

A Review of Smart Mirror to Upgrade Human Life Style

Ashwini S. Pakhale^{*1}, Ashish Manusmare² and Deepak Mhaske³

Ballarpur Institute of Technology (BIT) Bamni, Ballarpur, 442701 Maharashtra, India

*Email address: aashu0093@gmail.com

Abstract – This paper presents an implementation of a multiuser smart mirror system. Nowadays there are major problems faced by guardians to monitoring their children while they are away at work but providing security to home also become a big point of concern. Smart mirror system used to promote wellness and healthier lifestyles. This system is based on IoT which will be implemented by using Raspberry Pi technology. System requires Raspberry Pi, Camera, Touch Screen and android mobile as hardware mechanism. For this software coding Python, Node.js and Open CV library are used. This magic mirror will display practical information like date, time, weather and every day reminders and it will also help guardians to observe their children and help them with their studies and to organize their daily routines. This device can be used as a common easier and faster, which is an important part of home computerization also it provides information and home security as well.

Keywords – Raspberry Pi, LED, LCD, Smart Mirror

I. Introduction

The simplicity of human beings is growing as the conveniences are rising. Due to the incorporation of many technologies in day to day activities, life has become easier. As far as the technologies are anxious, it creates security related problems. For example, when we use ATMs for doing banking transactions, the security of device and the working precision of device matters a lot. Similarly, with the improvement in technology, and skills of thieves, robbers also have increased [1]. Hence, it is a great challenge to design a fool proof system. Usually people make use of security cameras to secure home but there is possibility that, the cameras can be damaged during incidents like robbery. Hence, complete security cannot be ensured in such cases [2].

The advanced progress in Technology has been seen almost every device as smart device in the present world scenario. Household things as well as advanced electronic gadgets almost all the devices are becoming smart. Educated parents plays an important role in day to day life for their children [3]. In today's complex world, efficient parenting becomes more important, and parents and guardians must be educated to get up their children in a advanced technological environment. A new technology has been developed with the ability to connect devices with each other intelligently which is called the Internet of Things (IoT). This type of communication is done without a need of human interaction. Due to this, people accomplish their tasks faster in an efficient way. Also, peoples can control the devices by touch, voice etc. The smart mirrors introduced by tech companies. Smart mirrors act as digital screen as them with their studies and to make sure their children are safe at home due to the features available in smart mirrors [4]. This reduces the time available for them to communicate with their children and to make sure that they are safe at home. It will also helpful for teenagers to make responsible at their work, since they would require more adult supervision and

attention from their parents. The main focus is to save the time of working parents.

In this paper we focused on single device that is a smart mirror. A smart mirror is an intelligent device that works as a mirror with the ability to display various responses and information such as date, time and weather on the screen [5]. There are many types, shapes, sizes and applications of smart mirrors that can be applied in various fields such as academic, general and medical field. In the past years, the smart mirror was just interface for providing general information. Now the mirror has become more advanced because it may predict the presence of the user in front of it by using different sensors inside the smart mirror. Magic Mirror that can be implemented using Raspberry pi technology, which is based on IoT [6]. The screen of Smart Mirrors are designed using a LCD (Liquid Crystal Display) or LED (Light Emitting Diode) monitor along with the two-way Acrylic sheet and a mirror. This system can work with voice, touch as well as mobile based commands. The system can be modified as per the needs of the user and can designed accordingly. . The features can be added and removed as per conveniences of the user. figure 1 shows the features that are implemented in the proposed model. The figure 2 shows the prototype designed, which is tested for best possible accuracy [7].



Fig. 1. Features of Smart Mirror



Fig. 2 Smart Mirror

II. Related Work

Already Smart mirror related works have been done in this field. Such types of systems built with different hardware and software. They also differ in design, capabilities, features, applications and methods. Intelligent mirror receives voice commands from the, Microphone. It is built by using Raspberry Pi microcontroller.

