Internet Based Sensor Networking & Home Automation Using Cortex Processor on Linux Platform (Rassberry Pi2)

Internet Based Sensor Networking & Automation SYS Using ARM CPU

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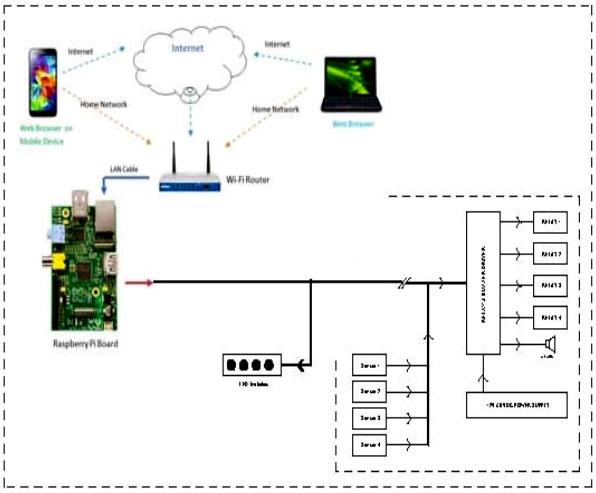
Abstract- In this present day Embedded field most of research focused is on Embedded Linux. Our focus in this paper is Sensor Networking and Automation used for domestic and industrial applications. Using Rassberry Pi 2 developing on python editor& cortex processor present a design and prototype implementation of new home ill automation system that uses WiFi technology as a network infrastructure connecting its parts. The proposed system consists of two main components; the first part is the server (web server), which presents system core that manages, controls, and monitors users' home. Users and system administrator can locally (LAN) or remotely (internet) manages and control system code. Second part is hardware interface module, which provides appropriate interface to sensors and actuator of home automation system. Unlike most of available home automation system in the market the proposed system is scalable that one server can manage many hardware interface modules as long as it exists on WiFi network coverage. System supports a wide range of home automation devices like power management components, and security components. The proposed system is better from the scalability and flexibility point of view than the commercially available home automation systems.

Keywords: Embedded Linux, python, Rasberry Pi 2, HTML. CORTEX ARM9 processor.

I. INTRODUCTION

To face four main challenges, these are high cost of ownership, inflexibility, poor manageability, and difficulty achieving security. The main objectives of that research is to design and to implement a cheap and open source home automation system that is capable of controlling and automating most of the house appliance through an easy manageable web interface to run and maintain the home automation system. The proposed system has a great flexibility by using WiFi technology to interconnect its distributed modules to home automation server. That will decrease deployment cost and will increase the ability of upgrading, and system re-configuration. System will make use of secure wireless LAN connections between distributed hardware modules and server, and secure communication protocols between users and server.

II. SYSTEM MODEL



The ARM based security and energy saving system will have the various features. The energy consumption is significantly maintained in the concept, for example when there is no human presence in the room then the light will be switched OFF. When any one enters the room then the light will be switched ON automatically. (One PIR sensor and two Wire loop sensors are used to detect human entry inside the room; relays for connecting loads. Manual/automatic control for switching of the loads) and the PC at receiver module (to display and control the status of the room).

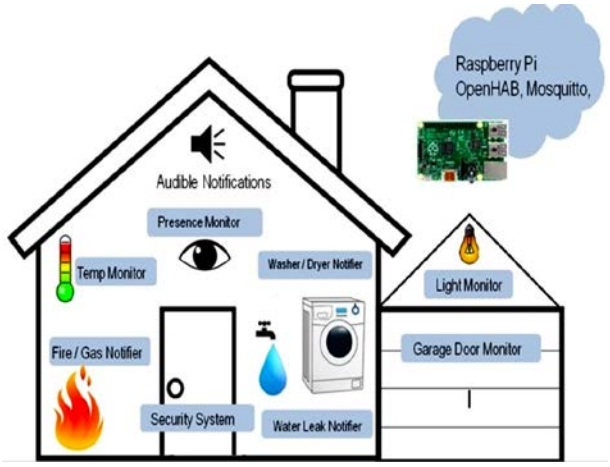
As a part security system involved in this project PIR sensor and Wire Loop sensor (used to detect if any one try to open a lock). Microcontroller will continuously monitor all the Sensors and if it finds any security problem the Microcontroller will switch on the Alarm.

