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AN ARTIFICIALLY INTELLIGENT IOT BASED SMART MIRROR

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***Abstract*— In this world everyone continues running behind the comfort and solace. Present-day man has an assorted development for a comparative reason. People are happy to get to data adequately whether or not it is through the TV or web. A Smart Mirror is proposed which is an intelligent framework that makes the client get refreshed of the everyday happenings. It will be fascinating if the Mirror perceives the client and reminds the significant gatherings on that day. The Smart Mirror gives a nearby encounter that empowers the client to just walk around and be welcomed with data. The proposed mirror framework attempts to mitigate the house part's terrible mindset by giving positive explanations and music treatment. Accordingly, from an expansive perspective, the proposed mirror framework gives a social connection between the viewer and the mirror.**

Index Terms— Two-way mirror, Raspberry Mirror, Haar cascade classifier.

I. INTRODUCTION

Smart Mirror targets expanding the fundamental intelligent mirror with installed knowledge to join day by day schedule errands like newspaper, getting stock updates, climate changes, offer upgraded highlights, most recent news, and nearby time comparing to the user's location, etc and giving such information to the user while he/she prepares. Most of them use mirrors each day to take a look at themselves, they mentally collaborate with the mirror each day to check what they look like and how their clothing is while preparing for their work. So, it is having an intelligent mirror that can be responding. The Smart mirror will help in mechanizing our work and the improvement of smart houses.

The Smart Mirror structure which relies upon the possibility of the Internet of Things (IoT) is developed expressly for permitting the customers to regulate and handle house machines with assessment of vocal acknowledgment. For this situation, overseeing house machines has been distinguished as the fundamental issue looked by a great number of people. There are simply an excessive number of things to be done at once and a specific point, clients can't perform various tasks at once.

Smart Mirrors offer convenience to customers by regulating and controlling of electric appliances in the homes or offices with a composed relationship between the light and the device. This can be progressed by acquainting the movement sensor which distinguishes the movement of the articles and can have the option to watch the films, read the news, and the entirety of our home apparatuses can be controlled with a smart mirror.

As far as execution, the proposed mirror framework has a camera to catch the viewer's pictures. By investigating the viewer's outward appearances, the framework can decide his/her feeling. In the wake of knowing the (social) feeling of the watcher, the proposed reflect framework can appropriately react to the feeling of the watcher and mitigate the watcher's feeling if negative enough. Likewise, the proposed framework has an update mode for the watcher to check the schedule. Our plan idea is to fabricate a framework to be a household item for a keen home to improve the living nature of the home individuals and to give social connections to home individuals.

The Smart reflects are wandering achievements being created in the shrewd houses which introduced man-made thinking. The project is performed on an electrical board kit called RASPBERRY P 3. It comprises a 2-route mirror with an equipment innovation with a glowing LCD and a raspberry pi 3 kit, related with the data sources and gives the output on the monitor, displaying on the mirror.

II. REQUIREMENTS

- **Hardware Components:**

1. Raspberry Pi 3 Model :

Raspberry Pi 3 Model [3,4] features 64-piece quad-focus 1.4GHz ARM Cortex-A53 CPU Broadcom processor. This single-board PC gives Bluetooth 4.2/BLE and 2.4GHz and 5GHz double band remote LAN. The Raspberry Pi 3 Model offers quicker PoE (Power-over-Ethernet) and Ethernet (USB 2.0) and capacity utilizing independent PoE HAT. This single-board PC additionally gives improved Preboot Execution Environment (PXE) arrange.

Fig 1: Raspberry Pi 3

2. Web Camera :

Web Camera is [3] a 13.1MP which feeds or streams its image logically to or through a PC to a PC framework. Rather than an IP camera (which uses Wi-Fi), a webcam is ordinarily connected with a USB connection, or near connection, or fused with PC hardware, for instance, PCs. Used for emotion detection and face recognition.

Fig 2: WebCam

3. Monitor :

A Monitor screen is an output device which helps in showing information in pictures format. The monitor screen in present-day screens is conventionally a slight film semiconductor liquid jewel show (TFT-LCD) with LED background enlightenment having replaced cold-cathode bright light (CCFL) scenery brightening.

