the monitor.

The hinges will be used to keep the monitor and the mirror intact and the raspberry pi will be placed behind the monitor in a protective cover that comes with the kit. The front of the mirror looks clean and smooth and it will give user a delightful experience. The raspberry pi will be connected to the power supply through its adapter that is provided with the kit. It will only require 5 volts 2.4A charger and it will work with utmost efficiency. For Internet connectivity, the raspberry pi comes with inbuilt Wi-Fi and also has an Ethernet port for cable connections. The internet has to be configured before using the smart mirror program as the program relies on net connectivity for real time data of its modules. User will have to switch on the power supply to access the data from the mirror and switch it off as per his requirements. It can be kept on all the time as a heat sink has been attached to the processor but it should be made sure that the mirror is in cool environment and away from sunlight as external heat may cause the SD card to short out.

III. Methodology

- The Raspberry Pi is connected to power supply.
- It will act as a normal mirror, if no face or unauthorized user is detected.
- If an authorized user is detected then all the data is displayed on the mirror.

IV. Conclusion

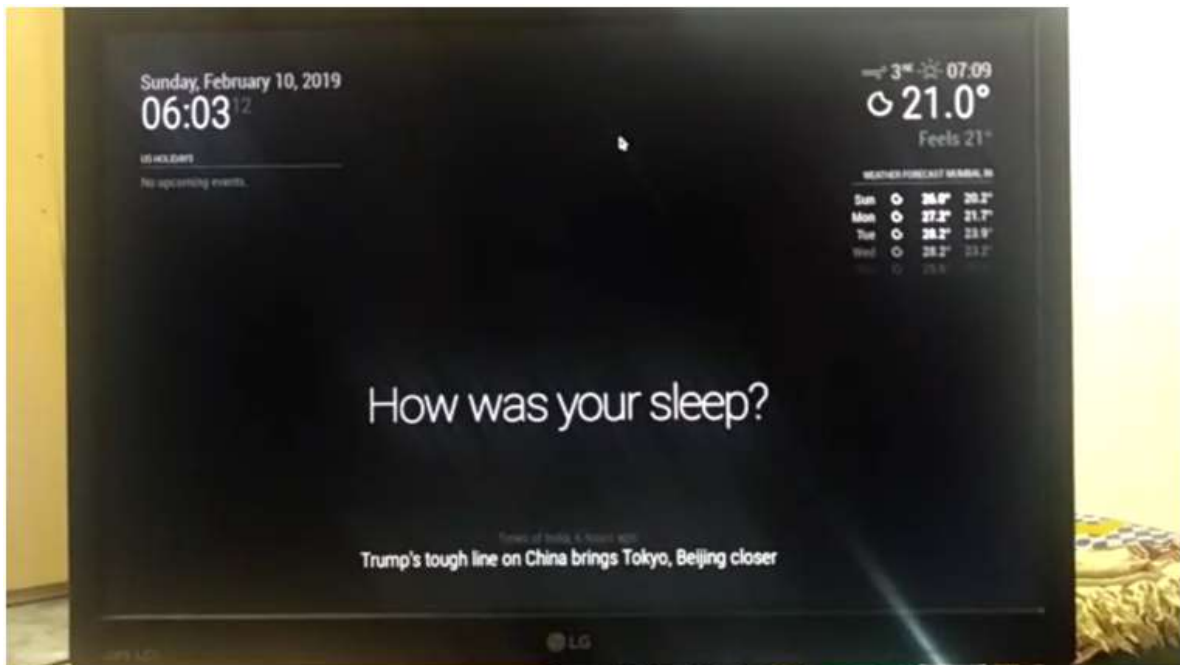


Fig: Base Smart mirror output on monitor.

