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Design of Smart Mirror Based on Raspberry Pi

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Abstract
Smart systems are not only used on mobile phones and tablets, but also many intelligent & smart gadgets are coming into existence. Nowadays 3D mirrors and hair salon mirrors are expensive, and are limited to use in public places. With this project, a smart mirror based on raspberry pi is designed for the home of Internet of Things. A smart mirror is a two-way mirror with an electronic display behind the glass so that it could display information on the mirror. The smart mirror is made of raspberry pi as the host controller. In off condition, the smart mirror acts just like a normal mirror whereas in working condition, the system by raspberry pi is connected to the network through Wi-Fi, and obtains information through an API and displays date, time, weather information, social feeds etc. in the form of widgets. Our smart mirror comes along with an Android app so that the user could configure what he wants to see on the display. The user can select options from the personalised menu. The designed smart mirror has the advantages of small size, simple operation, low cost, is suitable for families, and has broad application prospects.

Keywords: Internet of Things, Android Things, Facial Recognition

I. INTRODUCTION

With the introduction of system on chip such as the Raspberry pi, the idea of creating smart devices is widely practised with every age group. Specially the small age groups are showing more interest in this emerging technology were they can build their own small and smart systems. The main appeal of a smart mirror is to carry out the daily tasks in much smart and stylish way. This is a fun technology to work on. It's a display that acts as smart mirror but has the functionality of displaying multimedia data through mirror glass as if the mirror was the glass.

A basic approach to develop a smart mirror is to use a two-way glass, a monitor, a wooden frame to hold them. An android app is also being made to choose what data ca be shown on the mirror. Smart homes are developed with combination of smart systems and mirrors. The proposed system has few limitations. Like it is not possible to develop a mirror in normal house owing to a large space requirement. Voice recognition feature may not give the desired output. Smart mirrors are built from conventional mirrors into an interactive and informative display with special interactive capabilities. These features make it more appealing to the people. Moreover, there's an use of acrylic glass two make it two-way mirror. A person standing in front can see himself as well as the feed provides on the mirror. In this smart mirror, main things to be consider are the date, time, app notifications, etc.We're also going to use certain API's in order to display the date, time and weather in more accurate and presentable manner.

II. RELATED WORK

This section explores the various fields where 'Smart Mirror' can be used efficiently.

Frangly Francis,et.al.[1] proposed that in last few years, the home automation system has changed in many ways due to the introduction of wireless technologies such as ZigBee, 802.15.4 ZigBee is used for irregular signal transmission by the sensor. The home systems having wireless connectivity has to be impSeveral voice commands are taken in order to provide the desired output. With the help of this functionality an user can control the working of basic home appliances such as lights, fans, AC, etc.

Tara Al Hadithyet et.al.[2] The idea behind this paper is to display a smart interactive mirror which has smart functionalities. This mirror will provide a better interface than ambient home environment display mirror which is used for various purposes. Beside with the recent research in the Internet of Things standards and applications, the mirror is developed to enable users to control the

household smart appliances. The multipurpose user-friendly functionalities of the proposed mirror interface provide users with the versatility needed for better management and integration of daily tasks. A service oriented approach is adopted in the architecture of the proposed system. It consists mainly of two mobile applications devoted to the customisation of user profiles, which are displayed on the smart mirror interface once successfully paired. Moreover, in the proposed system, emphasis is particularly given to the user profile personalisation, as well as planned system interactivity and adaptability. Therefore, the planned system is set apart from others for its usability.

Mohammad Syafwan et.al.[3] IoT got the advantage that can help in simplifying users everyday lifestyle. Therefore, the researcher comes with a proposed system called Smart Mirror. This mirror is build for home with functionalities like operating the electrical appliances . Now this will gather some info from your gadgets in order to perform tasks accordingly. The way of interacting between system and user can be achieved by Sonus technology. Home appliance can be controlled via voice commands. The statistical approach used in this project is The Evolutionary Prototyping which collects all requirements and designs the system in a fastest method. A prototype is made in order to give feedback. Further improvements can be made to modify the prototype, seeing to user's satisfaction. As we know is Sonus can convert speech into text which can be helpful to configure any hardware easily. Now there are various voice command technologies like Siri, Alexa and Ok google which can help with operating the home appliances. When a hot word/hotkey is detected, it will be added to user's speech recognition cloud service, then the results shall be delivered. With this type of Smart Mirror system, people can manage their daily activities easily and also solve many problems in managing some house areas.

M. Anwar Tahim, Prakash Minhas et.al.[4] This paper describes the design and development of a advanced smart mirror that represents an low-key interface for the clime home environment. Some focus is also given to ensure fluidity in accessing these services with a minimum requirement of user interaction. In order to unlock the mirror one can use facial recognition and prove their identity for unintended mirror use.
A practical working model has been adopted to develop and implement some services, where the mirror interface, the devices, and the news and data feeds all use web service communication mechanisms. The smart mirror features have been executed by developing an easily extendable home automation system that facilitates the integration of household appliances and various customized information services.

Jun-Ren Ding, Chien-Lin Huang et.al.[5] states an amazing idea of an interactive multimedia mirror environment which can be named as Magic Mirror. Now the magic mirror is not so difficult to made as it can be configured with the regular machines and gadgets, and 3D and multimedia software. The integrated Magic Mirror, which includes speech recognition, speech synthesis, face detection/modified/recognition, 3D virtual genius, hidden LCD mirror, and camera, makes simple action to capture info about devices and network connections. A person can easily activate personal automated services using voice commands. The Magic Mirror can act as a servant who listens and follows the owner's commands and instantly responds to their queries, providing required adequate amount of data. Moreover, the Magic Mirror has the tendency to catch a person's feeling based on rate of speech and face recognition features to play the appropriate music and related content to change the user's mood.

