

Design of Intelligent Mirror System using IoT& AI

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Abstract— In this paper, novel design and implementation of an intelligent mirror based on Raspberry pi using internet of things and artificial intelligence implemented. By using google assistant software which helps to gives the mirror to receive news online and display it on smart mirror along with additional details such as time, calendar and other notifications, thus it can be used to replace the traditional notice board in the schools, college, office & other public places. In the proposed system which includes the raspberry pi-based processor board and a display which are interfaced with each other. Further improvement of the system, specialized glass is used with a back frame. Python software is implemented to control the intelligent mirror.

Index Terms— Raspberry pi 3B+, LED, Micro phone, intelligent mirror, Internet of Things, Artificial Intelligence.

I. INTRODUCTION

Internet of Things (IoT) is used to define “Technologies, Systems, and design principles related with the emerging wave of Internet-connected things that are based on the physical environment” [1]. In this world everyone needs a comfort life. Modern man has invented different technology for this purpose. People needs to be connected and they are willing to access the information easily. Whether it is through the television or internet, individuals easily to be informed and up-to-date activities happening around the world. The Internet of Things means interconnection via the internet of computing devices embedded in everyday objects, enabling them to send and receive data. The IoT with enormous growth broadens its application to the living environment of the people by changing a home to smart home. Smart home is a connected part that connects all type of digital devices to communicate each other through the internet. Our existence has evolved in such a way that optimizing time is the most significant thing. The main process of intelligent mirror is to show whether, date & time, calendar and notification can be displayed on the mirror while you are grooming yourself in front of mirror. The other important of this project by providing the customizable information on the display. The system has ability to display widgets and provide social media interaction that appeals to most users. The world technology is improved day by day but no technology can be invented to help the intelligent mirror using IOT & AI. The existing system displays weather information, time and location of user information on the mirror with the use of controller. The main drawback of this paper was it easily controlled by voice commands without any security. So the entire system was suddenly collapsed [2]. There is another drawback of this model is that the device is in continuous search nearby Bluetooth enabled device which consumes more power and users without mobiles phone can’t access the smart mirror [3]. The proposed work is based on the idea that all look at the

mirror when go out, so why wouldn't the mirror become smart [4]. A common approach for building an intelligent mirror is to use a high-quality one-way mirror, a LED monitor, a frame to hold the glass and monitor, and a microphone with python to provide the software features and drive the display. AI is used to make a user friendly and interactive two-way communication with the mirror. Nowadays information is accessible to our electronic devices [5]. To deal with this situation, Smart Mirror is urbanized to provide handiness. The product is similar to regular mirror that can display weather reports, calendar, time and other notification displayed on the mirror [6].

This paper presents an advanced method of IOT and machine learning based notice board system, which is used to display all necessary information which can be dynamically changed. The System uses IOT & AI technology to achieve an efficient, intelligent notice board system [7]. The reflector is basically a two-way reflective surface (or) one way reflective surface which acts both as mirror and as an interface to display the notices. The smart mirror is inbuilt using Raspberry Pi [8]. There is an LED screen which is used for displaying the contents like news, weather, date & time, calendar and other notification, etc., Using microphone to give the commands for raspberry pi through will interact with the user and there is a speaker by which get the required response [9]. All programs and codes are developed in Python [10]. Tinder is GUI (Graphical User Interface) used for Python [10]. Design & Development of Smart Home with Real-Time Sensor is discussed in [11]. Here, how to use rasberi pi 3 for online application is explained in detail. Intelligent Mirror Using Raspberry Pi and IoT is discussed in [12].

II. PROPOSED SYSTEM DESIGN

A. Raspberry Pi 3 Model B+

Raspberry Pi 3 is a development board in Pi series. It can be consider single board computer that works on LINUX operating system. The board has terrific processing speed making it suitable for advanced applications.

B. One-waymirror

One way mirror is transparent on one end and reflective on the end, unlike standard mirror, which is transparent on both sides. In the proposed work, the one-way mirror is used and prefers 3B Raspberry pi with a display. Fig 1 shows the block diagram of the proposed system.

