Smart Lab Using Ubiquitous Computing

Borade Pooja V.[1], Patil Kajal P.[2], Patil Sayali D.[3], Salve Pallavi K.[4],
Prof. A.R.Potdar[5]

[1,2,3,4] *BE Student, Information Technology Department, SVIT Chincholi, Nashik*
[5] *Professor, Information Technology Department, SVIT Chincholi, Nashik*

Abstract

This study aims to develop and design a prototype that can be used, together with an android phone as centralized switch for simple smart Lab appliances via Local Area Network or Internet. The prototype can use to Computer or Laptop on and off with an IR-Sensor. The main body of the prototype contains an Arduino microcontroller connected to a relay driver circuit. An android application is also developed using Basic Android IDE. The proponents add features such as main Lab switch on off and mark On-line Attendance to make a user friendly. The proponents used the developmental method and conducted several tests to determine if the prototype satisfied the scope and limitations. The prototype can really automate the switching of simple Lab appliances and Mark Online Attendance therefore can further develop for a full Lab Automation system.

Keyword : - *Arduino, Android, Android phone, Switch control, Home automation*

1. Introduction

The proponents develop a Wi-Fi based switch control system for home appliances using Android phone .This paper gives basic idea of how to control various lab appliances and provide a security using android phones. The programming platform used for the software is the Basic android and the code is generic and flexible in a user friendly manner. Moreover, the system has hardware components: a relay in which the appliances should be plugged in, an Arduino microcontroller that transfers signal to the relay, a web server that monitor and change the status of the appliances when the user is using a personal computer, and an android phone that serves as the controller of the appliances. The prototype of the proposed system is tested based on its functionality, accuracy and reliability. The functionality of the system and the functionality of the Wi-Fi connectivity. Same with the accuracy, it is tested based on internet connection and local area connection. The reliability of the system is the summary of its functionality and accuracy. According to the reliability results, the proposed system which uses Android phone, Wi- Fi connection and Arduino microcontroller is adequate in Overall.

To develop and design a prototype that can be used, together with an android phone as centralized switch for simple smart Lab appliances via Local Area Network or Internet. The prototype can use to Computer or Laptop on and off with an IR-Sensor. The main body of the prototype contains an Arduino microcontroller connected to a relay driver circuit. An android application is also developed using Basic Android IDE. The proponents add features such as main Lab switch on o_ and mark Online Attendance to make a user friendly. The proponents used the developmental method and conducted several tests to determine if the prototype satisfied the scope and limitations. The prototype can really automate the switching of simple Lab appliances and Mark Online Attendance therefore can further develop for a full Lab Automation system.

