ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Zigbee Based Smart Home System with Control with Internet Connectivity

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ABSTRACT:
Automation plays an important role in today's human life and people's life is gradually changing with smart living due to modern technology development. Applications in areas such as telehealth and household security often require wireless communication between low-cost embedded systems and personal smart phone. This project presents the design and implementation of a Zigbee and wifi capabilities in smartphones running the android operating system to communicate wirelessly in real-time with an ARM11-based embedded system. It also integrates home security and alert system. The use of ARM11 in such systems promises higher processing capabilities and low power usage than traditional microcontrollers, and has the added advantage of being reconfigurable for future development.

Index-Terms:
ARM 11, USB Camera (UVC Compatible), Zigbee module, Temp Sensor, Light, Alarm, and Light.

I. INTRODUCTION:
The continuous growth of mobile devices in its recognition and functionality has lead to an increase in the demand for advanced ubiquitous mobile applications in people's daily lives. Smart phones are more than just phones in today's life having a broad range of applications, such as education, health care, and entertainment. Smart homes aim to provide enhanced convenience and comfort, energy efficiency, security and surveillance. It is claimed by market researchers that majority of homes will be outfitted with home automation systems in the very near future. Various smart home systems have been proposed where the control is via Bluetooth [1], internet [2, 3], short message service (SMS) based [4] while some researchers have proposed voice controlled smart home system based on Microsoft speech recognition [5] and microcontroller based voice activation (voice recognition module is used) [6].

II. PROJECT IMPLEMENTATION:
2.1 EXISTING WORK:
In the existing work, the smart home system and the smart home app which has been developed has a limitation of hardware and software as the entire platform was only dedicated Android. There is no live device monitoring which is the major drawback to know the current status.

2.2 PROPOSED WORK:
In the proposed system, we will implement the security and surveillance and automation control based on Linux OS over an ARM 11 processor Raspberry Pi board. A USB Camera is included for live video streaming and ADC device drivers are developed for temp sensor monitoring. The user can access the device from non android platform also.

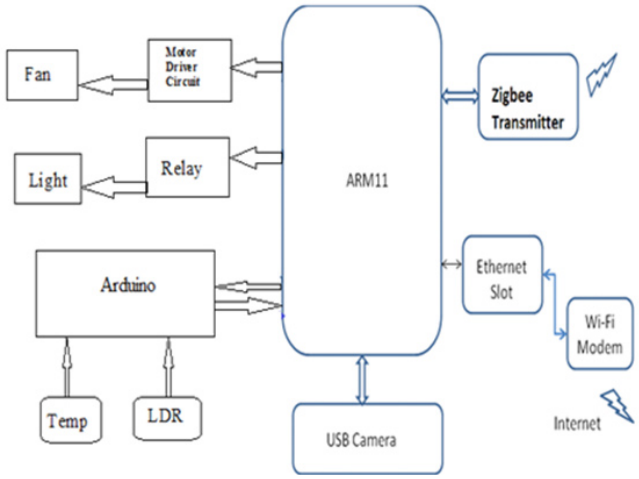
2.3 BLOCK DIAGRAM:


Figure-1: Block diagram

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III. HARDWARE COMPONENTS:

3.1 RASPBERRY PI PROCESSOR:

Figure-2: Raspberry Pi processor

The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi is manufactured in two board configurations through licensed manufacturing deals with Newark element14 (Premier Farnell), RS Components and Egoman. These companies sell the Raspberry Pi online. Egoman produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pis by their red coloring and lack of FCC/CE marks. The hardware is the same across all manufacturers.

3.2 ETHERNET:

Ethernet is a family of computer networking technologies for local area networks (LANs) commercially introduced in 1980. Standardized in IEEE 802.3, Ethernet has largely replaced competing wired LAN technologies. Systems communicating over Ethernet divide a stream of data into individual packets called frames. Each frame contains source and destination addresses and error-checking data so that damaged data can be detected and re-transmitted.

The standards define several wiring and signaling variants. The original 10BASE5 Ethernet used coaxial cable as a shared medium. Later the coaxial cables were replaced by twisted pair and fiber optic links in conjunction with hubs or switches. Data rates were periodically increased from the original 10 megabits per second, to 100 gigabits per second.

3.3 RELAY:

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. Relays are used wherever it is necessary to control a high power or high voltage circuit with a low power circuit, especially when galvanic solation is desirable. High-voltage or high-current devices can be controlled with small, low voltage wiring and pilots switches. Operators can be isolated from the high voltage circuit. Low power devices such as microprocessors can drive relays to control electrical loads eyond their direct drive capability. In an automobile, a starter relay allows the high current of the cranking motor to be controlled with small wiring and contacts in the ignition key.

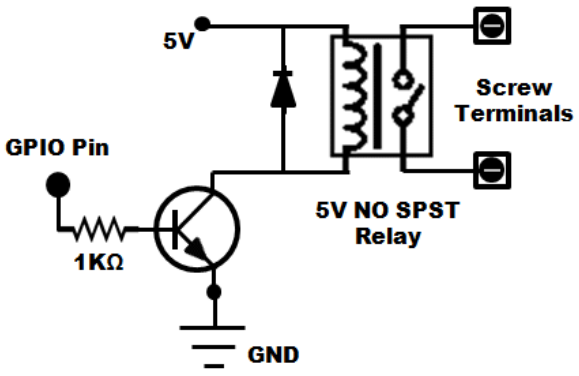

Figure-3: Relay Circuit

3.4 TEMPERATURE SENSOR (LM35):

LM35 series sensors are precision integrated-circuit temperature sensors whose output voltage is linearly proportional to the Celsius temperature. The LM35 requires no external calibration since it is internally calibrated. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range.

