Appliances Control Using Ethernet and Raspberry PI

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Abstract: The aim of this work is to develop an embedded referring the presented paper on "Bluetooth Communication using touch screen interface with Raspberry Pi" and "Ethernet based Automation using FPGA". Considering their results we have designed a system which employs server/client architecture; switching commands for the appliances which are connected to the client can be received and displayed at either end. We access the device using the web page and the switches provide on the web page help us control the information The data containing information about the control commands are transferred between the end points of communication using Transmission Control Protocol (TCP). This type of control system gives the liberty for control of appliances from remote locations connected through Ethernet. A novel embedded system has been designed, implemented on Raspberry Pi and a small-scale prototype is developed and tested.

Keywords—Ethernet, Appliance Automation, Raspberry Pi, Transmission Control Protocol(TCP).

I. INTRODUCTION

Earlier there was a simple manual way of handling the appliances. However, with the advancement of technology came new ways of controlling the appliances like automation. Now a days everybody wants an affordable and secure way to control their home from any smart mobile device or Internet connection.. At the touch of a button we can have access to a large amount of information due to capability of computers and the Internet. Remote access is a wonderful feature that came in to being because of high speed internet.

The main objective of proposed system is to provide a technology oriented and low cost system to make a advanced home for those who stay away from their home and have got low budget for security of their house.

This project uses Raspberry Pi as the base. Home appliances are connected to Raspberry Pi through relays. Camera which is at home is also connected to raspberry pi board. Power Supply is provided using USB cord cable which is connected to the PC. A web page is designed using Html. The raspberry pi itself behaves as a computer. For this we have used Python coding for the booting process and also the main coding of relays is also done using it. Relays are used as electric switches for controlling multiple devices. It is accessed using the Ethernet port which is present on it. Putty configuration helps us to obtain the IP address of the raspberry pi board. We can access that using the web page through which if we put IP address of raspberry pi we can have live feed plus we can control the appliances. Ethernet is used because it can be used for providing high speed in transmission of data and it can also be used in long distance communication. It provides high security as it has its own IP address. Ethernet infrastructure offers network based control functionality.

According to [1], embedded system was designed and implemented by IEEE on Field Programmable Gate Arrays(FPGA's) and a small scale prototype was developed and tested. However, FPGA is a very costly kit and we have to handle it with lots of care. The control signal generated by FPGA cannot directly drive an appliance as it cannot deliver sufficient current, whereas Raspberry Pi overcomes these drawbacks.

According to [2], a system was developed which provides a superior and user friendly interface (TFT touch screen and display) reducing the complexity in operation of controlling the appliances The Raspberry Pi is controlled by a modified version of Linux optimized for the ARM architecture. The display contains a GUI which gives us various fields for data entry via an onscreen keyboard. Also, various fields were provided to display data obtained from a remote host.

II. METHODOLOGY

According to our work, we are using Raspberry Pi and Ethernet as the main important components of our project. Raspberry Pi is the advance version of ARM11 processor. Using putty configuration it is interfaced on computer and commands are written using Python. We are using latest version of Raspberry Pi that is Model B because it provides us with Ethernet interface. Also camera is interfaced for surveillance purpose. Relays are provided for the connection of the appliances and their control.

Thus, first of all we design web page using HTML which includes the information of the appliance we are going to control. Now we use this web page to have an access to the other Ethernet. Once we give an input through this web page other Ethernet has its own IP address through which we access it; gives it to further relay and the appliance works according to input. Simple principle behind this is automation. Camera can be used to check whether the operation is carried out according to the instructions given from the web page.
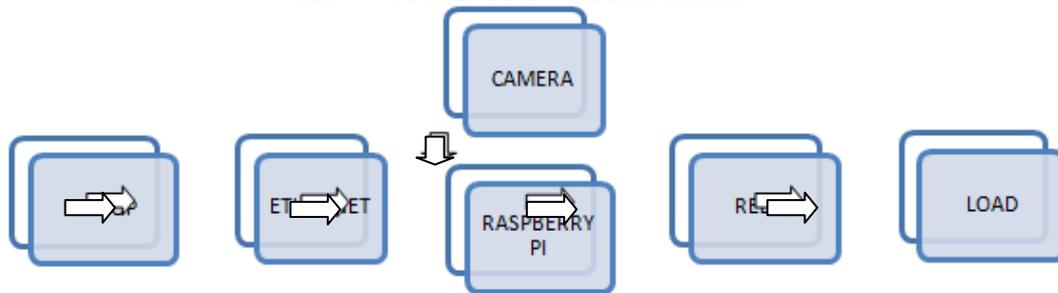
III.   SYSTEM BLOCK DIAGRAM