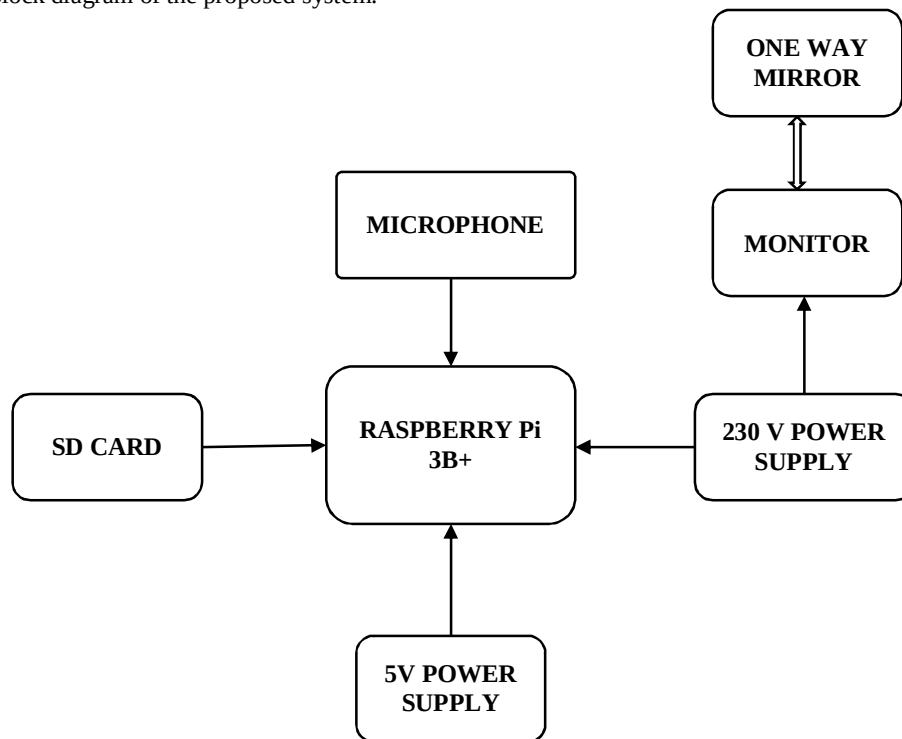


Fig.1 Block Diagram of proposed system

Here, IOT is enabled through Raspberry pi as it is in built in it. The information to be displayed on the mirror is given to the monitor. Various notice board information can be dynamically taken from web and posted in the mirror which is dynamic and intelligent notice board. Machine learning algorithms can be implemented to make the mirror more intelligent to respond the dynamic requirement. LED Monitor is connected with Raspberry Pi module by using HDMI Cable that provisions for video outputs through LED monitor. For voice commands, Google's voice assistant API is used via 3.5mm Mic (via a USB external sound card) for input and a 3.5mm speaker for output. Both of these are connected to the Raspberry Pi. An Ultrasonic Proximity Sensor with the Arduino Uno platform is associated to the LED monitor which is used to spot out nearby user(s). GSM shield module is also linked to the Arduino Uno for an SOS calling feature by the click the button on the frame. All these components are protected by the wooden frame that for protecting purpose. Testing of Intelligent Mirror is given in Table I.

TABLE I. TESTING OF INTELLIGENT MIRROR

Test Case	Result
Design of intelligent mirror is clean and easy to view	Information from the mirror content of date, time and weather reports is correct
Different types of data are entered including negative number, positive number, and special characters.	System's validation function is able to validate the input data according to the criteria set in the input element of user interface.
Insert the memory card into the raspberry pi with NOOBS (OS installer)	Easily to access the voice command through google assistant

Figure.2 which shows the main interfaces such as current date, time, weather and other messages are available in Smart Mirror. Here the day, time, temperature and location information are displayed on the mirror. Also, dynamically we can change the information from web. The notice board information in general and any other information can be displayed on the mirror. Also, we can use the microphone to tell the information to be displayed using google assist

Figure.3 which represents the main interfaces i.e., Google Assistant available in Smart Mirror. We need to tell clearly in microphone the information which are required to be displayed and then the required information will be displayed on the mirror as shown in the figure. The whole set up is made into a compact arrangement as shown in the figure. This option is more convenient for the users as it is easy to tell the requirement saving time but we need to clearly slowly tell to google assist as the machine will understand only if it is clear.

