Smart Mirror

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Abstract - This paper depicts the design and development of a smart mirror that represents an elegant interface for glancing information for multiple people in a home environment. Face-recognition based authentication is used to detect the user. The Smart Mirror implemented as a personalized digital device equipped with peripherals such as Raspberry PI, microphone, speakers, LED Monitor covered with a sheet of reflective two way mirror provides one of the most basic common amenities such as weather of the city, latest updates of news and headlines and local time corresponding to the location. Using speech processing techniques the Smart Mirror therefore interacts with the user through verbal commands, functions and listens to the user's question and responds to their commands adequately.

Keywords - Smart Mirror, Raspberry PI, Weather, Time, News, Face Authentication

I. INTRODUCTION

Interactive computing, with wirelessly connected embedded devices that are being used in various day–to–day activities, are changing and improving the standards of the quality of life. Based on this interactive computing and communication technologies, many devices/products are now emerging and with this multimedia intelligence it is providing comfortable, secure and convenient personal services everywhere whether it is home or various industries and making a lot of users comfortable. We look at the mirror daily and interact with it psychologically to find out how we look and how our attire is. The interactive mirror is a development effort to augment the mirror with proper embedded intelligence for offering enhanced features such as weather of the city, latest updates of news and headlines and local time corresponding to the location. The objective of this project was to design and prototype a device that will act as a "Smart Mirror" by displaying the user's daily info and providing customizable information on the display. A "Smart Mirror" is a device that acts as a traditional mirror while also superimposing informational data, which can be customized by the user. The mirror also allows user interaction with some of the data.
The remainder of this paper is organized as follows: Section 2 briefly comments on theory and some related works. This is followed by the description of the smart mirror including the design and architecture of the proposed Smart Mirror in Section 3. Conclusion and some thoughts on future work are presented at last.

II. RELATED WORK

Our Smart Mirror represents a natural interface that facilitates access to personalized services. This is an attempt to contribute to the design of a smart mirror-like interface as well as the smart environment in which the interface is used for interaction.
Below we briefly comment on some related research in this direction. The Smart Mirror contains some devices equipped with a touch screen or TV enhanced externals devices. However, most of them support entertainment and some interactive tasks. The work has been reviewed as follows:

- Mirror 2.0 [1] combines the advantages of a smartphone and a mirror. It contains an LCD display positioned behind the glass. It provides news and weather information and it allows the playback of both videos and music.

- Smart Washbasin [2] displays different information in a wash basin mirror such as mails, weather forecast, the water temperature and pressure, the calendar and the user's weight measured through a built-in-scale in the base portion. The device consists of an Android Tablet that displays the widgets on the basin mirror, made with a semi-reflecting glass put on top of an LCD display. It is possible to control it without touching the screen surface, since it is equipped with proximity sensors able to track the hands position and motion.

- NEOD Framed Mirror TV [3] is a standard LCD screen (up to 50 inches), covered by a mirror, and specifically designed for the screen. The screen provides some TV functionalities, but it does not provide more interactive features.

- Smart Mirror for home environment [4] allows to control all the smart devices at home. It relays on face recognition for authenticating the user and displays personalized information (news, mail, messages etc.). The system exploits a touch screen monitor and two webcams, one for the face recognition and one for the home surveillance.

-Multi Display in Black Mirror [5] by Toshiba is a prototype that combines the functionalities of a tablet together with the reflecting surface of a mirror. It provides two configurations taking into account two different home environments: the bathroom and the kitchen. Considering the bathroom, the prototype provides useful information for the beginning of the day such as the weather forecast and fitness information coming from personal devices. In the kitchen, the setting includes a camera allowing the user to interact through gestures while preparing recipes and controlling the appliances.

- The Reveal Project [6], created in the New York Times research and development, consists of an LCD Display covered by a mirror glass. The device exploits a Microsoft Kinect for tracking user's movements in real-time. It visualizes different information on its surface (calendar, mail, news, online shopping websites, instant messenger etc.). In addition, it responds to vocal commands. A peculiar feature is the medicine box scanner, which allows the user to buy medicines recognizing their packages.

In comparison to works described above, our work is different in that we aimed to develop a working system for providing services in the ambient home environment based on open standards and off-the-shelf technology, where the smart mirror is the interface to access/control various data feeds, information services, and act as a home automation device.