The LED monitor and acrylic mirror display the weather, time, and information about location on the screen [8]. By using Raspberry Pi and MCU (Multi Control Unit) Smart mirror is built which displays weather and latest news updates on the screen. Humidity and Temperature sensors are used and IoT is implemented using cloud [9]. In future multimedia based Smart Mirrors are designed which accept voice commands. In this system Artificial Intelligence concepts are used. System get alert about the Weather condition and suggests the user as per the weather. For example, if it is cold day, it will display a message on the mirror saying "Please wear jacket today" [10]. Some Smart mirror have Webpage based interface. Voice commands are used to operate such type of smart mirror. These are made by using APIs of various websites. The proposed mirror makes use of Google Assistant and stores user details in the database [11]. For weight and fitness tracking some mirror designs can be used. Using Face Recognition authentication is provided. The additional features are GPS navigation, Bluetooth Connectivity and wireless communication. To improve the communication SONUS technology is used.[12]. Some mirror designs use Hermione 1.0, which is an extension of Magic Mirror. The platform provides the user with easy installation of a Smart Mirror for domestic purpose. It is voice-based System which can be used as a Home Assistance. [13]. Other system proposed work in two modes viz., Normal Mode and Smart Mode. Using python and Java script programming tools such as Node.js. system is developed. It is a voice command based smart mirror. [14]. Some Smart Mirrors are implemented using Raspberry and SMT32F030CT8T6 microcontroller used as core controlling chip. Using SYN6288 chip, voice enabled and special Speech Synthesis module is implemented [15]. Also, for Theft Detection in a home environment Smart mirrors are designed. For detecting human motion PIR sensors are used and the camera captures the information which stores in reminders, daily routines, news feeds, calendar, time and weather forecasts, etc. Smart mirrors are very useful to children as well as parent to assist drop box. DHT22 chip and VNC viewer is used for theft detection and mobile control respectively. [16]A Voice based Smart mirror is Proposed and a comparative study of Smart mirrors is given. This system supports Human Gestures and Face Detection. It is an AI based system. Machine Learning Techniques are used to make system more approachable [17]. To examine postures of human for finding any changes in postures over a period of time, System use special algorithm called PAA (Posture Analysis Algorithm) [18]. Commercial and Home usage Smart Mirrors are designed to capture real time data on the screen. This is voice-based system and it makes use of AmI (Ambient Artificial Intelligence) technique [19]. Multi-user Smart Mirrors are designed as commercial products which are based on RFID access of employees. The device has a personalized user interface [20].

III. Issues and Challenges

To provide maximum possible accuracy in human interference detection is one of the challenges in this model. To

work with an embedded system is the major dispute. Raspberry Pi is a device with low processing capacity and storage. The latest edition of Raspberry has 1GB RAM only. Hence, scheming proposed model with such a low processing device is a big dispute. Most incredible challenge is to click the clear facial snapshot of the intruder during the intrusion detection [21]. The other issues linked to the proposed system are the cost and durability of the hardware devices used. Sometimes Raspberry heats up and starts rebooting frequently [22].

