An Application of Internet of Things for Smart Home

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Abstract— In this paper, we present one of the pilot application i.e., a smart room, which is an interactive intelligent environment dealing with awareness, intelligence, and natural interaction issues. The main aim of SMART ROOM is whenever we lock the room and if any electronic devices are ON, it senses the LIGHT and TEMPERATURE, it automatically turns off all the devices. Now a day, we generally forget to switch off the electronic devices. SMART ROOM IS THE BEST SOLUTION. So that we can save electricity.

I. INTRODUCTION

Recent advances in intelligent computer systems and communications have created the necessary conditions for the networking of a wide variety of heterogeneous devices. This led to the integration of short-range mobile transceivers into everyday life objects and has enabled new forms of communication between objects and even between people and objects. The concept of smart devices, i.e. the inclusion of software, identifiers and networking to devices typically not computerized, led to the "Internet of Things" (IoT) [1] [2]. The main feature of this technology is the integration of heterogeneous sensing and action elements (actuators) in a distributed system which performs different actions based on the information gathered by the sensors combined with the requirements of the particular application. Intelligent information systems enable the processing of multimodal data collected by the sensors, so as to reconcile heterogeneous information and safe conclusions on the facts giving rise to the activation of the necessary actions to address the consequences of these events. Moreover, the availability of new (smart) energy meters allows for real-time monitoring of energy consumption and provides a unique opportunity of using energy more efficiently.

Such applications make the home a bit smarter, but they're not really intelligent. That's because most home-automation devices are loners: They don't work with each other. They're made by different manufacturers, and by the way, they lack privacy and security protection. IEEE is working with industry to build an architecture that provides connectivity; simultaneously, it is developing standards and addressing security concerns.

The smart room is a great example of where many technology and business domains start interacting and leveraging the Internet of Things [3].

We use components like arduino board which is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. GSM modem which is a specialized model which accepts a SIM card and operates over a subscription to a mobile operator just like a mobile phone. We used sensors like IR, LM35 and a DC motor.

II. LITERATURE SURVEY

The Internet of Things (IoT) is predicted to become one of the most significant drivers of growth in various technology markets. Most current standardization activities are confined to very specific verticals and represent islands of disjointed and often redundant development. The architectural framework defined in this standard will promote cross-domain interaction, aid system interoperability and functional compatibility, and further fuel the growth of the IoT market. The adoption of a unified approach to the development of IoT systems will reduce industry fragmentation and create a critical mass of multi-stakeholder activities around the world. This standard defines an architectural framework for the Internet of Things (IoT), including descriptions of various IoT domains, definitions of IoT domain abstractions, and identification of commonalities between different IoT domains. The architectural framework for IoT provides a reference model that defines relationships among various IoT verticals (e.g., transportation, healthcare, etc.) and common architecture elements. It also provides a

blueprint for data abstraction and the quality "quadruple" trust that includes protection, security, privacy, and safety." Furthermore, this standard provides a reference architecture that builds upon the reference model. The reference architecture covers the definition of basic architectural building blocks and their ability to be integrated into multi-tiered systems. The reference architecture also addresses how to document and, if strived for, mitigate architecture divergence. This standard leverages existing applicable standards and identifies planned or ongoing projects with a similar or overlapping scope.[4]

At the same time, Cloud Computing came into play to offer enormous storage, computing facilities and data sharing opportunities. However, the convergence of IoT and Cloud can provide new opportunities for both technologies. It can open a new horizon of ubiquitous sensing, interconnection of devices, service sharing, and provisioning to support better communication and collaboration among people and things in a more distributed and dynamic manner. It can also support powerful processing and storage facilities of huge IoT data streams (big data) beyond the capability of individual "things", as well as to provide automated decision making in real time. Thus, such convergence can enable the development of new innovative applications in various emerging areas such as smart cities, smart grids, smart healthcare and others to improve all aspects of life.[5][6]

III. METHODOLOGY FOR SMART ROOM

1) Arduino:

Arduino is an open-source project that created microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices[7]. Arduino is an open source hardware and software project first introduced in 2005 based on 8-bit Atmel AVR, aiming to provide an accessible way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors. The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It was create people with no profound knowledge of electronics. It includes a code editor with features such as syntax highlighting, brace matching, cutting/pasting text, searching/replacing text and automatic indentation, and provides simple one-click mechanism to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a series of menus. A program written with the IDE for Arduino is called a "sketch".[8] Sketches are saved on the development computer as files with the file extension .ino. Arduino Software (IDE) prior to 1.0 saved sketches with the extension .pde. The Arduino IDE supports the languages C and C++ using special rules to organize code. The Arduino IDE supplies a software library called Wiring from the Wiring project, which provides many common input and output procedures. A typical Arduino C/C++ sketch consist of two functions that are compiled and linked with a program stub main() into an executable cyclic executive program: setup(): this function is called once when a sketch starts after power-up or reset. It is used to initialize variables, pin modes, start using libraries, etc.

loop(): after setup() is called, this function is called repeatedly until the board powers off. It actively controls the Arduino board and allows the program to change or respond. After compiling and linking with the GNU toolchain, also included with the IDE distribution, the Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal coding that is loaded into the Arduino board by a loader program in the board's firmware.