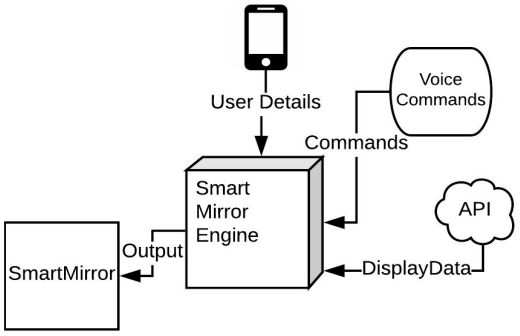
III. PROPOSED SMART MIRROR

The mirror is eventually a technologically augmented interaction device. The objective of designing the mirror is to provide a natural interface in the ambient home environment for accessing various services such as location based weather, time, calendar, gas detection etc. The project includes downloading the Raspbian operating system based on Debian and extracting the image on SD card, inserting the card in the Raspberry Pi SD slot and then performing the required steps.

We plan to deliver a working prototype i.e. design and development of a futuristic Smart Mirror on Raspberry Pi3 for the ambient home environment as well as for commercial uses in various industries. Most people have mirrors at home, so the concept of a smart mirror that you can interact with is attractive and can be fantasized by anyone. At times no one has time to read the newspaper or switch on the TV right in the morning to check the news headlines or the weather forecast. If a mirror serves to this purpose, one can imagine the amount of time it will save and be of such a great use.

The device will look like a regular mirror but will have a reflector inside it which will be responsible for interacting with the user. The project which would collect real world machine data such as location based latest news and headlines, weather reports, and as well as show us the local time. The data would be transmitted from the machine and would be managed in a central database. We have also worked on including Artificial Intelligence in the Smart Mirror wherein a Voice enabled assistant will cater to the needs of the user. We are also using AI for performing face authentication. To customize the data that the user sees on the mirror, we are providing a very intuitive and user friendly android app.

Figure 1 shows a schematic view of the proposed smart mirror.



IV. FUNCTIONAL OVERVIEW

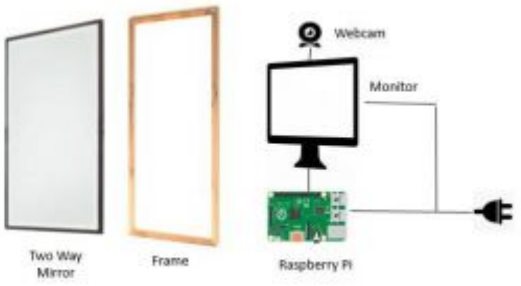
The proposed mirror is designed to perform several functionalities that can be summarized as follows:

a) Mimic a natural mirror interface.

b) A flat monitor is used for the mirror display. A one way mirror is used to provide real time display of what is located in front of the Smart Mirror using Raspberry Pi thereby mimicking the function of a regular mirror.

c) Personalized Information services: Users will be able to obtain news updates, weather reports as well as get reports of our interests.

d) Customized management of profiles: Users can create their own profiles and store them in the system. According to this profile, customized services are provided to the user.



V. CONCLUSION

The Smart Mirror thus accomplishes incredible functionalities using all the technology inside it, making it very approachable to use and integrating seamlessly into our lives. The Smart Mirror has scope in the field of IoT and home automation. The Smart Mirror can be connected to the home appliances, mobile devices, etc. which can expand the functionality of the mirror.

We have designed a futuristic smart mirror that provides natural interaction between users and the ambient home services. The mirror display is provided by a flat LED display monitor which displays all the necessary information which are useful for the user. We have developed a functional prototype to demonstrate our work. Overall, the prototype provides an easily extendable framework that can be utilized to provide even more functionality to the user.

The goals of the smart mirror is to aim to reduce time needed in a user's daily routine and provide a merger of user and technology that becomes an enhancement, not a new burden. The functionality must meet these descriptions in the design. The smart mirror did the thinking for the user with intelligent, commonly used applications. Data of apps like calendar, music, news, and weather will be available. The data will be unobtrusively displayed on the screen, hidden by the two-way mirror, as to look like a seamless experience.

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