3. System Architecture:

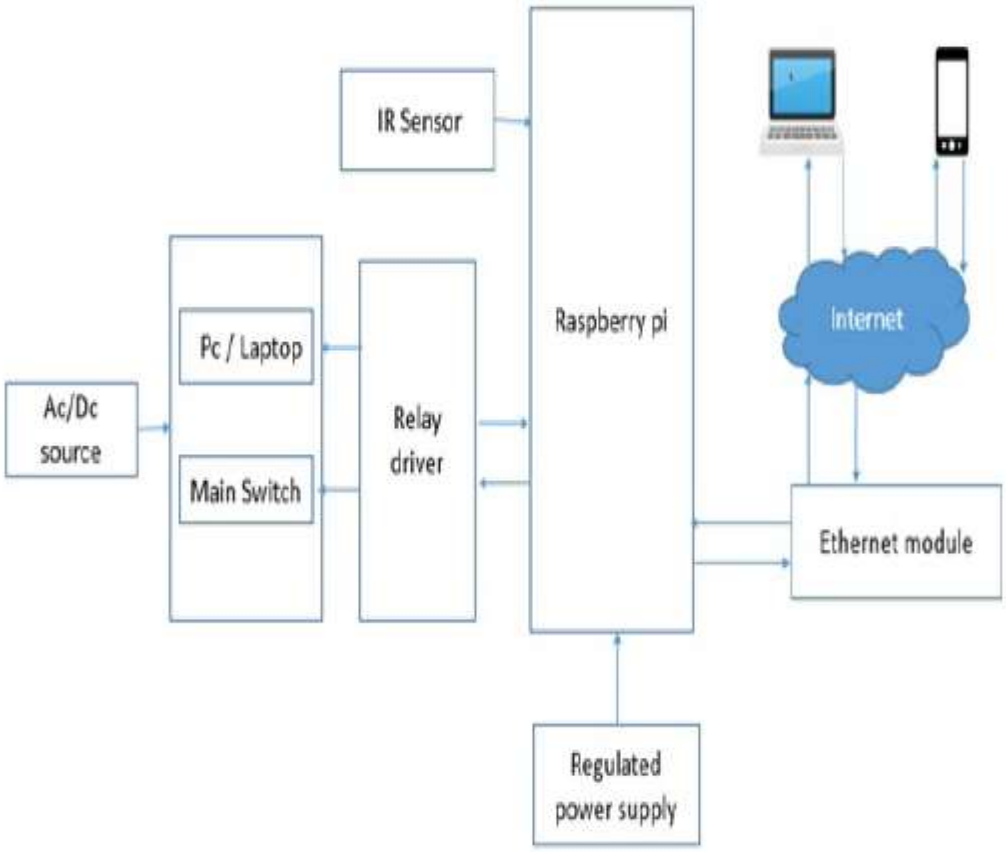

Fig: System Architecture

The Lab Automation concept is implementing for user Friendly access of lab appliances. The terms Smart lab, Intelligent lab following used to introduce the concept of lab appliances and devices in the lab. Lab automation Systems (lASs) represents a great research opportunity in creating new fields in engineering, architecture and computing .LASs becoming popular nowadays and enter quickly in this emerging market. However, end users, especially the disabled and elderly due to their complexity and cost, do not always accept these systems. Due to the advancement of wireless technology, there are several different of connections are introduced such as IR Sensor, WIFI, Raspberry pi, and Internet. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implementing in lAS project, Internet is being chosen with its suitable capability. Internet with globally available is able to provide connectivity up to conveniently .

4. Construction

Lab automation gives us access to control devices in lab from a mobile devices anywhere in the world.The first and most obvious beneficiaries of this approach are “Smart” device and appliance that can be connected to a local area network via Wi-Fi or Internet .We are used many hardware component for lab automation.First connect your HDMI cable to your Raspberry-Pi and your monitor or Laptop. Then connect USB device .If using an Ethernet cable to connect to Router ,go ahead and connect that as well.Finally one everything is connected ,go ahead and plug in power adapter.The Raspberry-Pi is connect to IR sensors and Relay switch.IR sensors can measure the heat of an object as well as detects the motion.Usually in the infrared sensors all the objects radiate some form of thermal radiation .A relay is an electromagnetic switch operated by a relatively small electric current that can turn On or Off a much larger electric current.This relay circuit connects to your laptop or Pc and Switch. It gives us final output.

5. Raspberry

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries. The original model became far more popular than anticipated selling outside of its target market for uses such as robotics. Peripherals (including keyboards, mice and cases) are not included with the Raspberry Pi. Some accessories however have been included in several official and unofficial bundles. Several generations of Raspberry Pis have been released. The first generation (Raspberry Pi 1 Model B) was released in February 2012. It was followed by a simpler and inexpensive model Model A. In 2014, the foundation released a board with an improved design in Raspberry Pi 1 Model B+. These boards are approximately credit-card sized and represent the standard mainline form-factor. Improved A+ and B+ models were released a year later. A "compute module" was released in April 2014 for embedded applications, and a Raspberry Pi Zero with smaller size and reduced input/output (I/O) and general-purpose input/output (GPIO) capabilities was released in November 2015 for US$5. The Raspberry Pi 2 which added more RAM was released in February 2015. Raspberry Pi 3 Model B released in February 2016 is bundled with on-board WiFi, Bluetooth and USB Boot capabilities. As of January 2017, Raspberry Pi 3 Model B is the newest mainline Raspberry Pi. Raspberry Pi boards are priced between US$5–35. As of 28 February 2017, the Raspberry PI Zero W was launched, which is identical to the Raspberry PI Zero, but has the Wi-Fi and Bluetooth functionality of the Raspberry PI 3 for US$10. The Raspberry Pi Zero runs at 1 GHz.RAM On the older beta Model B boards, 128 MB was allocated by default to the GPU, leaving 128 MB for the CPU.On the first 256 MB release Model B (and Model A), three different splits were possible. The default split was 192 MB (RAM for CPU), which should be sufficient for standalone 1080p video decoding, or for simple 3D, but probably not for both together. 224 MB was for Linux only, with only a 1080p framebuffer, and was likely to fail for any video or 3D. 128 MB was for heavy 3D, possibly also with video decoding (e.g. XBMC). Comparatively the Nokia 701 uses 128 MB for the Broadcom VideoCore IV For the new Model B with 512 MB RAM initially there were new standard memory split files released(arm256_start.elf, arm384_start.elf, arm496_start.elf) for 256 MB, 384 MB and 496 MB CPU RAM (and 256 MB, 128 MB and 16 MB video RAM). But a week or so later the RPF released a new version of start.elf that could read a new entry in config.txt (gpu_mem=xx) and could dynamically assign an amount of RAM (from 16 to 256 MB in 8 MB steps) to the GPU, so the older method of memory splits became obsolete, and a single start.elf worked the same for 256 and 512 MB Raspberry Pis.