IV. Proposed System

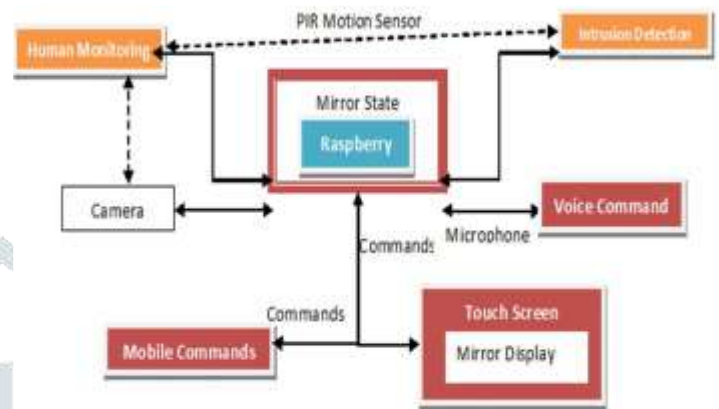


Fig. 3 Block diagram of smart mirror

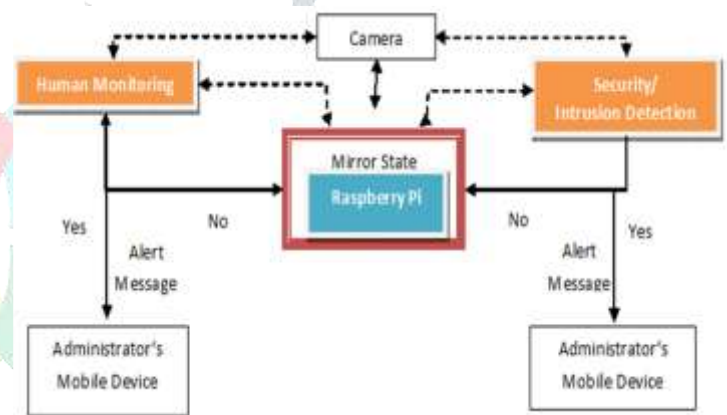


Fig. 4. Block Diagram for Intrusion Detection and Human Monitoring

In fig.3 the block diagram of the proposed model is shown. Block diagram for human intrusion detection is shown in fig 4. The block diagram depicts the modules used in the planned work. The task of a synchronizer done by software component is mirror state. The proposed system is built with hardware components like Raspberry Pi, Touch screen, Camera, Power bank, android mobile and Wi-Fi connectivity. The software components needed are Python, Open CV libraries, Python Anywhere cloud services and SMS Lane servers. The Photo of intruder can be uploaded to the Amazon cloud services such as Python anywhere. The picture will be converted to base64 configure and stored in the catalogue. Such format transfer is necessary for easy storage and retrieval of the photos [23]. The planned system works in two modes are Normal Mode and Triggered mode. Normal mode, displays the real time information on the mirror. The latest news, weather information, calendar, Indian holidays and greetings are displayed on the screen. The contents displayed on the mirror screen are designed as the webpage are the dynamic content being fetched using the APIs and displayed at the particular locations on mirror using NodeJS and electron. The system can be pushed into triggered mode either by the touch commands or mobile commands. During triggered mode the system will act

as a human intrusion detection system. During this mode of operation, as soon as the human is detected, the system will take a frontal photo of the human and send it to the owner of the Smart Mirror through SMS. Further, the owner can take actions based on the situation.

