Automatic paper vending and direction control

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***Abstract*—This machine caters the needs of students and professionals within an institution. It is difficult to purchase paper during rush time and students have to stand in long queues. Using this prototype student can automatically collect required number of papers by inserting coin. It will consume less power than other vending machines. This mechanism makes use of sensors and microcontroller and various principles of mechatronics for both coin detection and vending system. The machine makes use of modulo design wherein the blocks are replaceable. This machine also has an inherent mechanism which helps to find locations within the campus.**

Keywords—vending,direction control,mechanism,coin,rollers

I. INTRODUCTION

Vending machines have been in use since 18th century. They have been used for dispensing different products like soda cans, cigarettes, bills, water, candy, toys etc. the common example of vending machines which uses engineering principle is the Automatic Teller Machine (ATM). The idea proposed in this project is to vend a specific or predefined quantity of papers on insertion of a Rs. 10 coin. The aim is to reduce the burden of people working in stationeries as well as customers. This machine also has an integrated mechanism which directs people to their destination without any hassle.

A. SIGNIFICANCE

This machine mechanically vends the papers thereby reducing human efforts and time.

B. SCOPE

The basic working mechanism of normal vending machine is improvised by combining the operation of cash counting machines and navigation system. The main advantage of this project is that it operates on low power. The coin sensing mechanism used here can also be used in other large scale applications as per the requirement of the user. Further the machine can also be modified so as to accept paper bills as input money instead of coins. The no. of papers that are vended are accurate as per the user requirement.

II. METHODOLOGY

The main aim of the vending machine is to provide a fixed quantity of white pages on insertion of a Rs.10 coin. The project operates on basic principles of mechatronics [1] and automation. It basically eliminates manual operation and the units involved are as follows:

1. Input Unit[1]
2. Processing [1]and control unit
3. Output Unit[1]

- Input Unit: The unit deals with accepting a Rs.10 coin and checking for its authenticity.
- Processing and control Unit: It consists of a microcontroller which upon receiving the genuine coin sends a signal to the dispensing mechanical unit to start vending the required quantity of papers.
- Output Unit: It dispenses the required quantity of paper using roller mechanism.

The basic system consists of the following parts:

1. Mechanical Unit [1]: It consists of rollers, gears, shafts which form an integral part of the paper dispensing system. The basic framework for dispensing paper has been done using wood, metal.
2. Electronic Unit [1] and Programming IDE: It consists of arduino microcontroller which will check for the authenticity by comparing the speed calculations with a specific fixed criterion and thereby send signals for starting dispensing mechanism. We make use of basic concepts of Embedded C language clubbed with Arduino Instruction Set.
3. Electrical Unit [1]: The SMPS as well as electrical motors form the electrical components.

III. COMPARISON WITH THE EXISTING TECHNOLOGY

Currently vending machines are in practice all over. Although the basic coin insertion mechanism is similar, but the use of modulo blocks and the concept of spring action which helps in faster supply of papers is what makes the system unique. Also a secondary system of direction provision is something new implemented within the same system. This machine is a dual purpose system which is being developed for the welfare of students, staff members etc. in a college or an organization

IV. SENSORS AND CONTROLLER

A. MICROCONTROLLER[2]:

The microcontroller used is Atmega 328.The Atmel 8-bit AVR RISC-based microcontroller combines:
32 kB ISP flash memory with read-while-write capabilities
1 kB EEPROM, 2 kB SRAM,23 general purpose I/O lines, 32 general purpose working registers, 3 flexible, timer/counter with compare modes, internal and external interrupts, Serial programmable USART, A byte-oriented 2-wire serial interface , SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages),programmable watchdog timer with internal oscillator, Five software selectable power saving modes, operating frequency of 20MHz. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz

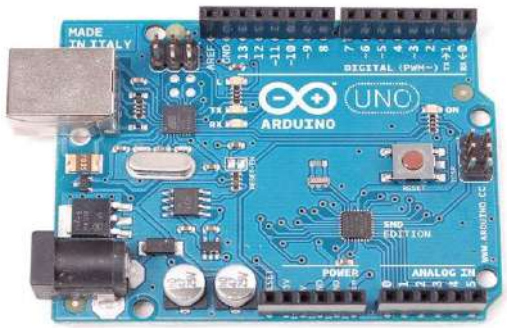

Figure 1 Atmega328 Arduino Board

B. THROUGH BEAM IR SENSOR MODULE[3]:

Two sensor modules used basically determine the time required for the Rs.10 coin to pass between a fixed distances which is considered as the standard for checking the authenticity of the coin. The specifications for the same are as follows: 1.Dimension: 32mm X 11mm X height 20mm width
2. The main chip: LM393, infrared on the radio head
3. The working voltage: DC 5 VHaving a signal output instruction.
4. A single-channel signal output.
5. The output valid signal is low.The sensitivity is not adjustable.
6. Can be used to count the work piece, the motor speed. The circuit board output switch