III. PREVIOUS WORKS

Followed by home automations developed based on micro controllers ex.pic micro controller home automations using zig Bee etc

IV.PROPOSED SYSTEM FEATURES

The proposed system is a distributed home automation system, consists of server, hardware interface modules. Server controls hardware one interface module, and can be easily configured to handle more hardware interface module. The hardware interface module in turn controls its alarms and actuators. Server is a normal PC, with built in WiFi card, acts as web server. The web server software is developed usingasp.net technology, so web server should support asp application and.net frame work 4.0, like IIS7.0 for windows OS. System can be accessed from the web browser of any local PC in the same LAN using server IP, or remotely from any PC or mobile handheld device connected to the internet with appropriate web browser supports asp.net technology through server real IP (internet IP).WiFi technology is selected to be the network infrastructure that connects server and hardware interface modules. WiFi is chosen to improve system security (by using secure WiFi connection), and to increase system mobility and scalability. Even if, user intends to add new hardware interface modules out of the coverage of central access point, repeaters or managed wireless LAN will perfectly solve that problem. The main functions of the server is to manage, control, and monitor distrusted system components, that enables hardware interface modules to execute their assigned tasks (through actuators), and to report server with triggered events (from sensors).In setup mode, user can add and remove hardware interface modules, and can create basic macros involving simple triggers and to customize the macros to perform complex series of events. Macros can be activated manually or as are action for certain trigger like motion sensors and surveillance cameras.



User can also program macros to activate at random; this feature allows your system to turn the lights on and off at random or semi-random intervals. In running mode, if hardware interface modules report server with received events and execute their pre-programmed macros. Hardware interface modules are directly connected to sensors and actuator through direct wires connections. Hardware interface modules has the capabilities to control energy management systems like lighting, thermostats and HVAC (heating, ventilation, and cooling) systems, and security systems (door locks, cameras, motion detectors, fire alarms…).

Specifications & Features

- Four Digital Sensor Input = Active Low @ 5V DC
- Status of each sensor with LED Indication
- WIFI or LAN based Communication
- Four Relay based switching output for external load like, Siren, Strobe Light ETC
- Relay Controlled (on / off) by PC Wirelessly
- Relay output - 5A rated changeover contacts
- Power on LED Indication
- Relay on / off LED Indication
- Operating voltage – 12 to 15V DC
- Operating current – 500ma (Approx)
- Diode protection for reverse polarity connection of DC supply to the PCB
- Onboard regulator for regulated supply to the kit
- Extremely easy to install
- ARM Cortex 9 (Raspberry pi) CPU based design for greater flexibility

The System suitable for below applications

1. Security Alarm System applications;
2. Building, home and industrial Automation system
3. Supervision and monitoring alarm systems;
4. Automatic monitoring system;
5. Pumping Stations, Tanks, Oil or Water levels;
6. Buildings and Real Estate;
7. Weather Stations;
8. River Monitoring and Flood Control;
9. Oil and gas pipelines;
10. Temperatures, water leakage applications;
11. Energy saving, street lights control system;
12. Valve controls;
13. Transformer stations;
14. Unmanned machine rooms;
15. Control room application;
16. Automation System

