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"Hermione 1.0"- A voice Based Home Assistant System

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ABSTRACT

The smart mirror is a popular project among DIY enthusiasts and it usually consists of a one way mirror with a screen attached to it that displays a static web page. However what this project wanted to achieve through "Hermione 1.0" was something user could interact with. This project's goal was to learn how a Raspberry Pi worked and to understand how to combine the software and the hardware components to create an IOT based project. The main goal of this project was to develop a smart mirror device as well as an operating system to run on similar devices. The device was to look like a regular mirror but would have a screen inside and you would be able to interact with it using voice commands, hand gestures and smart phones. The operating system would support running apps. The main features the Smart Mirror would have would be showing basic weather and time information, being able to add alarms, reminders or notes in a similar way we stick notes on a fridge. User would also be able to read messages and email and interact with the mirror, for example. The software needed to be designed to be modular and responsive in order to fit different hardware. Up to now there have been many Smart Mirror projects but somewhere they lack interactivity. The project aims to change this by letting the user interact using different means.

Keywords: IoT, DIY, Hermione 1.0, Raspberry pi, Mirror

I. INTRODUCTION

Hermione 1.0 is an extension to the Magic Mirror platform on the Raspberry Pi. The Magic Mirror platform provides the user with easy installation of a Smart Mirror for domestic use. Hermione 1.0 brings to the user all the functionalities of the traditional Magic Mirror along with a personal home assistant, Hermione. Apart from having more features than a traditional Magic Mirror, Hermione 1.0 is comparatively easier to install and customize. Hermione 1.0 aims on utilizing the underlying processor in a better way so as to improve the performance and throughput. A personal Home Assistant thus could be added. Also, the increasing use of Internet of Things (IOT) devices has generated a need of a display that could be used to monitor them. Hermione 1.0, thus, uses various cloud services to integrate this into the list of services that it provides.

The Magic Mirror is a modular smart mirror platform which helps in providing a futuristic view to the rather simple and dull looking home mirror. The current implementations, although great in User Interface (UI) and User Experience (UX), do

not utilize the underlying processor to the full of its potential. Also, in the existing implementations, the ratio of the number of features included to the cost of the product is so small that mass production of such devices has become commercially unviable. Services like personal home assistants and IOT Displays are the need of the time. However, there exists no medium which could unite these services into one head. Hermione 1.0 brings together all of these features into the Magic Mirror platform and thus improves the overall experience.

Smart mirrors, such as Magic Mirror and Home Mirror have recently started to be developed by people in the Maker community, with varying degrees of interactivity. However, so far, the features of these mirrors have been limited. This final year project describes how a smart mirror was built from scratch using a Raspberry Pi for the hardware and custom software built on top of Raspbian, a Linux distribution. The goal of the project was to create a Smart Mirror device that people could interact with but also to further develop the technology so that it would let you install and develop your own applications for it.

II. RELATED WORK

This project was inspired by a "Magic Home Mirror" device that we found while browsing the DIY section in a popular website called Reddit. The "Magic Home Mirror" is a Nexus 7 Android tablet attached to a one way mirror. The device has a display with a webpage that shows time and weather information and it looks very futuristic. There were also some similar projects that were built using a Raspberry Pi mini computer, but again it was a static panel with no interaction. The project has a very broad scope covering some current popular topics in the IT sector such as the Internet of Things, Maker culture and home automation.

The projects and products similar to our smart mirror project cover a large spectrum of functionality and purposes. There were significantly more projects than actual products. Some blame can be put on the fact that the smart home is still an emerging market and is limited by the cost of manufacturing keeping the products out of reach from the everyday consumer. The fact that there were more projects shows the interest in developing a more affordable and functional smart mirror. Although, the actual products developed by a company delivered on features, they were either still in a development phase or already priced too high to be considered a viable competitor.

