

Raspberry Pi Based Smart Home

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Abstract:

Home automation is becoming more and more popular day by day due to its numerous advantages. This can be achieved by local networking or by remote control. The Raspberry Pi is a low cost single-board computer which has recently become very popular. In this paper we showcase our attempt at building a low cost stand-alone device. This paper aims at designing a basic home automation application on Raspberry Pi through Interfacing camera as security purpose and the algorithm for the same is implemented in developed in python environment which is the default programming environment provided by Raspberry Pi.

Keywords: Home Automation, Raspberry Pie, python.

I. Introduction

Raspberry Pi is a credit-card-sized single-board computer developed in the UK by Raspberry Pi foundation with the intention of teaching basic computer science in schools. Home automation refers to the application of computer and information technology for control of home appliances and domestic features. In Home automation results in convenience, energy efficiency, and safety benefits leading to improved quality of life. The inbuilt sensors can be accessed easily. We have built an application with following features such as proximity sensors, camera, internet, humidity sensors. it will take a picture or sound the alarm and email the pictures to you immediately. IP camera can be used in various places, such as warehouse, office, supermarket, and doorkeepers and so on. Due to the advancement of wireless technology, there are several different of connections are introduced such as WIFI, and Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implemented in HAS project, WIFI is being chosen with its suitable capability. The capabilities of WIFI are more than enough to be implemented in the design. Also, most of the current laptop/notebook or Smartphone come with built-in WIFI adapter. It will indirectly reduce the cost of this system.



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 480Mbps/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. We have implemented the Sensors like humidity sensors, proximity sensors.

a) Humidity sensors:

DHT22 humidity sensor is used to sense surrounding humidity. This sensors could be used for temperature monitoring and display the results on screen. We are implementing humidity sensor to control humidity of surrounding home.

b) Proximity sensors:

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. Proximity sensors can have a high reliability and long functional life because of the absence of mechanical parts and lack of physical contact between sensor and the sensed object. It's range could be varied by using pot. In our project we are

making use of proximity sensors for door purpose (i.e. Opening and closing of door).

c) 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. Proposed System.

In this paper, we propose a system, which is very different than the existing system. We are going to implement it with the help of Wi-Fi (Wireless Federation). The main advantage of this system is that it can be implemented with a wider range. It allows communicating with a brief and small set up without wired connection. This system can be extended for a proper Surveillance of home (Humidity control, security and remote sensing) system.

V. 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 freewheeling 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 in corporates 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. Raspbian comes with more than 35000 packages; pre-combined software bundled in a nice format for easy installation on Raspberry pi.

V1. Design And System Architecture

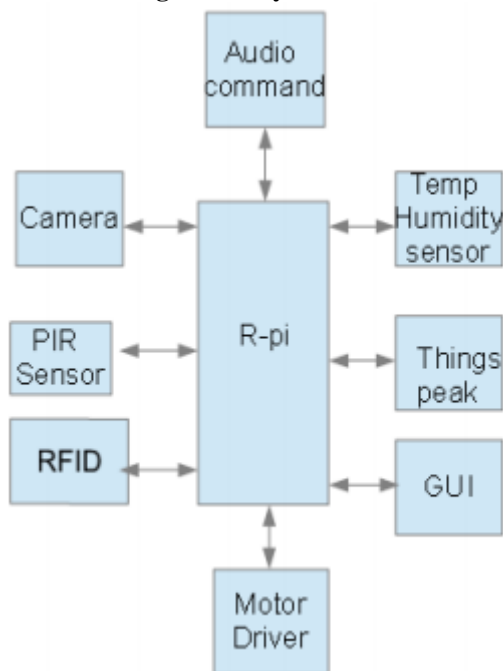
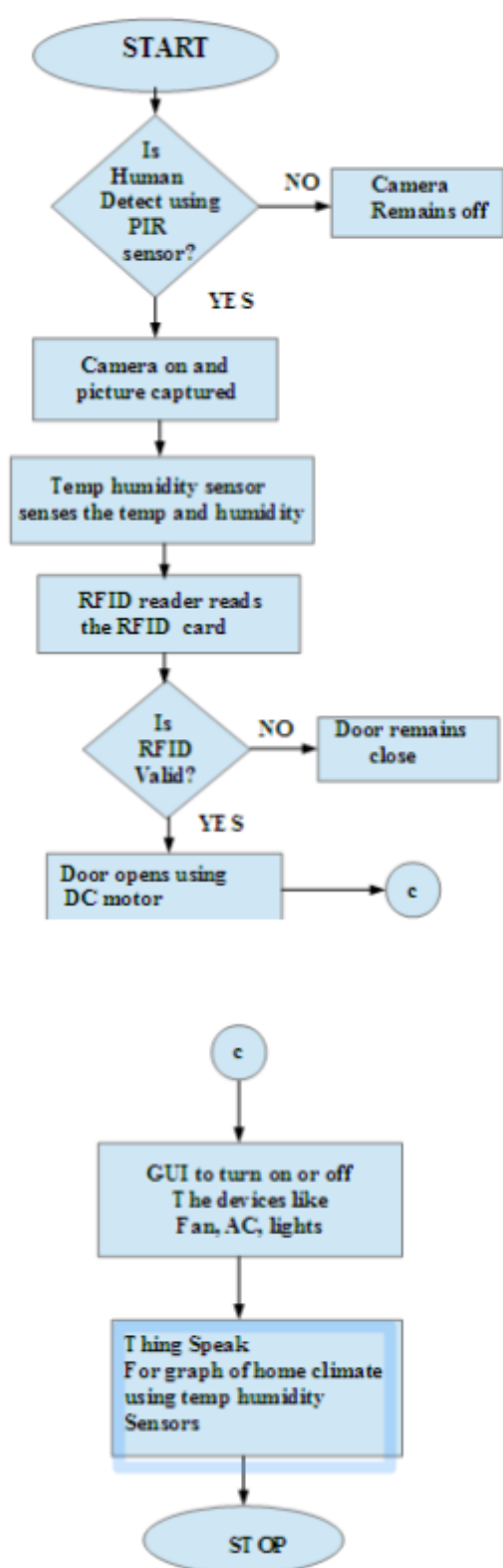


FIG.2 block diagram

Shows that in our system the camera interface acts as a security system that captures images .And the wifi Adapter is used to get network on the pikit.

The relay is used for switch in on and off the devices connected which is interfaced with the raspberry pie. The appliance such as sensor, camera are connected to the relay for controlling purpose. The switching circuitry is in hold of the devices to be automated

VII. Flowchart



VII. Conclusion

The goal of the paper was to design a home automated system using Raspberry pie. 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.

VIII. References

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