Figure 2 IR sensor module

C. DC MOTOR [4]:

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. In this system, the DC Motor of operational voltage and Most types produce rotary motion; a linear motor directly produces force and motion in a straight line. Current: - 12V, 5A is used. The speed is 500rpm.

Figure 3 DC gear motor

D. LCD MONITOR (16*2) [5]:

Liquid Crystal Display (LCD) screen is an electronic display module and finds a wide range of applications. A 16 x 2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over other seven segments and other multi segment LEDs. The reason being LCDs are economical, easily programmable, have no limitation of displaying special and even custom characters(unlike 7 segments),animation and so on.

Figure 4 16*2 LCD Display [5]

V. WORKING

The devices which are connected/interfaced with the microcontroller(Arduino)can be represented in a block diagram as shown below:

A .BLOCK DIAGRAM

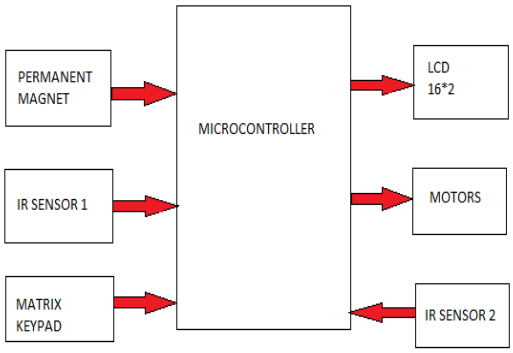

Figure 5 Block Diagram

B.FLOW DIAGRAM

The basic working of the machine can be explained with the help of a flow diagram.

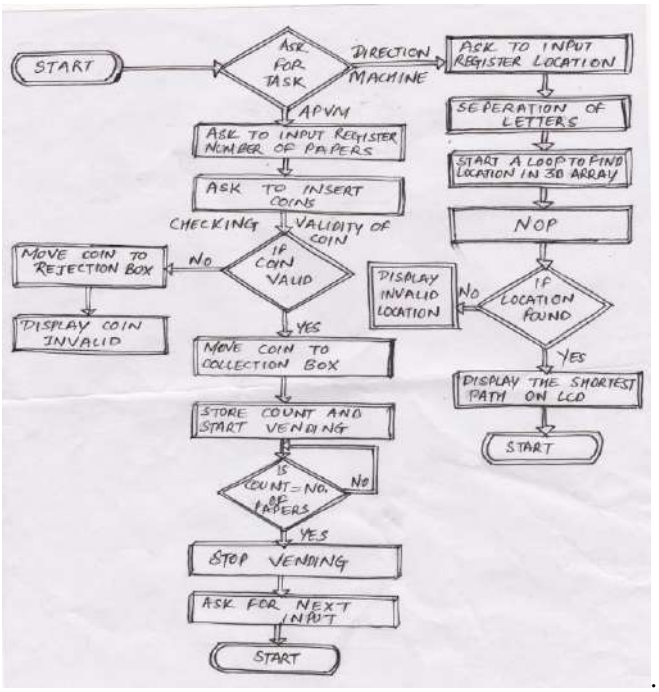

Figure 6 Flow Diagram

1. PAPER VENDING MECHANISM:

- A pair of magnets is used to slow down the coin on insertion due to hysteresis effect.
- Coin passes through the optical gates and blocks continuity of light thereby generating interrupts to the arduino unit. If the time measured between these interrupts matches the preset value then the coin is validated.
- On validation arduino issues a signal to a gateway motor on it's on its output pin. Thereby coin is accepted into the collection box else it is sent to the rejection box
- After validity check the arduino issues a signal to start the roller mechanism and thereby the vending of preset value of papers begins.