Fig 3: Monitor

4. Two-Way Mirror :

The Two-way reflect is keen on one side and direct at the other. The impression of single bearing relaying is practiced when single phase of the mirror is marvelously displayed and the contrary phase is dull. This grants seeing from the side that is helped at this point not by the clouded side.

Fig 4: Two Way Mirror

5. Computer Microphone :

A Microphone is a appliance that gets the sound by changing over sound waves into an electrical sign. This sign can be increased as a basic sign or may be can be changed over to a modernized sign, which can be set up by any electronic gadget associated with the Raspberry Pi model 3 on the association board of the association.

Fig 5: Computer Microphone

6. Computer Speaker :

Appliances which can change sound waves into an electronic signal are called speakers. These speakers are connected to their slots on the raspberry pi board to their specific connections. The connection helps in production of sounds with the user instructions.

Fig 6: Computer Speaker

Software Components :

1. OpenCV :

OpenCV is [3] the Open Source Computer-Vision Library with AI based programming library and open-source PC vision. The sum product is generally utilized for processing of the image and analysis of the video. With the assistance of such coding, the computer starts to process, then understands the videos and images.

2. Python :

Python being the easily understandable, high-level, interpreted, universally useful programming language, helps in multiple programming platforms. It includes structured object-oriented and functional programming. [3] The language builds and object-oriented approach of python plan to assist developers with writing clear, intelligent code for little and enormous scope ventures.

3. Raspbian OS :

Raspbian Operating System is a framework which is at zero cost working and enhanced [3,4] for the Raspberry Pi equipment. Raspbian OS works with in more than 35,000 groups, pre-defined characteristics making it easy for installing on a Raspberry Pi PC.

III. SYSTEM DESIGN

The hardware construction includes a computer monitor of any size, a two-way mirror, a Raspberry Pi 3 Model B, two USB microphones, a Camera, a Fan, and a channel relay, is used. These components are attached in a wooden framework.

The construction [1] has two wooden fragments. The back part holds the presentation and the Raspberry Pi and is utilized to help the construction to hold tight on a wall. The edge is appended to the glass by two little wooden supports and it has four openings, two on each side. The casing [6]can be connected and isolates from the back part, so it's anything but

difficult to change the glass or even the casing. A HDMI link is utilized to interface the presentation to the Raspberry Pi in the wooden casing for video and sound of the mirror yields.

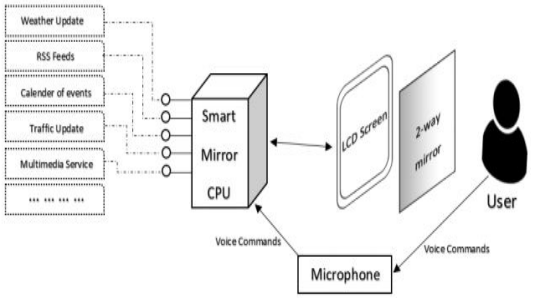

Fig 7: Proposed Block Architecture of Smart Mirror

The construction has the anterior phase [8,9] for user appearance and in the posterior phase the other segments are kept. USB receiver, LED lights, web camera, Fan are associated with the raspberry pi 3With the use of HDMI link, LED is placed for display in the edge and LCD is interfaced through Raspberry pi 3. At long last, the force hotspot for the raspberry pi, LED, LCD is set up. The 8-channel relay is connected to GPIO pins on Pi for controlling the home appliances.

IV. METHODOLOGY

Basic Algorithm and Flowchart

Fig 8: Basic Flowchart of Smart Mirror

Step1: Start
Step2: If a face is detected,
Step3: Then the message will be displayed with name on the screen.
Step4: Else go to Step2
Step5: Once the face detected, Time, Date, Calendar, and Schedules will be displayed.
Step6: Else If the voice command is recognized,
Step7: Light on, Light off, fan on, and fan off occur.
Step8: Else if
Step9: Wait for voice commands.
Step10: else
Step11: Display Time, Date, Calendar and Schedules
Step12: Stop.