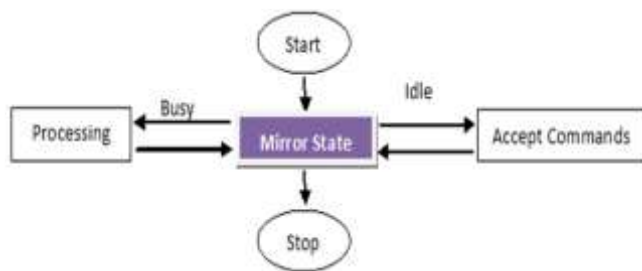


Fig. 5 Mirror state

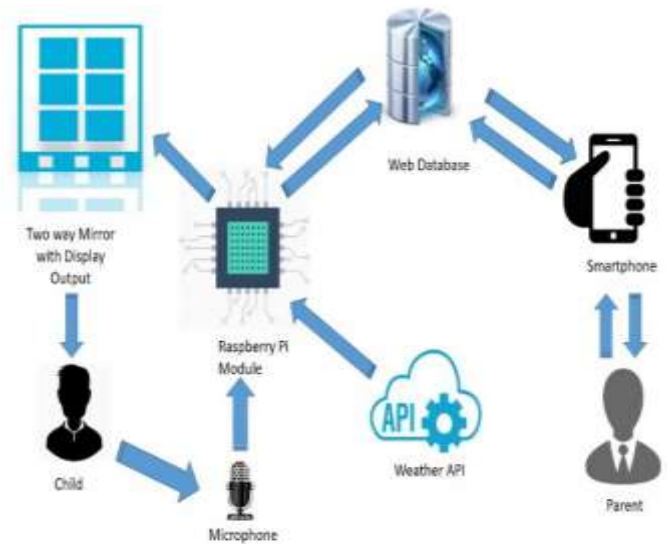


Fig. 7 High Level Architecture of the system

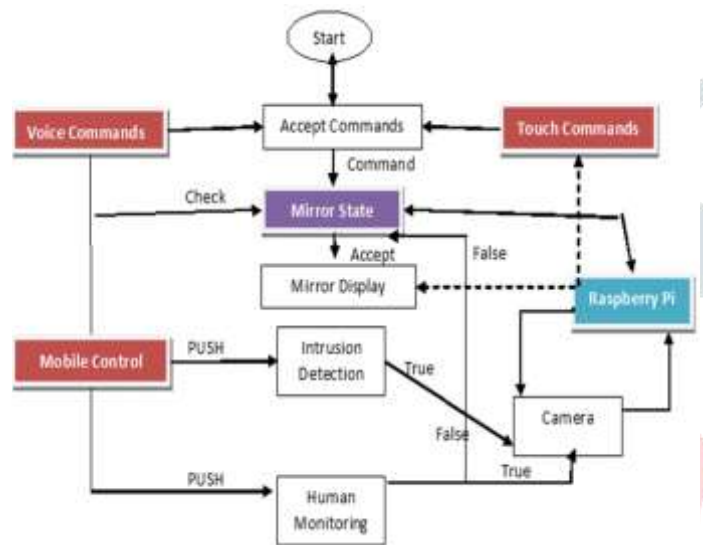


fig.6 Types of inputs

The system accepts touch and mobile command as input and processes them to produce results. Touch commands can be used when the user stands in front of the mirror and mobile commands can be used when user is away from the mirror. Fig 5 shows the Mirror State. It decides if any given command can be executed at that instance of time or not. It is because, some previous command may be already under execution. The details are shown on fig 6.

V. Design

Designing the system comes as the next phase where it looks forward to do the designing of the system which includes Mirror's design, User interface design and Mobile application design.

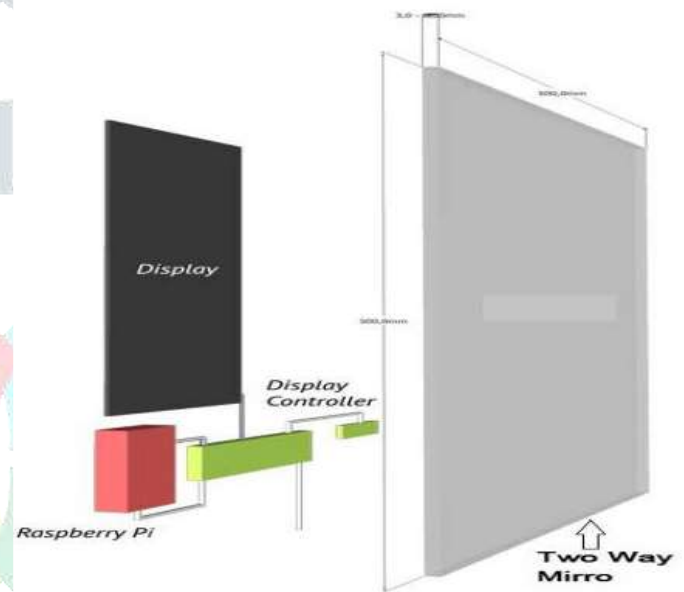


Fig. 8 Hardware Design of the System

Fig 7 depicts the High-Level Architecture diagram of Raspbian Magic Mirror at this phase and Fig 8 depicts the Hardware design diagram of Raspbian Magic Mirror sketched at this phase [24].

Designing these sections act an important role because an attractive mirror makes users attract towards it making it expose to the marketing level. And user interfaces and the mobile application must be eye touching. communicate with the child using the smart mirror.

VI. Implementation

Once the system design is received the implementation phase begins as the most time allocated phase. It consists of two main sections such as hardware implementation and software implementation

At the hardware implementation, the physical mirror body is designed with the Two-way mirror, LED Monitor and the Raspberry Pi Circuit. Coding the program is done at the software implementation where it again classified as frond end programming and back end programming. Database is also implemented and integrated to the same system within this phase [25].

VII. Testing

Testing is the last phase that helps to evaluate the quality of the program and also for improving it, by identifying defects and problems. Also, it verifies and validate that the program has meets its requirements. Testing is done in three ways such that unit testing, integration testing and system testing respectively. Unit testing comes under black box technique method and the individual units/ components of a software are tested. In the integration testing individual software modules are combined and tested as a group. Software testing where a complete and integrated software is tested. It evaluates the system's compliance with the specified requirements [26].

VIII. Conclusion

The prime purpose of this work is to design a product with maximum features the model provides not only an information but also an intelligent system, which can provide security. better accuracy and speed during detection process is also important. Raspberry Pi technology is used, to implement a mirror with the intention of efficient parenting. The accomplished work will be verified by sending a voice note through the mirror to their parents. The smart mirror will display additional details such as weather, time, date, calendar with updates, daily routine, meetings, etc. Also, the system can be used as security system. The system can be proposed as a commercial product. There is a scope for future work in this proposed system by adding Artificial Intelligence., By using this mirror we can able to control Home appliances even when we are getting ready for the day. In order to increase the level of security, face detection can be used for authentication. The face identification can be done by comparing with the photos stored in database. This system can also be tried Human monitoring techniques in order to increase the accuracy of the system.

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