The Raspberry Pi 2 and the Raspberry Pi 3 have 1 GB of RAM. The Raspberry Pi Zero and Zero W have 512 MB of RAM. Peripherals The Raspberry Pi may be operated with any generic USB computer keyboard and mouse. It may also be used with USB storage, USB to MIDI converters, and virtually any other device/component with USB capabilities.Other peripherals can be attached through the various pins and connectors on the surface of the Raspberry Pi.

6. Objective

This study aims to develop and design a Wi-Fi based switch control that can be used, together with an android phone. Specifically, this study aims:

- To design and construct a switch control system thats applicable for common Lab appliances.
- To develop an android application that will interface the android phone and the prototype to the devices.
- To test and evaluate the functionality, accuracy and reliability of the prototype.

7.Software,Hardware &Test Data Requirements:

7.1Hardware Requirement:

1. Raspberry-Pi
2. IR-Sensors
3. Arduino ATmega328
4.Relay

7.2Software Requirements:

1. Operating System: Android
2. Coding Language: Android, C.Net, Python
3. IDE: Arduino 1.6, Android Studio, Visual Studio2010

8. Conclusion:

In this study, the proponents develop an android based switch control system for lab appliances using Android phone. This paper gives basic idea of how to control various Lab appliances and provide a security using android phones. The programming platform used for the software is the Basic android and the code is generic and flexible in a user friendly manner. Moreover, the system has four hardware components: a relay in which the appliances should be plugged in, an Arduino microcontroller that transfers signal to the relay, a web server that monitor and change the status of the appliances when the user is using a personal computer, and an android phone that serves as the controller of the appliances. The prototype of the proposed system is tested based on its functionality, accuracy and reliability. The functionality is tested into two parts, the functionality of the system and the functionality of the Wi-Fi connectivity. Same with the accuracy, it is tested based on internet connection and local Area connection. The reliability of the system is the summary of its functionality and accuracy. According to the reliability results, the proposed system which uses Android phone, internet connection and Arduino microcontroller is adequate in overall.

9. References:

[1] Bluetooth Remote Home Automation System Using Android Application 1R.A.Ramlee, 2M.H.Leong, 3R.S.S.Singh 4M.M.Ismail, 5M.A.Othman, 6H.A.Sulaiman, 7M.H.Misran, 8M.A.Meor Said Centre for Tele communication Research and Innovation, Fault Kej. Elektronik dan Kej. K computer, University Teknikal Malaysia Melaka, 76100 Durian Tunggal, Hang Tuah Jaya, Melaka, Malaysia.

[2] DEVELOPMENT OF WI-FI- BASED SWITCH CONTROL SYSTEM FOR HOME APPLIANCES USING ANDROID PHONE Rionel Belen Caldo*, Derrick Castillo, Joseph T. Seranilla, Jose Maria T. Castillo, Ivan Carlo C. Largo,Marie Antonette T. Latayan, Michael Gabat Computer Engineering Department Lyceum of the Philippines University-Laguna (LPU-L), Laguna, Philippines*Email: rionel14caldo@yahoo:com

[3] Gartner, R. (2013). Worldwide Traditional PC, Tablet, Ultramobile and Mobile Phone Shipments On Pace to Grow 7.6 Percent in 2014. Retrieved from www.gartner.com/newsroom/id/2645115 on May 10, 2014.

[4] Tadimeti, Hari Charan and Pulipati, Manas. (2014). Overview of Automation Systems and Home Appliances Control using PC and Microcontroller. IEEE / IET Electronics Library: De La Salle University.

[5] Bingol, O., et al. (2014). Web-based Smart Home Automation: PLC-controlled Implementation. Acta Polytechnica Hungaria: Journal of Applied Science.Volume 11, Issue No. 3.Retrieved from http/www.uniobuda.hu/journal/BingolT asdelenKeskinKocaturk49:pdfOn May10; 2014:

[6][Online]_http://developer.android.com/about/index.html

[7] [Online] http://www.pcmag.com/encyclopedia/term/54342/web-server

[8] [Online] http://www.allaboutcircuits.com/vol_4/chpt_5/1.html

[9] [Online] http://arduino.cc/en/Main/Arduino BoardEthernet