

Smart Mirror using Python

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Abstract - Embedded systems are present everywhere right from mobile phones, smart cards to biometric systems. Embedded system is an electronic system which is designed to perform limited functions with the interplay of hardware and software. Python has emerged as the new programming language for embedded systems due to its advantages such as writeability, error reduction, and readability. This paper designs an innovative smart mirror which represents a model for the generalized home environment. The mirror furnishes a collaboration between the user and household smart appliances, in accessing the services like climate, time and location information, current event information, with a minimum amount of user involvement using python as a language via voice commands doing away with the need to sit with the laptop and tablet.

Keywords –Smart Mirror, Python, Raspberry Pi B+, RTOS

I. INTRODUCTION

An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, store and also control the data in various electronics-based systems. In a simplest and most general form, an embedded system constitutes of a processor, sensors, actuators and memory. The idea is that any application should have the proficiency to provide solution to a real-world problem, for which some data is definitely to be read in. from the sensors. This data is processed by the processor and the result of it is given to actuators which perform appropriate actions. An embedded system is a subset of some larger system. For example modern different types of embedded systems which can be used for automaion eg. driverless car.

Most of Embedded Systems use Real Time Operating System (RTOS) to serve real time applications. RTOS is an operating system that perofrms a taskwithin the deadline that maybe absolute or relaxed. A RTOS handles some real time tasks or routines. The kernel of the operating system allocates the CPU to a particular task for a specific period of time. It also scrutinizes the task priority, sort the messages fromschedules andtasks.

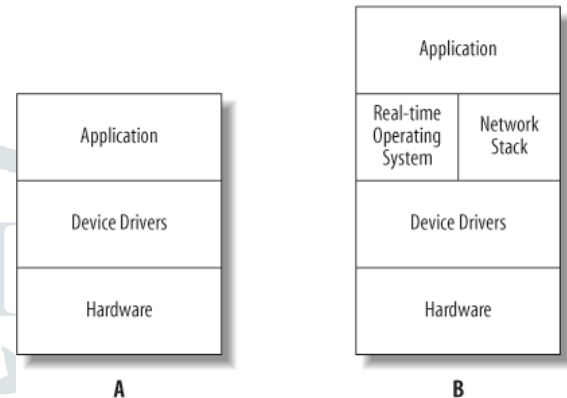


Fig. 1. (A) Basic embedded system software and (B) a more complex embedded systemsoftware

Programming Languages for Embedded Systems:

- C/C++ - According to a survey conducted by IEEE spectrum in the year 2016, C and C++ were the two topmost popular languages used for programming embedded systems
- Python. ...
- VHDL and Verilog. ...
- Online Resources.

One of the widely used programming language for embedded systems is C language. Of course, C is not the only language used by embedded programmers.

Where as Python is a general purpose, multi-programming paradigm language which lays stress on eliminating the redudancy as much as possible for a simple and lucid code.

Python incorporates numerous libraries making it easy to implement different useful. It is excellent language for automating testing, collecting and analyzing data [1].

We have designed embedded system –smart mirror using Python as a programming language.

II. PROPOSED SYSTEM AND BLOCK DIAGRAM

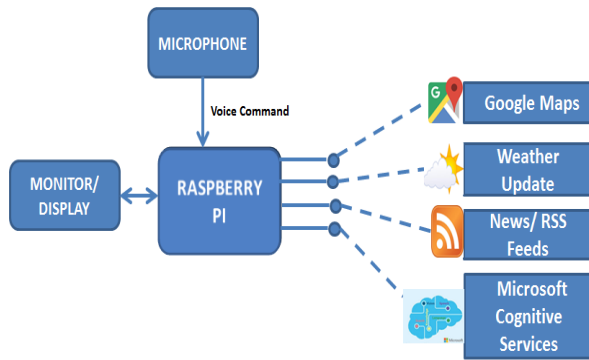


Fig. 2 Proposed system

The proposed system is to design an interactive smart mirror using Raspberry Pi B+. It also incorporates the features of artificial intelligence which has an ability to recognize voice and provide details of the same. Majority of day-to-day activities use interactive computing, with wirelessly connected embedded devices. Based on this technology, many devices/products are now emerging and along with added intelligence it provides comfortable, secure and convenient personal services everywhere. The project aims at creating a smart system for users where it detects voice using Python. The mirror will recognize user's voice and it will be processed using Raspberry Pi B+ and display user's feeds.