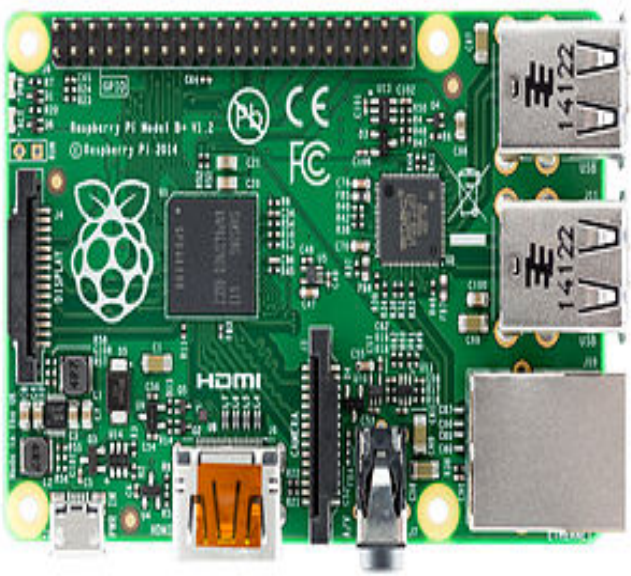
Rassberry Pi

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device

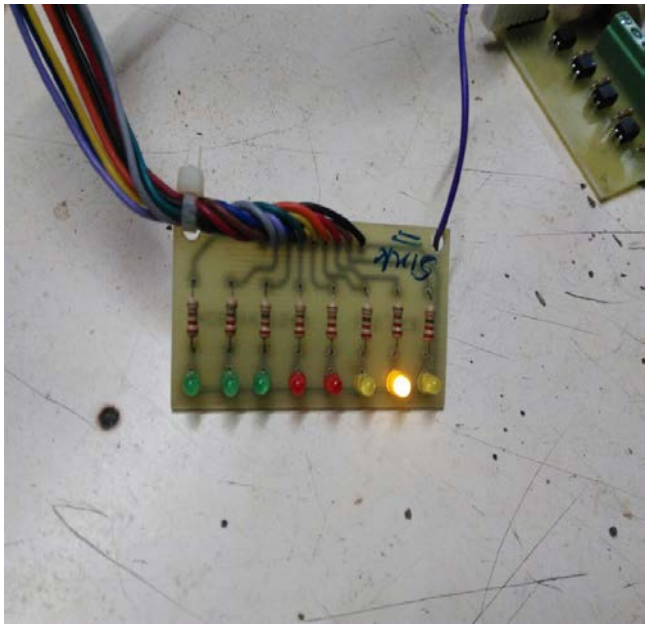
that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and lynx. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

The Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded (models B and B+) to 512 MB. The system has Secure Digital (SD) (models A and B) or Micro SD (models A+ and B+) sockets for boot media and persistent storage.

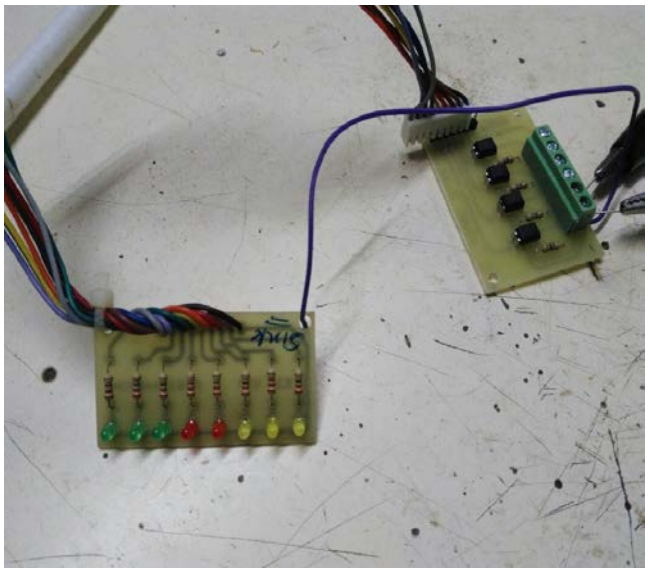
What's more, the Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras. We want to see the Raspberry Pi being used by kids all over the world to learn to program and understand how computers work.