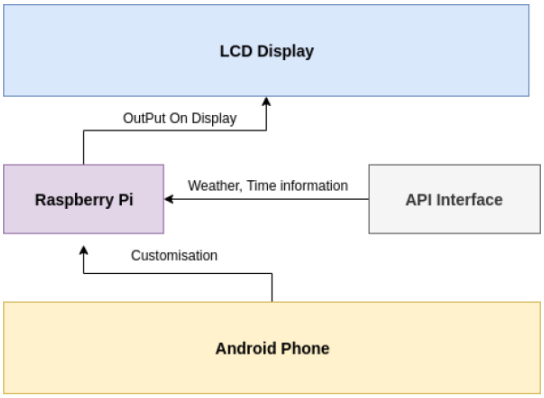
D.K. Mittal, V. Verma, R. Rastogi et.al.[6] States that multipurpose computing devices having wireless connectivity which embeds everyday things are being used in different activities and are giving a whole new experience. The interactive computing, voice recognition, artificial intelligence is providing comfort in persons daily life.. In every home there is a ordinary mirror and we watch it every day and find out how we look. The smart mirror is a modification over a ordinary mirror with interconnected smart devices and technologies with which offers advance functionality such as time, news, weather, booking an taxi or cab, showing maps. The mirror will help in developing smart homes and provide a ambient environment to the users. Machine Learning will provide self-learning and self-adapting features to the mirror which will keep the mirror updated and more responsive.

Snophy Porinchu, Ms.Seenia Francis et.al[7] describes that our daily lifestyle has become such that optimizing time is the most important thing.The work is based on the plan that we all look at the mirror when we go out, so why wouldn't the mirror become smart. The plan will provide basic services, like the display of personalized weather data, time, date and will also add some additional functionality, like reminders, tasks by smartphone synchronization and via social media. The plan is based on detecting presence of the person using Passive Infrared sensors and Wi-Fi connectivity. Once a person comes in front of the mirror, it displays the information that is being fed from the web.

Daniel Besserer et.al.[8] proposed the concept of a smart mirror for healthy and smart living, the Fit-Mirror. There are many uses who feel tired after getting up in the morning. This mirror is specially designed for them in order to make them feel motivated and refreshed,. The basic motive behind Fit Mirror is to uplift user's feelings by changing their mood and feel healthy and happy. Fit Mirror is developed in order to track users emotions and make them better and healty.

Derrick Gold, David Sollinger et.al[9] stated that a smart mirror is a device that operates as a mirror with additional functionality of displaying processed data, such as text, images, and videos. This smart mirror allows users to access and interact with received information, such as weather data, calendar, social feed seamlessly as part of their everyday routine. Moreover, the author has developed Smart-Reflect a software platform where smart mirror applications can be developed.

Rihane Tomez-Barmona, Siego Pasado-Hansilla et.al[10] This paper will provide the info regarding the multipurpose use of the mirror.Now with this good functionality it's possible to verify employess identities.The smart mirror also provides indoor work place conditions. For personal physical exercise data obtained from smart watches and general information (e.g. Date, time, weather, social feed and daily news).



III. DISCUSSION

TABLE 1 – comparative analysis for character recognition systems.

Authors	Approach / Techniques	Features	Pros	Cons
Frangly Francis,et.al.[1]	A Novel framework for Smart Mirror	Includes the IEEE Standard Zigbee for secured networking.	Control electrical appliances like lights in a home using voice commands.	-May face some connectivity issues. -Voice commands may not give the desired output.
Tara Al Hadithyet et.al.[2]	Mobile Programmable Smart Mirror for Ambient IOT Environments	Recent advances in the Internet of Things standards and applications.	Customised information services for user profile generation.	-Advanced programming may be required to handle complicated devices.
Mohammad Syafwan et.al.[3]	Smart Mirror, Smart Life	Includes the use for Sonus technology for user & system interaction	Users can manage their daily activities at ease as well as solving many problems	-Relevant information may be disclosed.
Prakash Minhaset.al.[4]	Smart Mirror for Smart Home Environment	Provides social feeds in the form of app notifications	Face recognition-based authentication is used to automatically	-Face recognition may not work accurately with some people.
Jun-Ren Ding,	Magic Mirror 2	Web connectivity, and	Interactive multimedia	-It may face 3D

Chien-Lin Huang et.al.[5]		Multimedia software	mirror system. 3D and multimedia software.	interactive issues. -Compromising with the quality.
D.K. Mittal, V. Verma, R. Rastogi et.al.[6]	Interactive features like with providing feedback	Smart computing, voice commands, AI	- Heterogeneous computing devices. - Self-learning	- Multiple devices may get connectivity issues
Snophy Porinchu, Ms.Seenia Francis et.al[7]	Framework for Interactive Display.	Passive Infrared sensors and Wi-Fi connectivity	- Optimizing time is the most important thing.	-Time is an major constraint in this project.

IV. CONCLUSION

As a conclusion, the application is the new technology for smart life. From the result testing, most of the function of the application are functioning well and there still need some improvement to the categories of information like social media and email feeds to be displayed on smart mirror. These can be customised by utilising a dedicated mobile application, which allows users to create and manage their profiles based on what they wish to display on the smart interactive mirror.

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