Table 1. Existing Systems And Features

Devic	Features	Usage &	Website
Magic Mirror	Informational display , no user	Hobbyist project for personal	http://michaelteeuv.nl/taged
Samsung Smart Mirro	3d camera gestures control, voice control	Expensive luxury device, out of price range for	http://wwwbusinessinsider.com/samsu
Tech H20 televisions	Displays that also function as mirror	Only the mirror display component; no UI is involved with the device	http://www.tech2o.tv/

III. METHODS AND MATERIAL

Research of this project was done for about a month over the different available sources on internet and from there we came to know that there are many

such ideas implemented before, but as the research says none of the idea has assembled all the different facilities together, so from this we came to the conclusion that assembling all the different features together with some extra functions we can create a better product for use that will enhance the user facility and will keep them in touch with the technology of the real world.

One of the Major challenges in the implementation phase was the part of communication between all the technologies that are being used. The flowchart below describes the data flow between these components.

Following is the **flow diagram** of the Project that will highlight the actual data processing and the implementation of the project:

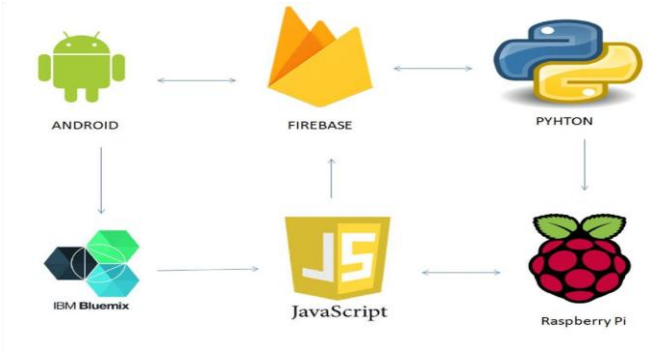

Figure 1. Flow Diagram of Technologies used

- **PHASE 1 -**

The inception of the Project was done with developing the Web Pages which were linked with the Firebase Back End Support. The development of the Web Pages was done using HTML5 and CSS. Linking with the Firebase Database was done using JavaScript. Once tested, these pages were deployed on the Raspberry Pi. The Raspberry Pi was configured to load the web pages at boot and display the result in the Landscape mode. So, the first phase had a working website which was linked with the Firebase System. The Web Pages currently had data about the date and time, the weather, the news. Also, an Alarm Clock module was integrated.

- **PHASE 2 -**

The controlling of the web pages until this point was done by manually changing data into Firebase. There was a need to do this in a hands free way. The Android application thus was developed. The Application used the same database as the Web Pages did. The application was linked and tested. Now, the user could change the current web page just by the click of a button.

- **PHASE 3 -**

The user would always not have the Smart Phone. Considering this constraint, there arises a need to provide input to the Pi directly. This was achieved by using the PocketSpinx Module of Python. Linking Python to Firebase was done by the Pyrebase Library.

- **PHASE 4 -**

Now, was the time to add the Home Assistant, Hermione? The Google Text to Speech Module of Python was used to achieve so. All the coding was done in Python, and the script for listening as well as for delivering the speech continually ran on the Raspberry Pi.

- **PHASE 5 -**

Next, the Bluemix Cloud Platform was used to display the status of IoT devices. Due to budget constraints, the device we used was an Android Phone. The phone was linked with the Cloud. All the data like temperature, accelerometer readings, and current location were accessed. We chose to display the current location of the device onto the Pi.

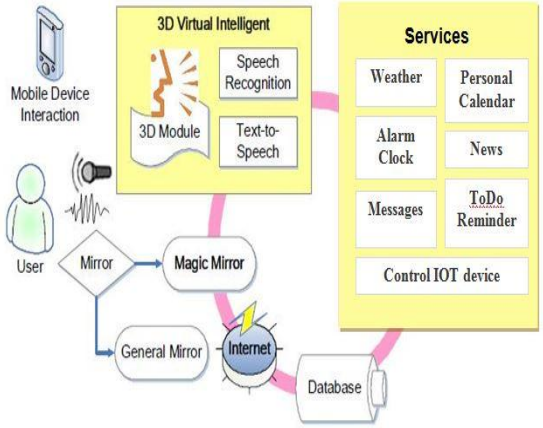

Figure 2. Function diagram of Hermione 1.0-mirror

IV. RESULTS AND DISCUSSION

The research in the first semester allowed for the team to learn about the different components in the design and get familiar with what we actually need to acquire. The design evolved along with the research to fit what is actually possible and what needs to be done to stick to the timeline and budget. The budget for the smart mirror project was developed early on in the project process. The original budget was setup with slight overestimates in each category to allow for movement of costs around to different components once proper research had been conducted.