1. FACE DETECTION AND RECOGNITION

1.1 Haar Cascade Classifier:

The Haar classifier is an algorithm for face detection. The algorithm [10] works with many positive images and negative images without a face for training the classifier. It quickly identifies any item, in light of a distinguished element not pixels, similar to facial highlights. Subsequently, the face is recognized and set apart with a rectangular box to inexact a alliance of the eyes for detection of eyes step, summarizes the pixel powers in every locale, and figures the contrast between these sums.

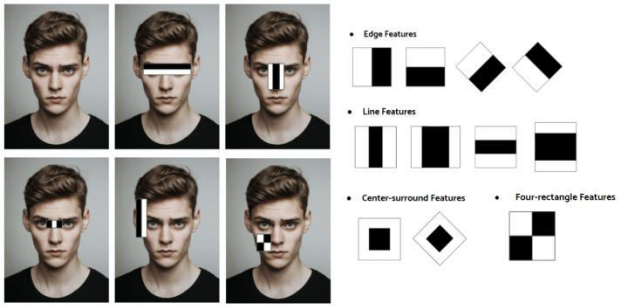

Fig 9: Haar Features for facial detection

1.2 LBPH Algorithm:

LBP is a basic yet productive Face Recognizer [8] which marks the pixels of a picture by thresholding the area of every pixel and takes outcome as a binary number.
With the facial pictures previously extracted, resized, cropped, and generally changed over to grayscale, the face recognition algorithm is answerable for discovering qualities that best portray the picture.

- If the face is recognized, it detects the user, and a welcome user speech is given. Also if there are any memos and reminders of the user, they will be sent to his mail in a text format.
- If the face is not recognized, then the thief mode collects the image of the unknown and sends it to the admin to his Email.

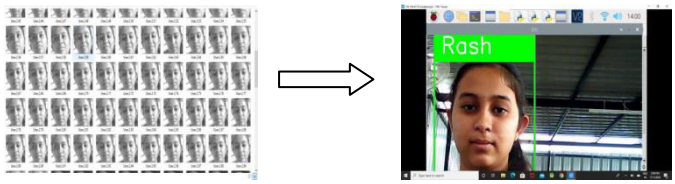

Fig 10: Dataset and Face Recognition

2. FACIAL EMOTION DETECTION

2.1 Landmark positions:

Face detection, recognition, and facial expressions use numbers given to the features of the face called Landmarks. A total of 68 facial landmarks are recognized in Dlib package dividing them to the mouth, jaw, left and right optics, nose, left and right brow. A collection of 19 features is chosen observationally by watching face positions and progressively identified with human appearances.

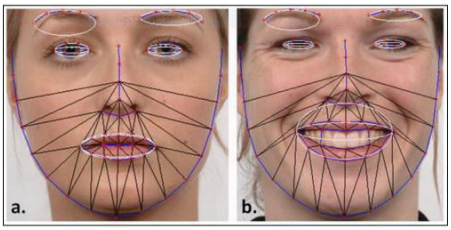

Fig 11: Ellipses architecture for unique regions on facial region(a) alteration in ellipse eccentricity(b)

There are two groups of features characterized in the Landmark positions: **linear** features and **eccentricity** features. The face algorithm detects the identified face by a axial frame(x, y, width, height). With the attribute predictor algorithm, [12] it receives the input of the distinguished facial feature. Thus, algorithm restores the 68 facial focuses at the mouth, eyebrows, optics, nose, including jaw. Numpy array coverts 68 focuses to a matrix of 68 (x, y) coordinates with their position.

The component focuses are isolated as 1-17 for jaw, 49-68 for the mouth, and so forth. Additionally, unconventionality is resolved for the other 7 elipses around: lower mouth, upper left optic, lower left optic, upper right optic, lower right optic, left brow, and right brow. The above figure segment (a) displays 8 ovals, however part (b) displays a alter in eccentricity when the individual grins.

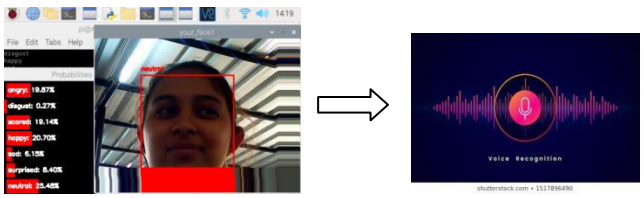

Fig 12: Song Playback after Emotion Detection

The system also provides the additional functionality of playing a soothing song to the user after it detects the emotion of the user. The moods detected are happy, sad, disgust, and angry. These songs respectative of the mood is being played on the Speakers. There are different songs for different moods and thus the user is always made happy. Only Kannada songs are played in playlist.