2. DIRECTION CONTROL:

- Will not work on GPS rather it will be working on a fixed and limited coordinated system within a given campus where the machine is to be installed.
- Program for the direction machine will make use of a 3D array which will consider a building as a 3D array with predefined number of active and passive blocks.
- These passive blocks will be reserved for future use as if there is any change in the construction of building i.e. if any new structure or rooms are added to the initial structure.
- The input will be taken from the user for what location within the campus he/she wants to go. The input which the user gives will be decoded into a set of ASCII and Binary codes.
- The input will be essential to locate the particular position to the 3D array which in turn will correspond to one of the rooms or location within the building.
- Once the position is found by the program a predefined set of output will be displayed on the LCD panel.
- The idea behind this is to not use GPS but a fixed coordinate positioning using 3D array for a specific building and specific location only.

VI. ADVANTAGES

The machine reduces human efforts required for handing out pages to customers. It also results faster delivery of white sheets. Also the direction feature helps newcomers to locate areas within a campus.

VI. DISADVANTAGES

The machine only operates for an Rs.10 coin and not for other variety of coins as well as paper money.

VII. APPLICATIONS

This type of vending machine can be used in educational institutions [1]. Offices, courts [1] and government [1] establishments can use this machine for both vending paper as well as understanding directions within the organization.

IX. Conclusion

Although vending machines are being used widely nowadays. Having paper dispensing machines is essential in campuses, offices wherein students or employees need to wait in long queues. This type of machine reduces human efforts and also provides accurate results.

Acknowledgment

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POWERLINE COMMUNICATION USING X-10 PROTOCOL

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Abstract: Power lines carry energy to the appliances. The aesthetics of PLC (Power Line Communication) is that the data transmission is carried out without inserting any more cables, using a low-end but robust technology known as X-10 protocol. Nowadays the idea of intelligent homes is becoming an important feature. By making full use of X-10 technology, sending and receiving data to the appliances which are under our control by interfacing with the 220V power line and modulating our data on 120 KHz carrier burst. In this research work, we added the dimension of controlling home with the help of PLC using serial port communication i.e. by sitting anywhere we can manage the status of appliances along with attaining the temperature, light intensity, voltage and current control.

Keywords: PLC, X-10.

I. INTRODUCTION

Home automation is a step to digital housing. In this paper the discussion take place on home automation using power line communication (PLC). By means of PLC, data can be sent and received by already existing power cables. For data transmission we have used transreceiver. Framing is used for coding in which instruction is placed between start and stop bits. In Character oriented transmission data is packed between start and stop bit. Start bit is always low and is always one while stop bit can be two or more bits and are always high. Zero crossing detector plays important role in the circuit as it detects the point in AC signal where command signals are to be sent. In buildings different types of wiring is present. Normally to avoid any problem we are using main 220V supply for transmission of our data. A personal computer is used in the network to control all the instructions. To avoid complexity we have used simplex transmission and power line coupling circuit is used for interfacing. FSK modulation is used by this circuit to meet high frequency need for interfacing with 220V AC signal. LDR and different other sensors are used for measuring temperature, voltage and current. PLC can be used in buildings, hospitals, in green houses and in places where monitoring is needed. In PLC, there is no need of extra wiring rather preinstalled electric wires are used. This is the main advantage which captivates the researchers to work on PLC. Anything which is connected to the sockets in home using PLC is the part of the network and can be controlled to the desired level. One more upper head of using this network is the availability of many access points in one room as there are many sockets in each room. However noise can occur in PLC. According to power lines are connected to a transformer for supplying power however interference between signals can happen that can cause problem in communication [1]. It is discussed that narrowband noise fluctuates with day and night times [2]. According to asynchronous impulsive noise causes fluctuation in amplitude, time and pulse width [2]. Frequency response of PLC is different in different buildings because of difference in wiring, structure and difference in machinery connected to the network. Thus it needs monitoring and controlling. In data attenuation can occur because of various elements connected to the circuit [3]. To retain signal strength repeaters should be used which can increase the cost. Security of the network is not that much satisfactory but research work is `under process to improve it. It is concluded that first generation PLC was able to transfer 14Mbs theoretically and this rate decreases to 10Mbs practically due to error correction and remittance caused by noise [2]. Now due to effective technologies and reliable research current innovative work shows that by using PLC that this speed can be improved to 100Mbs theoretically and 60Mbs practically [4]. Time delay in current PLC systems is very low almost up to 10 ms per next command.