Table 2. Materials Required For The Mirror

Sr. no	Equipment	Cost
1.	Raspberry Pi 3 Model B	`3228.00
2.	16GB MicroSD card	`499.00
3.	LCD Monitor	`3500.00
4.	Two-Way mirror +Wooden frame	`1200.00
5.	HDMI cable + HDMI to VGA connector cable	`500.00
6.	USB charger and Extension cables	`500.00

The final results of the project are satisfying as almost all modules are running successfully; just the mounting of the mirror in the whole frame is yet to be assembled.

The final Deliverables from the project are --

1. **Android Application:**
   - For customizing the display.
   - For obtaining the voice inputs.
2. **Magic Mirror:**
   - Will exhibit the current status of all the connected IoT devices and control them.
   - Will display notifications for E-mails, Messages, and Phone calls.
   - Will get general purpose information like the Date, Time, News, etc.
3. **Home Assistant:**

   With 'Hermione' the user will be able too
   - Exchange pleasantries.

   Change settings & get status information.

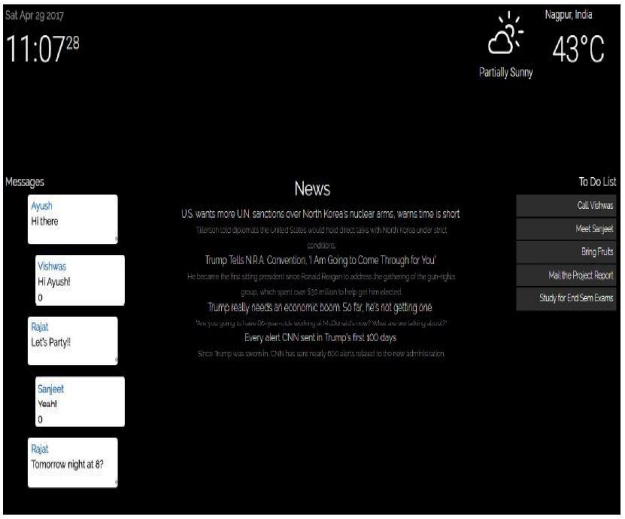

Figure 3. The Mirror interface which will display various notifications, messages, ToDo lists, etc.

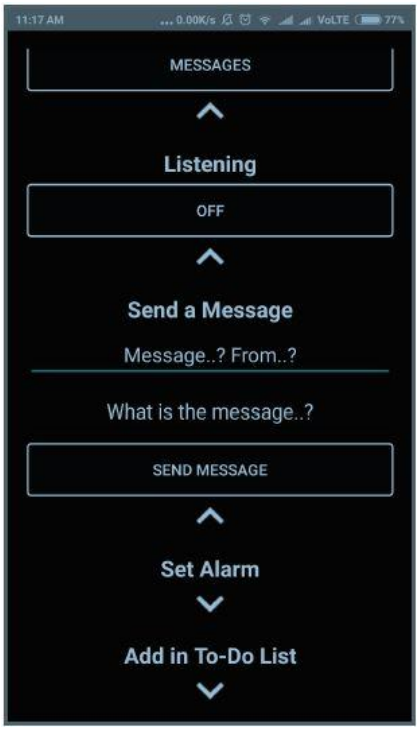

Figure 4. Screenshot of the Android Application to control the Mirror and provide voice input

V. CONCLUSION

This project will help to improve the Magic Mirror Platform. It is a Smart Mirror already and brings together two widely used features, that of a personal home Assistant and that of a device which would display the status of an IOT device. Hermione 1.0 is easy to deploy and has an edge over all the current implementations of the Magic Mirror.

There are many future possibilities for this project and hopefully it will be continued. The future implementations of the project would be to connect the voice assistant to various home, office appliances and control the appliances through voice commands.

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