3. HOME AUTOMATION IMPLEMENTATION

Using the applications like [11] artificial intelligence and machine learning, the Smart Mirrors are developed in smart houses embedded into their lives. On start, a power supply is given to the mirror which loads the raspberry pi OS and directly runs the UI of the mirror. The LED lights and a fan is already connected to the circuit board. [5]Artificial intelligence will take voice data of the client as load through voice software. Handling sound or discourse is additional tedious than preparing text. Thus, the sound info will be changed over into text through discourse programming. software. Thus, when the users stand in front of the mirror and give commands, the voice[5] is converted to text inside the processor. It will convert the commands given by the user into actions. These commands are already trained in the code [7] before the commands are given. Whenever unknown commands are given, such commands are not identified. The commands used in this project are :

1. Light ON
2. Light OFF
3. Fan ON
4. Fan OFF

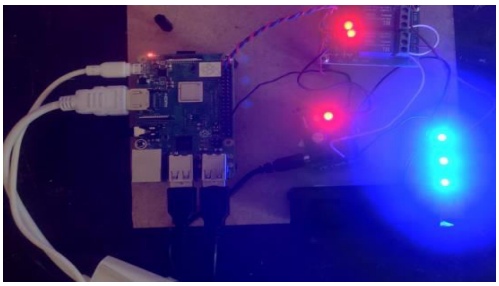

Fig 13: Light ON

- If the user commands “LIGHTS ON”, then lights in the circuit turns ON.
- If the user commands “LIGHTS OFF”, then lights in the circuit turns OFF.
- If the user commands “FAN ON”, then fan in the circuit turns ON.
- If the user commands “FAN OFF”, then fan in the circuit turns OFF.

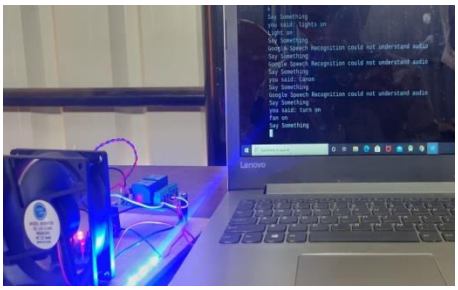

Fig 14: Fan OFF

V. IMPLEMENTATION

Magic Mirror [2] displaying time, date, news, weather, etc appears on the screen whenever there is no activity in the mirror. Since the smart mirror works on a manual mode selection basis, it exits from the magic mirror mode after the pressing of Ctrl+M.

Fig 15: Magic Mirror

After exiting from magic mirror mode, the command prompt opens to give a manual menu selection with operations. The user needs to select which operation he wants. The options are

1. Emotion Recognition
2. Face Detection
3. Speech Recognition
4. Exit

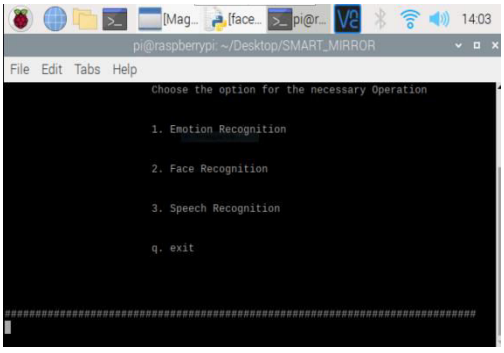

Fig 16: Command Prompt with User Manual selection

VI. CONCLUSION

The fundamental qualities of the undertaking are this is another sort of smart appliance that individuals don't see each day and it looks marvelous. Smart mirrors can possibly improve the client experience of getting to and associating with data. They permit clients to see pertinent data easily. The smart mirror spares time and makes it simpler to get to data.

A cutting edge smart reflect framework that gives data which include timestamp, calendar, day of the month, exact temperature and humidness, and most recent global information during glancing, grooming before the mirror.

The proposed system is:

- Cost-Effective
- Fast
- Accurate

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