Automation of Home on Raspberry Pi Platform

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Abstract—Home automation is now a days drastically demanding and become more and more popular due to its numerous advantages. This can be achieved by local networking or by remote control. The Raspberry Pi is a newly emerging low cost single-board computer which is best alternative to recent home automation technologies. In this paper we focus our attempt at building a low cost stand-alone device. This paper aims at designing a basic home automation application on Raspberry Pi. Interface camera and RFID reader as security purpose and GUI for simplicity purpose the algorithm for same is implemented in python environment which is the default programming environment provided by Raspberry Pi.

Keywords—Home automation, Raspberry Pi, Security Simplicity Purpose

I. INTRODUCTION

Home automation provides the comfortable, flexible, safe domestic environment and improves standard of living of human life stlye. The most available home automation systems use different wireless communication standard to exchange data and signaling between their components, like Bluetooth, Zigbee, Wi-Fi, and finally the Global System for Mobile Communication (GSM) . Wireless based home automation systems decrease installation cost and effort, and enhance system flexibility and scalability. In Home automation systems there are collections of interconnected devices for controlling various functions within a house. Mobile devices are ideal in providing a user interface in a home automation system, due to their portability and their wide range of capabilities. Within the house, the user might not want to go to a central control panel, or not even to the laptop, but use the phone that is usually placed in closer proximity to the user. When far from the house, the user might want to check its current status or even schedule actions for his return.

Raspberry Pi (represented in Figure 1) is a credit-card-sized single-board computer developed in the UK by Raspberry Pi foundation with the intention of stimulating the teaching of basic computer science in schools. It has two models; Model A has 256Mb RAM, one USB port and no network connection. Model B has 512Mb RAM, 2 USB ports and an Ethernet port. It has a Broadcom BCM2835 system on a chip which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and an SD card. The GPU is capable of Blue-ray quality playback, using H.264 at 40MBits/s. It has a fast 3D core accessed using the supplied Open GL ES2.0 and Open VG libraries. The chip specifically provides HDMI and there is no VGA support. The foundation provides Debian and Arch Linux ARM distributions and also Python as the main programming language, with the support for BBC BASIC, C and Perl.
II. LITERATURE REVIEW

As per our survey there exists many such systems that could control home appliances. Each system has its own unique feature. Following model describes the work performed in our project. Home automation using Bluetooth. Most systems would exchange data or would communicate with the help of Bluetooth, ZigBee and GSM. These systems have their own disadvantages. For example, system-implementing ZigBee has too low bandwidth for the data communication whereas the GSM implementing system has too large bandwidth for the data communication. Thus, there is wastage of the essential bandwidth, which goes without being used. Java Based Systems still use web pages, which is a disadvantage if data Internet is off. But raspberry pi is somewhat operated differently than the above mention Devices. such as it has The Pi uses a single USB 2.0 bus for Ethernet in addition to all USB ports. A USB 2.0 bus can handle up to 480Mbits/s of bandwidth - a significant portion of that will be consumed by the overhead due to managing multiple devices, with exact numbers being hard to find, as they depend on each individual connected device.

III. EXISTING SYSTEM

The existing system for our project is as follows Sensors, camera interfacing

a) IR sensors:
   It is an electronic device, that emits in order to sense some aspects. This sensor measure only infrared radiation. In our project we used IR sensor detect the human coming at door.

b) Camera interfacing:
   A web interface for the R-Pi Cam that can be opened on any browser (smart phones included) .It takes single or multiple (time lapse) full-res pictures and save them on the Sd-card. We are interfacing camera with raspberry pie which is used For home security purpose. It captures images of stranger entering house and the images are saved on sd-card and could be send on browser.

IV. HARDWARE AND SOFTWARE REQUIREMENT.

i) Hardware:
   A) Relay Interface Circuit
The relay interface circuit is used to connect the PC with the household electronic or electrical appliances. The circuit comprises of a relay (5v, 5A), a free wheeling diode, a transistor to drive the relay input and connectors to interface parallel port.

B) HDMI adapter:
high density media interface. It is used to have connection between computer and raspberry pi kit.

C) Wiring:
flat ribbon cables are used to have connections with breadboard.

D) Control Electronics
Raspberry Pi as the controller for its processing power and large developer community, 4 relays are connected to power strips.

E) Prepared Operating System SD Card
As the R-Pi has no internal storage or built-in operating system it requires an SD Card that issue up to boot the R-Pi. You can create your own preloaded card using any suitable SD card you have. Be sure to backup any existing data on the card. Preloaded SD cards will be available from the R-Pi Shop. This guide will assume you have a preloaded SD card. Prepared Operating System SD Card Display (with HDMI, DVI, Composite or SCART input) Power Supply, Cables. Highly suggested extras include: USB mouse Internet connectivity- a USB WiFi adaptor (Model A/B) or a LAN cable (Model B). Powered USB Hub.

F) Internet Connectivity
This may be an Ethernet/LAN cable (standard RJ45 connector) or a USB WiFi adaptor. The R-Pi ethernet port is auto-sensing which means that it may be connected to a router or directly to another computer (without the need for a crossover cable).

ii) Software:
operating system:
Linux as it may seem, installing an operating system on your Raspberry Pi requires a Windows, Mac or Linux computer. This is because the stripped down mini-computer uses an SD card as its storage device, and as the device ships without the SD card, it is left to the user to download a suitable operating system and load it onto the card.

Programming languages:
Python is an interpreter, interactive, object-oriented programming language. It incorporates modules, exceptions, dynamic typing, very high level dynamic data types, and classes. Python combines remarkable power with very clear syntax. It has interfaces too many system calls and libraries, as well as to various window systems, and is extensible in C or C++. It is also usable as an extension language for applications that need a programmable interface. Python is a high-level general purpose programming language that can be applied to many different classes of problems.

Raspbian:
Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi.

The initial build of over 35,000 Raspbian packages, optimized for best performance on the Raspberry Pi, was completed in June of 2012. However, Raspbian is still under active development...
with an emphasis on improving the stability and performance of as many Debian packages as possible.

V. DESIGN AND SYSTEM ARCHITECTURE

In proposed system motor driver, camera, sensors and display interface with the raspberry pi board. HDMI to VGA converter used to have connection between computer and raspberry pi kit. When any person come at home IR sensor detects and camera capture the image of visitor. This images are store in SD card which inserted in board. RFID reader reads the RFID card and give permission to enter in home only to authorised person and decline permission to other unauthorised card holder. Permission is access by opening door. Motor driver is use for open close operation of door. Fig3 shows the actual flow of operation.
VI. CONCLUSION

The goal of the paper was to design a home automated system using Raspberry pi. So, as to help people to easily Operate the home appliances. This project is based on the Raspberry pi, and the
language used for communication of kit is Python. These platforms are Free Open Source Software. So the overall implementation cost is low and can be easily configured. We are implementing smart home ideas interfacing it with the kit and making Home to perform automated Operations. Which help people to easily monitor home appliances without any learning.

REFERENCES