Fig 1: Block Diagram Of Appliances Control using Raspberry Pi and Ethernet.

> **DESCRIPTION:**

1. **PC:** In this we will design a web page using HTML. We will control the appliances using the web page instructions designed on PC. Also using the Ethernet port we will access the IP from the Raspberry Pi board.
2. **Ethernet Port:** This will be required for the LAN connection i.e. interface between Raspberry Pi board and the PC. Ethernet helps in obtaining the IP address configured on Raspberry Pi board. We are using SSH protocol.
3. **Relay:** Relay is a device which allows low power circuit to switch a relatively high current/voltage and controlling the actions performed. Designing this on PCB we are connecting the appliances like bulb, DC motor etc.
4. **Raspberry Pi:**This board contain the ARM11 IC. It operates similar to a computer and was developed in UK. We are using Model B as it provides us with the Ethernet port. Raspbian operating system which is Linux based is booted using the Python language. The GPIO pins provide us the ground Vcc etc. As this board works on 3.3V supply we need to connect 5V power supply circuit for it.
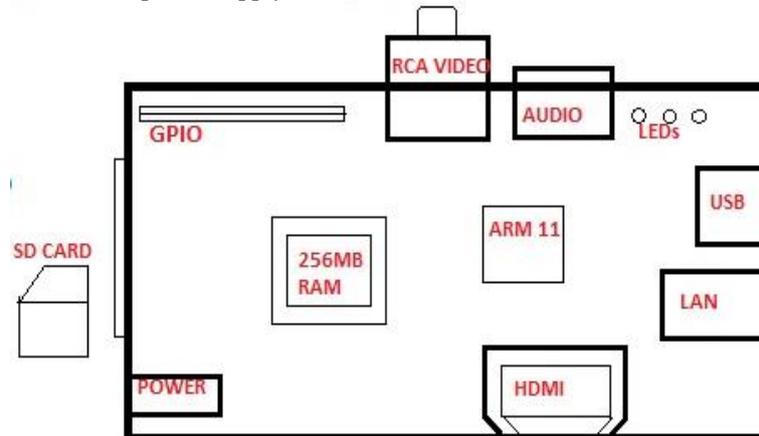

Fig 2: Raspberry Pi board

IV.   SYSTEM DESIGN

- **SOFTWARE**

 HTML:
HTML is a specific type of universal language used for decorating a web page.HTML stands for Hypertext Markup Language. Hypertext is the text that has been used up with extra specifications such as formatting, Image multimedia etc. Markup is a process of adding the extra symbols..HTML has its own syntax and rules.HTML is an universal language used for classifying the functions of different sections of a document. It indicates which part of document is title,which is authors name and address, which part should be emphasized and which part should include an image and so on.

HTML features:
It uses various tags like framestag, Header Tag. There are format type instructions that are taken into consideration like <head>, <title>,<body> etc. Button tag is also used.

PYTHON:
Python is a high level programming language. Its design philosophy provides code readability, and its syntax allows programmers to express concept in fewer lines of code than would be possible in languages such as C. It features a dynamic type system and automatic memory management and has a large and comprehensive standard library.

There are various instructions that we use and run using the putty configurations the platform. Also it can be used for booting up the raspbian operating system. Mainly available as an open source.

- **HARDWARE**

Raspberry Pi: On this board we have developed a appliance control code to check the accessibility of the raspberry pi board with the PC.