C Artificial Intelligence

Artificial Intelligence to empower computers to achieve such intellectual tasks. AI impresses the future of virtually every industry and human being. Machines can emulate actions of human brain. They have capacity to learn and solve problems like human being. They also have the ability to think rationally and act. Machines are able to think and make smart decisions. AI can be used to optimize learning outputs.

D. Machine Learning

Machine learning is a method of data analysis that systematizes analytical model constructing. Machine learning is a subset of artificial intelligence. It allows software applications to predict the outcome from the given datasets by understanding their pattern. Different algorithms are used based on the type of datasets. In Machine learning, based on the idea that systems can learn from data, identify patterns, and make resolutions with minimal human involvement

E Software

All programs and codes are developed in Python Tinder is GUI (Graphical User Interface) used for Python Here, google voice assistant is not used but other information are explained. Google Assistant SDK (Software Development Kit): It is used as the Voice Assistant. The Proposed mirror involves with an LED monitor as the main display, in order to display the various information to the end user. This monitor is protected with two-way reflective sheet that acts as a reflective mirror.

Figure.4 which represents back view of intelligent mirror in which all these components are protected by the wooden frame that for protecting purpose. Here the whole package is fixed into a wooden frame to be a compact which can be used anywhere.

Various test cases are implemented and the testing and result of an Intelligent mirror is given in Table II.



Fig.2 Intelligent mirror shows date, time and weather



Fig.3 Shows Google Assistant

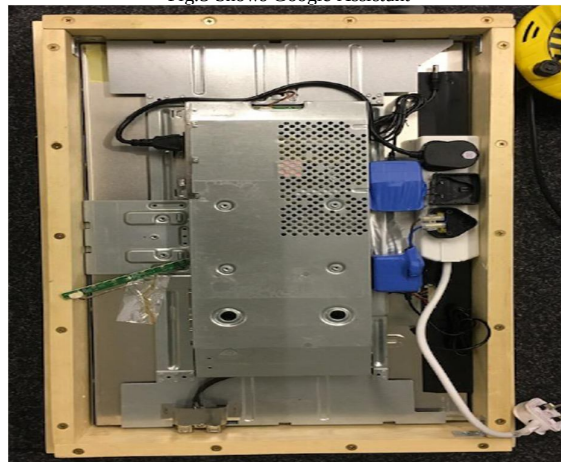


Fig.4 Intelligent Mirror – Back View

TABLE II. TESTING AND RESULT – INTELLIGENT MIRROR

Test Case	Result
Testing the intelligent mirror	Functioning of the intelligent Mirror
Implementation of Raspberry Pi 3	For Interactive with system and mirror
Testing audio signals and Voice commands	Mirror responds as per the voice commands via Google's Assistant API
Text box and text area are able to capture the information entered	Data is displayed successfully.

III. CONCLUSION

Intelligent mirror system integrated the concept and methodologies that have been implemented in many existing systems. It is an innovative application of creating a smooth connecting system. The system is dependable and easy to use. The system is very useful for interacting to the mirror system by using Raspberry pi. There exist many benefits from the intelligent mirror to consume time and power consumption. A Raspberry pi has been adapted for the development and deployment of the various services, where the intelligent mirror interface, the news feeds all use Google Assistant. The future prototype is suitable with potential and perhaps strong in terms of functionality. It uses voice commands to switch between each view and gestures to interact with information. Rather than confined to a home, it can implement the functionality to a mirror. So that it can have a wide range of applications like one can setup this functionality to a glass table, which used in office. This will help him to know about announcements from many sites at the same time in a single screen. Another application is that this decisively can be setup in community places. The intelligent mirror system is to develop different methods to rectify the existing system drawback and cost-effective solution for the development of a Smart Mirror to reduce and possibly eliminate the need for the user to make time in their daily routine to check their PC, tablet, or smartphone for the information they need. The mirror will provide the information with slight to no effort from the user with the goal of not being a liability that he or she must maintain.

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