II. BACKGROUND

Power Line Communication systems are also referred as demotic, Smart Home Systems or Ambient Intelligence Systems [5]. These systems will permit the controlling and monitoring of the appliances. From the many past years there has been concentration on this technology. Different techniques have been used for communication such as a ZigBee Remote control, Remote Access Device, Wi-Fi Remote Control, SMS Based Home Automation System and Home automation system using PLC. One of the

predominant applications of Bluetooth is home automation. Bluetooth technology has the aptness of transmitting the voice at half-duplex rates up to 1Mbps and data between the transportable and fixed electronic system with the non-appearance of cables but the disadvantage is incurring a access delay [6]. For the monitoring and controlling of the devices an economical and unchallenging system is to use a remote called zigbee remote control. Instructions from the remote are dispatched to the destination device. In this method, there is a requirement of mobile which have Wi-Fi and J2ME for help in accessing and controlling respectively [7]. In SMS based home automation, GSM has many characteristics like it uses mobile network and battery power so it is secured from internet hackers which may muddle our home automation, but the drawback includes system running cost [8]. X-10 is protocol which consign signal over 120V AC wiring [9]. Digital information is represented by 120 kHz bursts timed with power line zero crossing. X-10 technology is used along with the microcontroller (PIC16F877A) for creating a home automation environment. The use of this microcontroller is because of its versatility, its flash program memory and data EEPROM. From the above different methods discussed, the proposed method meliorates in a way because home automation using Power line communication is cost effective. Bluetooth has an issue of delay, mobile is required for Wi-Fi method along with the matter of signal distortion, SMS based are extortionate. So we are manipulating power line for our communication purpose. It will reduce the system cost and can control the devices with the assistance of personal computer by sending data over power lines.

III. METHODOLOGY

X-10 home automation is also known as X-10 protocol. X-10 protocol is a technique for home automation devices interaction. Power line is being deployed for the purpose of signaling as well as control. It is well known because it can be easily installed using preexisting cables rather configuring new wiring system [10]. X-10 is the most promising protocol system and it is budget friendly. It permits the users to transfer (transmit) signals to homes and offices across power line wiring. X-10 is not a complicated network. X-10 transmissions are harmonized to the zero crossing point of the AC power line. The design intent is to transmit alongside to the zero crossing point but from [11] should be within range of 200 microseconds. The delay might be 50 microseconds in between signal envelope input and 120 KHz output bursts. X-10 communicates with trans-receiver, sends signals over the power line wiring as well as receives the signal. Digital data sends between X-10 devices by using household electrical wiring [12]. The digital data is encoded onto a 120 kHz carrier that is transmitted like bursts during the zero crossings of the 50 Hz AC alternating current waveform. At each zero crossing, one bit is transmitted. A controller sends a command and address in the form of digital data to a controlled device and scrutinizes said devices. The status of advanced devices should simply exhibit voltage dimming level, on/off and sensor status. The device is more often plugged in the same place where home appliances are inserted.

X-10 WORKING: The method used by X-10 is based on a simple data frame with eight data bits (one byte) proceeded by a predetermined start code. The complicated part of this technology was not the system of binary data, but the method in which it was transmitted from one device (the transmitter) to another device (the receiver). The key was for every device to have an integral "zero crossing" detector so that all of them were synchronized together (figure 1). A receiver opens its receive "window" twice each sine wave (figure 2), that is 120 times each second or 7,200 times each minute.

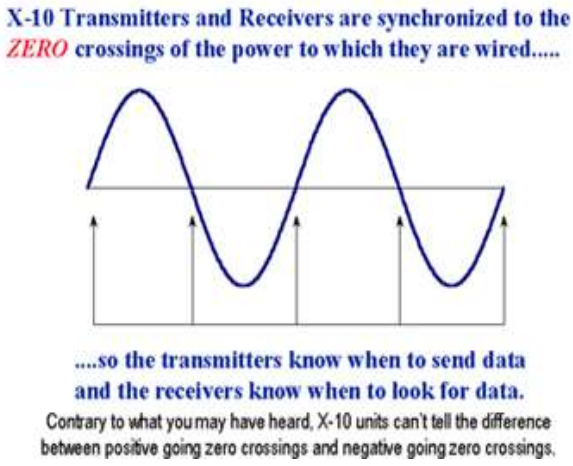

Figure 1 X-10 working

Since these devices would not have any direct wiring between them, it was necessary to devise a way of sending the data over the existing electrical wiring. The actual binary data is transmitted by sending 1ms bursts of 120 kHz just pass the zero crossing of the 50Hz power. It was also obvious that complementary bit pairs were necessary. Therefore, a binary "1" was defined as the presence of a pulse, immediately followed by the absence of a pulse. A binary "0" was defined as the absence of a pulse, immediately followed by the presence of a pulse.