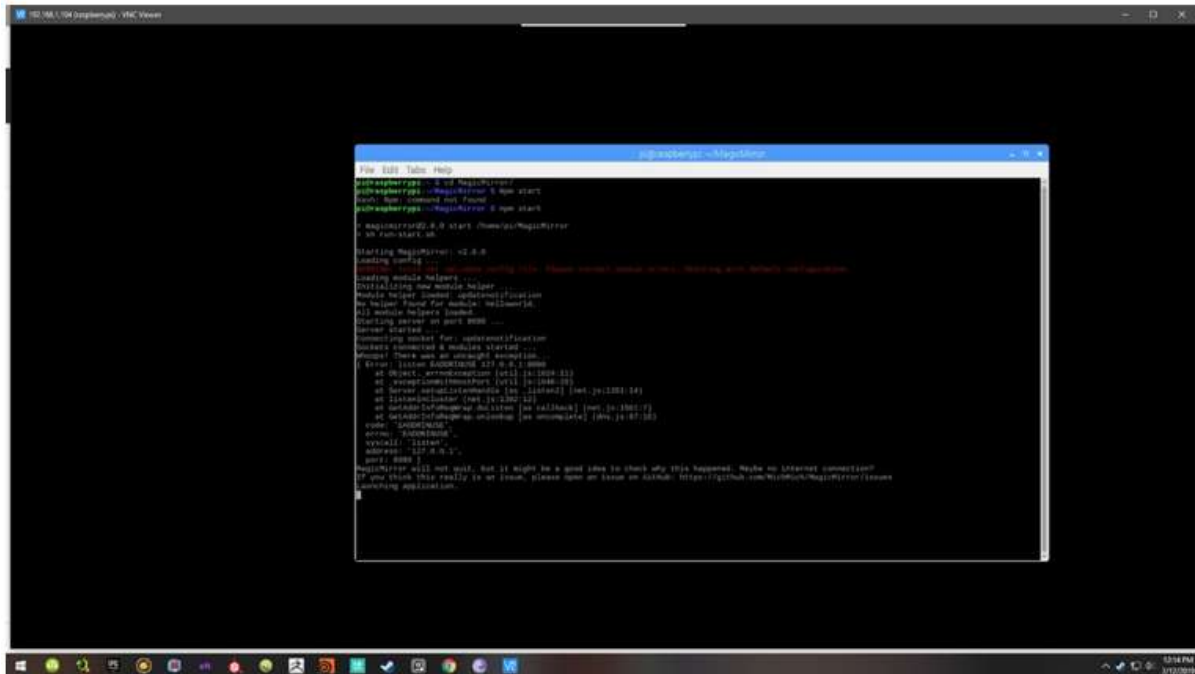


Fig: Python script execution in the Raspberry pi terminal for smart mirror.

Mobile addiction has become a serious problem in everybody’s life. All it takes is picking up the phone and the user spends easily hours chatting etc before putting it down again. But, if the user picks up his/her phone for the simple purpose of executing one important task, they may get distracted very easily thus wasting time. The smart mirror project allows the user to execute simple tasks without waste of time while they execute their other chores. This way not only they keep their mobile addiction in check, they also save time which is invaluable in the working person’s life.

The Smart mirror will thus be seamlessly integrated into our daily life. It will easily fulfill the requirements of the user while becoming a new method to get informed. Various different components can be easily integrated into the mirror that will produce endless possibilities, while still performing its basic task. It is essential to prepare for the day while being updated. Both these goals are achieved by the mirror and the users are able to save tremendous amount of time in their daily life. Instead of using different devices, the mirror will give user the information with minimum interaction. The user will be gain data just by unlocking the mirror, which in turn is a simple task as the mirror is protected by facial recognition system the user will have to look towards the webcam. Once the user gets identified the monitor will display all the necessary information or data on its screen. The data will then be displayed through a two-way mirror or acrylic sheet. User will be able to access the data such as weather forecast, time, date, newsfeed and many more. All these information will be useful for the user to get updated on the necessary information and prepare for the day at the same time.

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