Requirements for setting up Raspberry Pi:

Sr.No.	Item	Minimum recommended specification & notes
1	SD Card	Minimum size 4GB;class 4
2	Keyboard and Mouse	Any standard USB keyboard and mouse should work.
3	Ethernet cable	Used for Networking. Makes updating new softwares for Raspberry Pi easier.
4	Power Adapter	To give supply to the Raspberry Pi board.

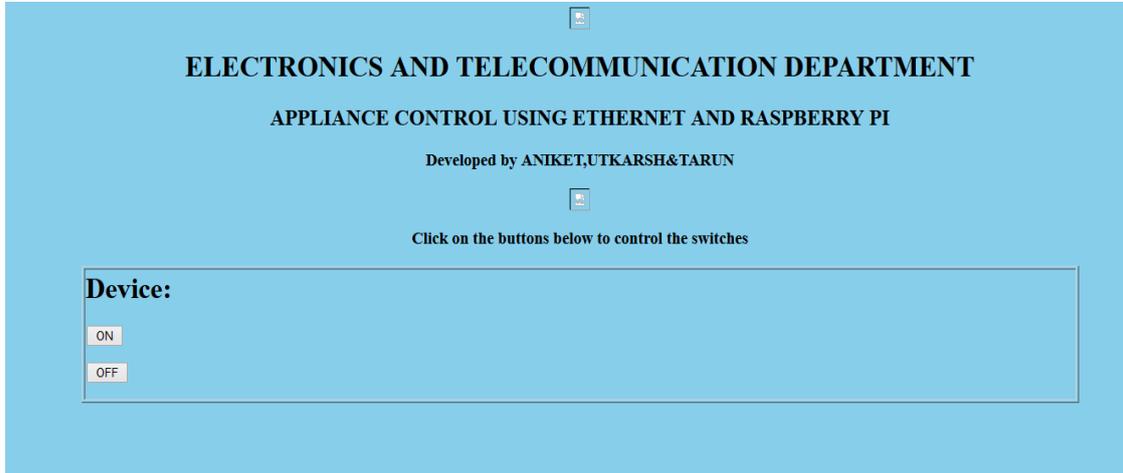## V.   RESULT

- **WEB PAGE DESIGN**

Fig 7: Web page designed using HTML

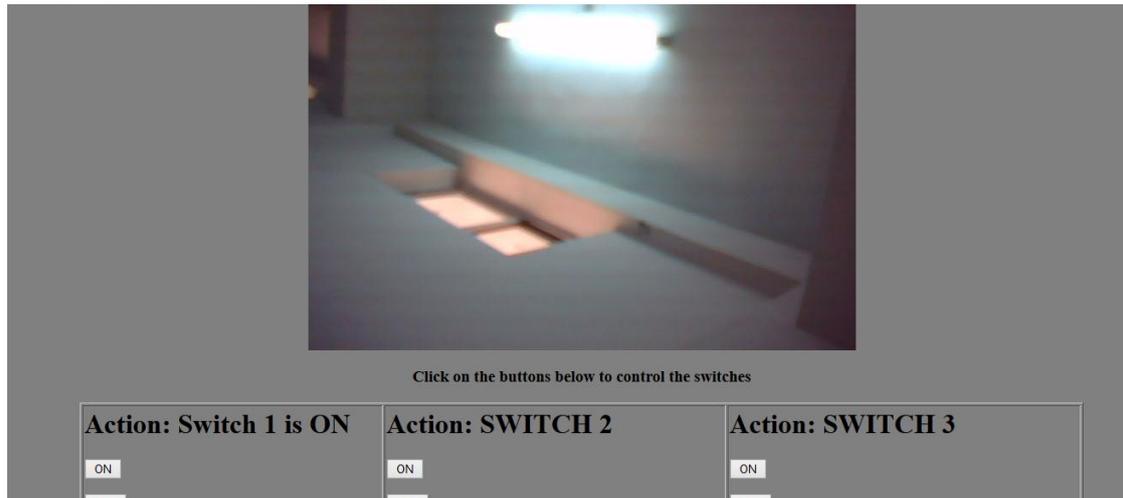- **OUTPUT WITH THREE SWITCHES**

Fig : SWITCH IS ON

Fig : SWITCH IS OFF

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