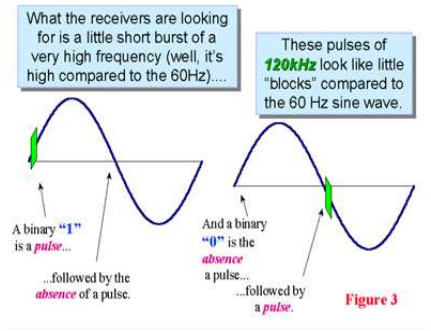

Figure 2: Presence and absence of a pulse

While the transmitted pulses were to be a full 1ms in duration, the receivers were designed to open a receive window of only .6ms. That allowed for the loose tolerances of the 1978-era components to "slop" plus/minus 200m sec. In order to provide a predictable start point (figure 4), every data frame would always begin with at least 6 leading clear zero crossings, then a start code of "pulse", "pulse", "pulse", "absence of a pulse" (or 1110).Once the Start Code has been transmitted, the first nibble is sent. (If you are not familiar with the term "nibble", that means 4 bits or half a byte.) In order to make it easier for the consumers to operate the devices, this first 4-bits were given "letter" code designations (figure 5). It was also decided to randomly rearrange the patterns so that the "A", "B", "C" codes, etc., did not fall in the predicable binary pattern. It is easy to see that in reality, the "M" code is first in the binary progression.

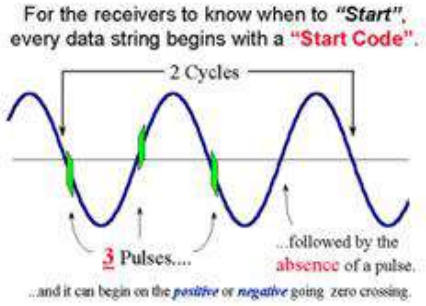

Figure 3: Start Code in data string

In one contiguous bit stream, the second nibble provides the second half of the address (figure 6). The last bit appears to be a part of the "number" code but in reality it is a function bit. Whenever this function bit is a "0", it designates the preceding nibble as a number code and therefore a part of the address. For purposes of redundancy, reliability and to accommodate line repeaters, the X-10 protocol calls for every frame of data to be transmitted twice.

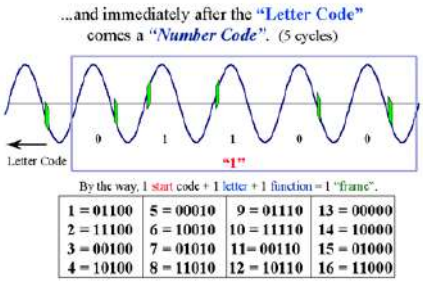

Figure 4 Letter and Number code

Whenever the data changes from one address to another address, from an address to a command, from one command to another command or from one command to another command (figure 8), the data frames must be separated by at least 6 clear zero crossings (or "000000"). When teaching classes in this stuff, I often say that this gap "gives the receivers a chance to catch their breath". In reality, of course, the sequence of six "zero's" resets the shift registers. Once a receiver has processed its address data, it is ready to receive a command. As before, all data frames must begin with a start code. Then the following nibble gives the letter code (figure 9). The next nibble is the command. Since the last bit is the function bit (bf = 0 = address number, bf = 1 = command) all the commands end in a binary 1. This diagram (figure 10) only shows the six most often used commands. A later graphic will illustrate all the available commands. As before, all X-10 protocol transmitters send their data frames twice. Figure shows that an example transmission of two data frames (A1 A1 A-On A-On, for instance) would take 47 cycles of the 50Hz sine wave. That would equate to 0.7833 seconds, or in practical terms, just under 1 second. Of course, some commands take less time. When sending an "All-Lights-On" command, for example, no address needs to be sent. Therefore the entire two frame sequence takes only one third of a second (actually, 0.3666 seconds, but who's quibbling). If your receivers react on the first frame, it could take a mere two tenths of a second (0.1833 seconds).