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The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to read-out or control circuitry especially easy. It can be used with single power supplies, or with plus and minus sup-plies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air.

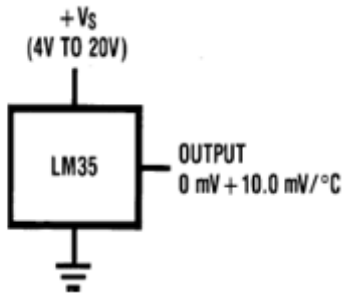

Figure-4: temperature sensor

3.5 LDR SENSOR:

LDRs or Light Dependent Resistors are very useful es¬pecially in light/dark sensor circuits. Normally the re¬sistance of an LDR is very high, sometimes as high as 1,000,000 ohms, but when they are illuminated with light, the resistance drops dramatically. Thus in this project, LDR plays an important role in switching on the lights in the room based on the intensity of light i.e., if the intensity of light is more (during daytime) the lights will be in off condition. And if the intensity of light is less (during nights), the lights will be switched on.

Figure-5: LDR sensor

IV. RESULTS:

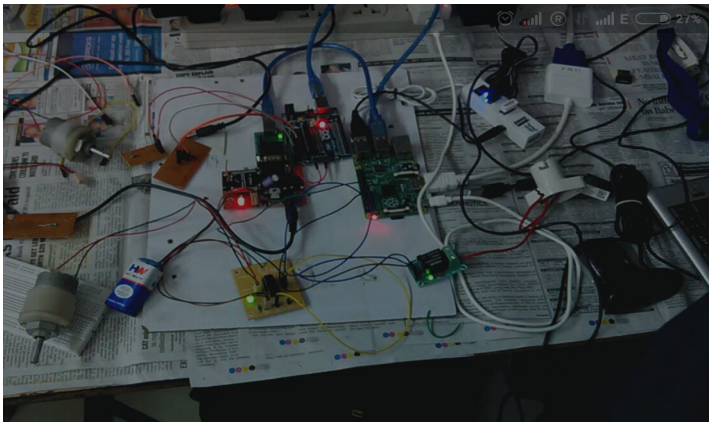

Figure-6: Hardware implementation of project

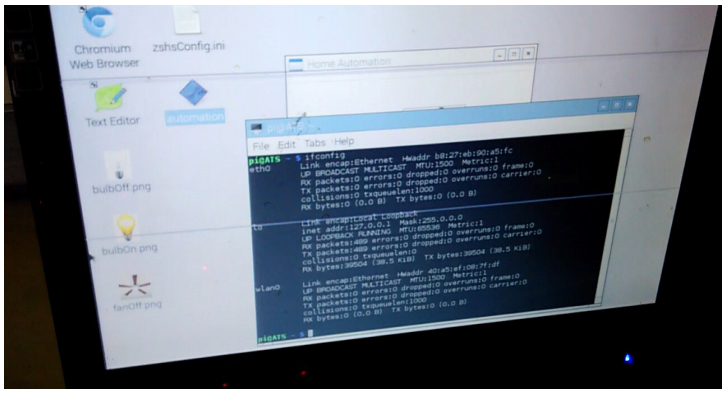

Figure-7: Output on monitor screen

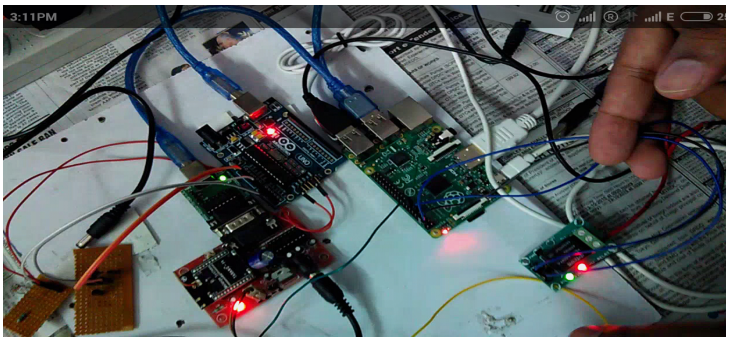

Figure-8: Hardware implementation

V. FUTURE SCOPE:

» The cost of ARM11 is more that's why in future we can implement this system using ARM CORTEX A8, Beagle bone etc as well as updated processors with high frequencies will work fine.

» As the storage space is also less in future we can also record these live streaming data by connecting external memory storage.

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» We can complete our project using wireless technology.
» In future we can provide more security to data by using encryption, decryption techniques.

VI. CONCLUSION:

The project "ZIGBEE BASED SMART HOME SYSTEM WITH CONTROL WITH INTERNET CONNECTIVITY" has been successfully designed and tested. It has been developed by integrating features of all the hardware components and software used and tested. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced ARM 11 Processor board and with the help of growing technology the project has been successfully implemented.

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