III. COMPONENTS REQUIRED

The Smart Mirror makes use of hardware components and software to display information.

Hardware Components.

1. Raspberry Pi B+: A Raspberry Pi B+ is a smart card-sized computer originally designed for education. Eben Upton's invention goal was to create a cheap device that would upskill programming and hardware understanding at the pre-university level [2]. Due to its small size, it was quickly accepted by project enthusiasts people around the world for designing microcontroller based projects [3]. It has 1.4GHz 64-bit quad-core processor, dual-band wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and Power-over-Ethernet support (with separate PoE HAT).

2. Mirror: Each person living in this world of factitious knows what a mirror is. It is an object found in most people's homes. In the mirrors we see our reflections, but in today's world of innovation where nothing is limited to its original advent lets a mirror to transmute into a smart mirror creating a perfect interaction between a user and the mirror or to be more factual to your own reflection making it economically beneficial. You can imagine a smart mirror as a three piece suit, as the mirror consists of Raspberry Pi, wooden frame with acrylic sheet and a monitor for display purpose.



Fig. 3 Raspberry Pi B+

Software and Tools:

1. Raspbian OS: Raspbian is a free operating system optimized for the Raspberry Pi hardware. Raspbian has over 35,000 packages with various pre-defined functions. This facilitates easy installation on a Raspberry Pi computer.
2. Python: It is an easily adaptive, powerful programming language with efficient high-level data structures. Python's well-designed syntax makes it an ideal language for scripting and rapid application development in many areas on most platforms.

IV. IMPLEMENTATION

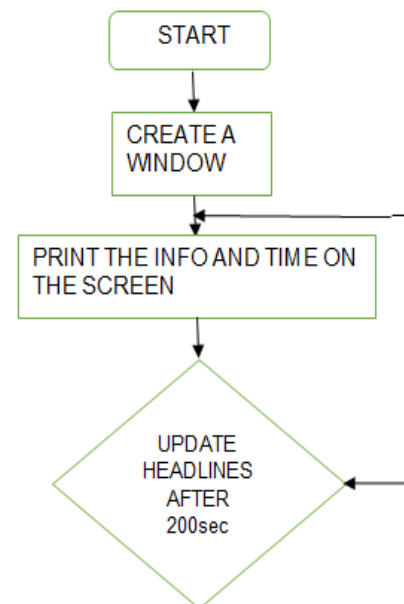


Fig. 4 A Flowchart of the software design

Initially the mirror will be in sleep mode acting like a normal mirror reflecting.

Raspberry Pi B+ is the main linchpin for this proposed model. The Raspberry Pi B+ constitutes a micro SD card which is loaded with Raspbian operating system [2]. After the OS is running, the Mirror code will then be implemented on it to run the application. The Monitor will be getting input from RPi using HDMI cable and voice commands can be given to RPi using a microphone.

The Smart Mirror interface is designed and implemented such that user interacts with the mirror interface using his/her's voice commands. User will be able to give voice commands to the mirror using a microphone connected to

the Raspberry pi 3. The mirror will display data in accordance to the user commands. Updates are retrieved from the internet and displayed on mirror. Anyone using this mirror will be able to get real time updates of traffic, stocks, news and headlines, date, time, weather updates as well as other reports of our particular interests [4], [5].