IV HARDWARE DESIGN

The home automation PLC system major components are trans-receiver and power line module. Home owner can control the electrical load by utilizing X- 10 protocol. This technology demands PLC trans-receiver switch, where the transmitter must also be included into the system to control receiver [9]. Replace this hardware mechanical switches and electrical outlet or receivers plug into main electrical outlet. In local houses, X-10 protocol control system transports signals by utilizing the 220V power line in order to provide remote control to a particular address.

Generally a trans-receiver is set to send the common address and the receiver aspires it to control. Devices controlled by master slave or centralized unit is personal computer. This centralized unit sends commands to serial port (MAX232) through software which controls all on/off functionality of devices. Serial communication utilization is based on UART protocol (Universal asynchronous receiver-transmitter) for networking purpose on power line channel. Isolator is like a switching device which produces break in the connection that will bear the voltage breakdown. It just acts like a circuit protector to safe the whole circuitry from direct 220 V through 1:1 adjustment. Overall system endorse RS232 serial interface for maintenance and configuration. Microcontroller comes with only one serial interface [10]. So, it will be connected with user interface (laptop or pc linking with serial interface) for communication [11]. The serial interface is pointed blank linked with terminal PC serial port terminal software Hyper Terminal to requisite for communicating with the system. UART interface is the basic source to connect the nodes with personal computers by debugging the source codes and checking the nodes continuously. Asynchronous serial data communication is commonly used for transmissions.

In asynchronous technique, data is placed between start and stop bits called as framing. For asynchronous communication in data framing, the data, like ASCII characters, are bind between a start and stop bit. The start bit always contain 1 bit and the stop bit can be one or two bits. The start and stop bits are 0 and 1 (0-low, 1-high) respectively. The signal is carried by high frequency carrier because it cannot flow through power transformer across the multiphase system [16]. The zero crossing of voltage waveform is timed to coincide by signal. Every node of X-10 system receives signal from zero crossing point which is then synchronized with X-10 transmission. To identify the signals transmitted by controller, zero crossing detector is utilized. The receiver searches the signal of zero crossing during 0.6 microseconds. Transmission synchronized with zero crossing is shown in Figure 5.

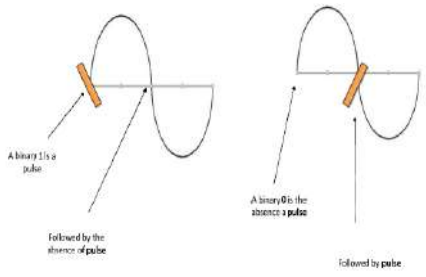

Figure 5: Transmission synchronized with zero crossing

In Power line communication all the data transmission takes place with the help of zero crossing. Use AC power lines so everything will be discussed in terms of AC supply. The zero crossing points are the points on the AC sinusoidal wave where the value of voltage is 0V. All the data that is conveyed while using X- 10 is done with zero crossing detector. The relay is actually electromechanical device that start working through electrical current. Relay is like a remote control which is using to control many applications. Here no. of relays used to control the on/off function of the different devices. For example by using software named as Hyper Terminal, house code from A to P is sent which is shown on LCD then sends the device code that actuate the relay of required device.ULN2003 is high voltage & current Darlington array. It is use to operate the load through relays which are connected to IC ULN2003.Connection with relay is shown in Figure 6.

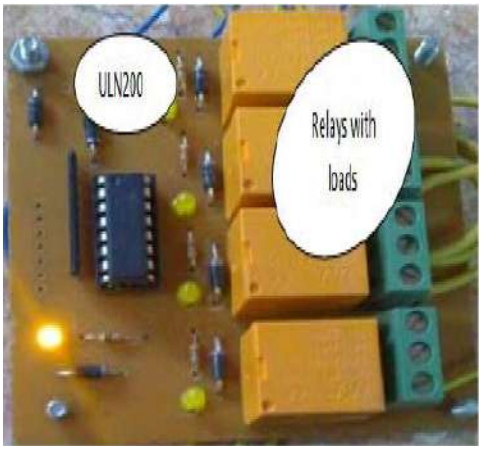

Figure 6: Relays with Max232 controlling devices

The transceiver is the vital feature of this research work. It has the ability of hearing all the incoming and outgoing instructions coming and represents those instructions as an output. In fact, transreceiver is that portion of which sends and receive data and also displays our required outcome. . Discussing the functionality of trans-receiver, a step down transformer is used which step downs the coming 220V form power line to 12V, as it is imperative because of the fact that our components cannot bear such high voltage. Latterly this 12V is supplied to our supply section; the supply section consists of DB107 which in its internal configuration is a bridge circuit hence it produces a pulsating DC. The capacitors remove all the spikes and perform the filtering action. This output from capacitors flow into the voltage regulator IC 7805 which is the heart of the supply section, the circuitry discussed before was just to support the voltage regulating function.