2) GSM modem:

GSM (Global System for Mobile Communications, originally Groupe Spécial Mobile), is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones, first deployed in Finland in July 1991.[9] As of 2014 it has become the de facto global standard for mobile communications – with over 90% market share, operating in over

219 countries and territories.[10]GSM was intended to be a secure wireless system. It has considered the user authentication using a pre-shared key and challenge-response, and over-the-air encryption.

However, GSM is vulnerable to different types of attack, each of them aimed at a different part of the network.[11]


3)TEMPERATURE SENSOR(LM35)

LM35 is a precision IC temperature sensor with its output proportional to the temperature(in oC).

The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor.

It also possess low self-heating and does not cause more than 0.1 oC temperature rise in still air.

The operating temperature range is from - 55°C to 150°C. The output voltage varies by

10mV in response to every oC rise/fall in ambient temperature, i.e., its scale factor is 0.01V/ oC[12].
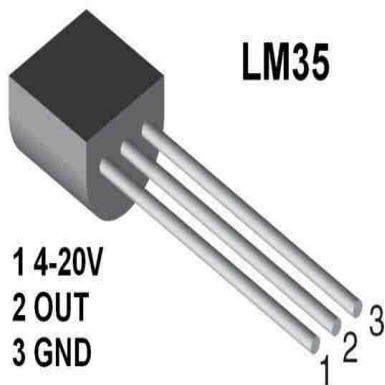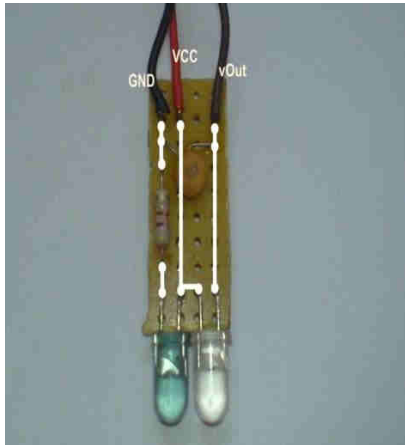

4) DC MOTOR:

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line. DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.[13]

5) IR SENSOR:

Infrared (IR) is an invisible radiant energy, electromagnetic radiation with longer wavelengths than those of visible light. Infrared sensors are connected to a control unit via low-voltage wiring or a narrowband RF signal which is used to interact with a response device. In some cases, the sensors are linked directly to a facility's central command computer. If an intruder breaks the beams, an alert is raised and facility personnel are notified. There are two main types of infrared sensor: a stationary version where the beams are transmitted in a single position, and a

patterned version where the beams continually change position so as to dissuade a potential intruder from attempting to pass though them. A common method of making the sensor beams visible is through the use of infrared goggles[14].

DATA FLOW DIAGRAM:

IV. CONCLUSION

Smart room is an excellent interfacing project because a very many devices are providing inputs or being controlled through a single port. It helps us in saving electricity. Smart room gives user remote access to the system. Smart room includes advanced security system with cameras motion sensors. Smart room offers enhanced energy efficiency light can shut off automatically when no one is in the room and other thermostat can be set to let
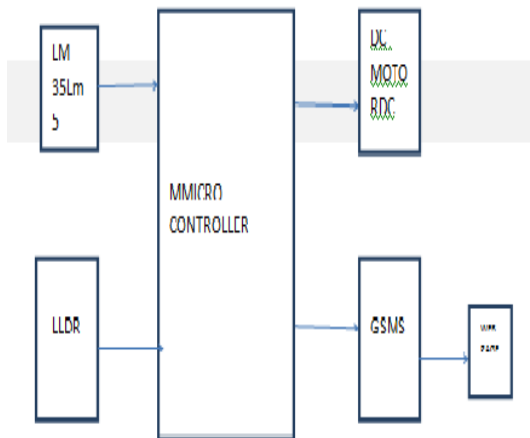
the indoor temperature drop during the day before returning it to a more comfortable level just before residence arrive in the evening. Smart room gives the homeowners a new level of control. These information regarding sensors and appliances which are can be access through android applications also.

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