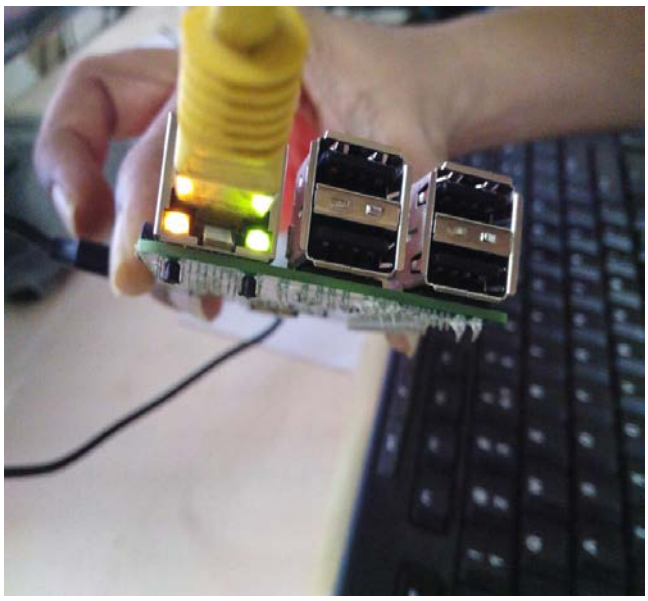


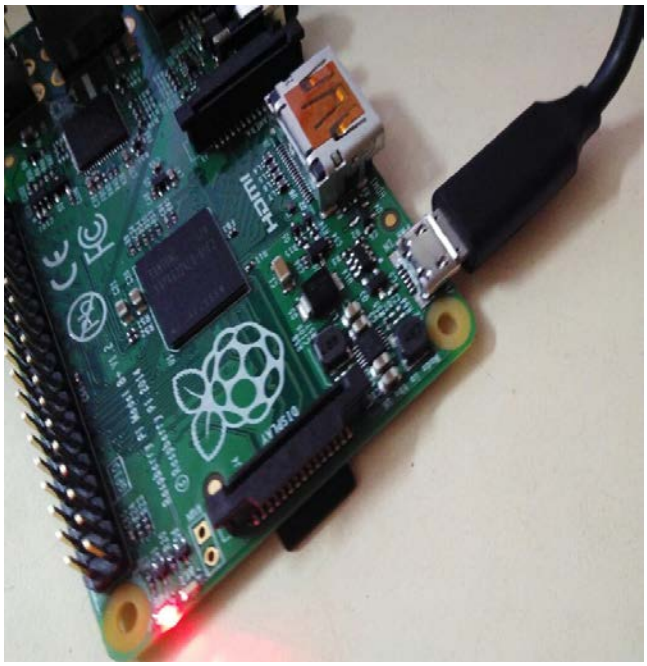
Release date = February 2012; 3 years ago
Operating system = Linux (e.g. Raspbian), RISC OS, FreeBSD, Net BSD, Plan 9, Inferno, AROS
CPU = 700 MHz single-core ARM1176JZF-S (model A, A+, B, B+, CM)[1]
Memory = 512 MB (model B rev 2, B+, CM)
Storage = Micro SD HC slot, 4 GB eMMC IC chip (model CM)
Graphics = Broadcom Video Core
Power = 1.5 W



V. EXPERIMENTAL RESULTS







Power up the full systems

- Main Power supply PWR LED on
- On pi board PWR Led should be On
- On pi board LAN Led Flashed
- Wait for 10 to 25 Seconds, for Boot up the systems, Access the system by Putty Network

Application

- Enter Pi IP address
- Enter Login ID / Pass
- Run Automation Python Script, Open Web Browser
- Enter Pi IP address
- Show u the Main Automation Webpage with Various control button(See Screen Shots)
- Click RLY1, 2 , 3 ,4 Button, on web page button color will be change depend upon RLY
- Status. RED = Device On / Green = Device Off
- On the hardware side, as per command receive from pi all relay turn on/off as per user
- All load should be on/off as per relay status,

Fire Sensor

To test the fire sensor, touch the soldering iron or heating dive to sensor, after set temperature reach the set point, sensor led turn on for few seconds. Pi read the sensor status and updates on webpage. On webpage fire sensor button color will be changed

Door Sensor

The magnet mounts to a door or access panel, while the switch mounts to the frame. When the door is closed the two pieces should be within 1/2" of each other. When the door opens this distance increases, eventually toggling the switch. This allows the Goose to know when the door is open. Pi read the sensor status and update on webpage. On webpage door sensor button color will be change

This project presents results of wireless intelligent sensor networking automation focusing on both the rational use of energy and maintaining security. The wireless approach, in this work, could better target retro-fitting of buildings, still in operation.

VI.CONCLUSION

The ARM based security and energy saving system will have the various features. The energy consumption is significantly maintained in the concept, for example when there is no human presence in the room then the light will be switched OFF. When any one enters the room then the light will be switched ON automatically. (One PIR sensor and two Wire loop sensors are used to detect human entry inside the room; relays for connecting loads. Manual/Automatic control for switching of the loads) and the PC at receiver module (to display and control the status of the room).

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VII. FUTURE SCOPE

For Future, upgradation of the system is made possible with use of octa core processor arm11. Simulation can be done yielding more hybridization of combinational results. With advanced innovations & market availabilities made choice of selection priority.

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