V.SOFTWARE SECTION

The idea of a smart home is always very fascinating for engineers though a lot of contributions have been made yet more has to come. However, X-10 technique is the most reliable technique because of its obvious advantages of controlling your home. The data transmission is very simple utilizing the existing power cables. The data is sent on synchronizing with every zero crossing points of a sinusoidal wave modulated on the 120 KHz high frequency signal of 50Hz of power line. The bits are sent in one by one fashion. The data flows in two different circuitries; a transmitter and a receiver. The whole process is shown in Figure 7

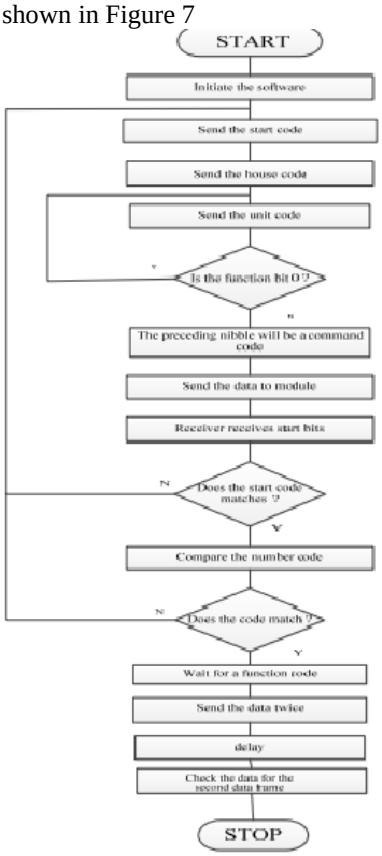

Figure 7: Flow of Software Section

First half of address of 4 bits i.e. nibbles is sent. The next nibble provides the second half of the address, it is designated as "house code" and it has 16 combinations of codes ranging from A to P. Note that each combination is unique and distinguishable. The last bit of the house code is a function bit. When the function bit is 0 the previous nibble which is a house code is considered to be unit code else in the condition when its 1, for which the nibble is assumed to be a command code. Since X-10 is an economical technology it is afraid that some amount of data is lost while the transmission takes place, to overcome this all the data is send twice [12]. This all is applicable for transmitting end. The trans-receiver starts receiving the incoming data after demodulation at the zero crossing points of the sine wave. As soon as the bits are received, bits matching operation begins for the verification. If the letter code matches exactly then the comparison of number bits start and waits for a function bit. As discussed earlier X-10 sends its code twice so that now the above procedure applies to the verification of replica of the transmitted code. After this the receiver takes rest of three cycles of sine wave, in reality it is not in rest state at this time rathe

VI. CONCLUSION

This paper focuses on the novel X-10 protocol controlled by PLC (power line communication) at frequency 120 KHz with transmission range is about 300 m. It also controls 256 devices by more simple commands unlike ZigBee and Wi-Fi because both devices need local internet which have drawback of signal attenuation. To lower such type of signal attenuation we use X-10 protocol. This study has some limitations like time delay in sending the signal and the RS232 serial port disconnection but this is inexpensive project as it incorporates less distortion factor. For the exchange of data by means of power lines, a favorable method is provided which will help in controlling and monitoring called home automation using PLCs [12]. Another prominent advantage of our research work is the software Hyper-terminal that is easily available and more convenient in use. In this research paper, X-10 protocol communicates between controller and appliances over power line. This technique is used because it gives successful reduction of extra cabling with active power factor correction technique . Also X-10 protocol has been devised in automation through this research work which was not accurately used in previous researches of PLC. Moreover, a module is inserted in the AC outlet which will help in interaction and communication purpose over power lines and PLC module also performs the bit error removal phenomena.