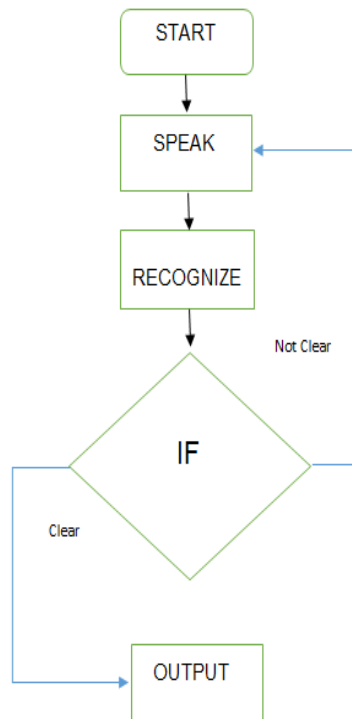
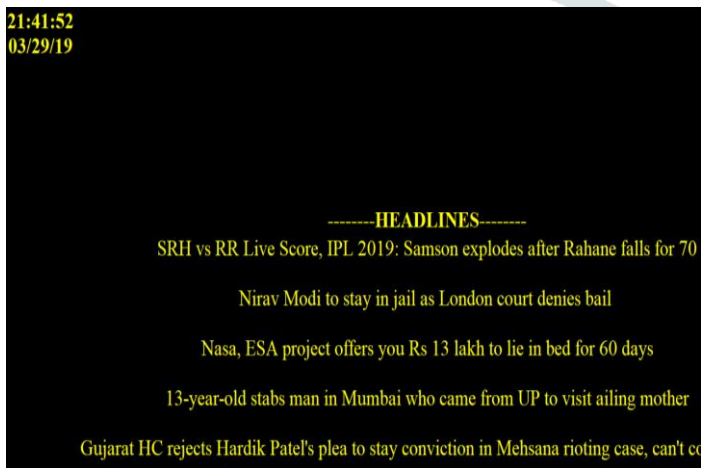


Fig. 4B Flowchart of Software Implementation

With more further enhancing creativity the smart mirror is supported with Google API which chisels its limit be more than a mirror to be looked into. By using open CV the mirror grabs the power of being a virtual assistance or in other words like your own personal assistance helping you groom yourself. Due to advance connectivity with communication devices the mirror can notify you for not being late to you professional calls [6], [7].

V. RESULT



Iris-What can I do for you sir?

Done

Hello

Iris-Hello Sir! Great to see you

Iris-What can I do for you sir?

Done

Can you please open www.youtube.com

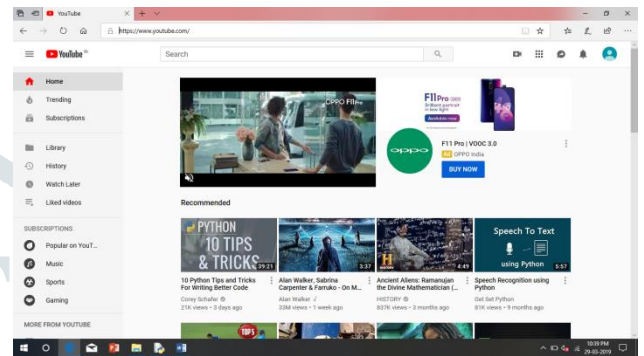


Fig. 5 Smart Mirror Result

Smart Mirror displays applications so that we can check the weather, local news, etc. while getting ready in the morning. It is also modular so we can easily move it around or hang it on the wall as we like.

VI. CONCLUSION AND FUTURE SCOPE

We have built a working model to demonstrate various functionalities of the smart mirror using voice commands.

We have designed a smart mirror keeping in mind the upcoming future advancements in the field of IoT. The prototype of the mirror is powered and controlled by the Raspberry Pi 3 and all the final output in the form of real time data feeds are displayed on screen. In future work, we can add advanced gesture controls, automated salutation using face recognition of the end user and also understand that how advanced artificial intelligence can be implemented to the mirror so that it can automatically take care of all the requirements of the end user.

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