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SOLAR HARNESSING WI-FI CONTROLLED ROBOT

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***Abstract*—Solar energy which is a renewable form of energy can be used to offset the present sources of energy. This paper proposes a solar tracking system designed with microcontroller ATmega328 and ldr's that will actively track the sun and change its position accordingly to maximize the energy output. Also, by providing a wi-fi module in the robot, mobility has been added to the bot which can be controlled using a computer or a mobile phone thus providing a wider range of applications**

Keywords- LDR, solar tracking system, solar cell, ATmega328, stepper, WI-FI

I. INTRODUCTION

In years to come the need for energy will increase manifold while the reserve of conventional energy will deplete in rapid pace. To meet the growing demand of energy harnessing of non-conventional /renewable energy is a must. Switching to a natural voltage source like wind, rain, tides, sunlight and geothermal heats is biggest industry in practice and research. In this advancing era of technology one of the most important and sought after aim is to find alternative sources of energy. Energy costs, decreasing supplies of fossil fuels, emphasis on protecting the environment and creating sustainable forms of power have become vital, high priority projects for modern society. Among all the available non-conventional sources, solar energy is the most abundant and uniformly distributed. Though the technology of trapping the solar energy is studied and developed, in existence the process can be improved to increase efficiency and make it cost-effective. the sun moves across the sky during the day, it is advantageous to have the solar panels track the location of the sun, such that the panels are always perpendicular to the solar energy radiated by the sun [1], [2]. This will tend to maximize the amount of power absorbed by PV systems. It is estimated that using a tracking system, over a fixed system, can increase the power output by 30% - 60%.

II. BACKGROUND

The problem that we can see here is the solar panel that is use is only in one way direction. Because of this problem, the power that can be generated is low. In Dual axis system, 30-40% increased efficiency results in more Earning compared to 20-35% in single axis. Solar electricity is almost always more expensive than electricity generated by other sources. The price for the solar tracking system is very expensive for the family that use more power than usual because they need to install more than one solar panel to produce enough power. Solar electricity is not available at night and is less available in cloudy weather Conditions. Therefore, a storage or complementary power system is required. Solar cells produce DC which must be converted to AC (using a grid tie Inverter) when used in currently existing distribution grids. This incurs an energy loss of 4-12%.Tracking the sun from east in the morning to the west in the evening will increases the efficiency of the solar panel by 20-62% depending upon the location [5]. Near the equator, you will have the highest benefit of tracking the sun.The system designed does not include a PLC (programmable logic controller). Hence, it is an economic solution. Solar tracker has been designed using the new principle of using small solar cells to function as self-adjusting light sensors, providing a variable indication of their relative angle to the sun by detecting their voltage output [3],[4].

III. METHODOLOGY

As mentioned earlier, the robot has got two phases. The solar harnessing phase and the mobility phase. Firstly, rays of light fall on the solar cells thus generating a potential. The LDRs underneath each solar cell varies its resistance with respect to the intensity of light falling on them the LDR is connected to the analog input pins of ATmega328 controller which compares the two voltages and sends an output signal to the stepper motor. This output signal makes the stepper motor turn in either right or left direction depending on which solar cell, lesser intensity of light is incident. thus, by rotating the solar cell towards the sun we receive a higher output potential.

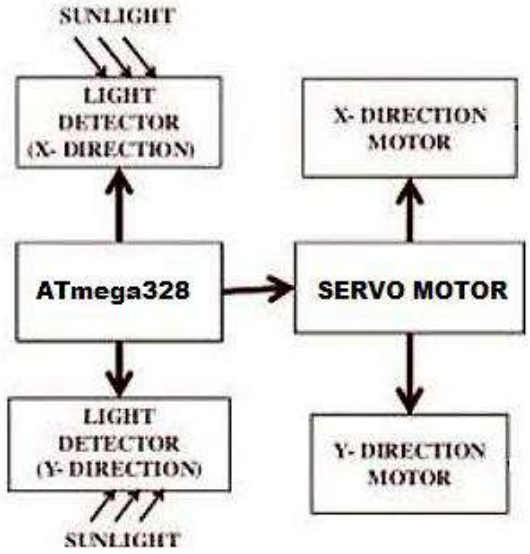

Figure 1: Block diagram for solar harnessing phase

Now coming to the mobility phase, a webpage and a mobile application has been created with IP address 192.168.10.2 with basic control commands i.e. right, left, up, down. The robot has a WI-FI module which when given a 3.3v input, provides a Wi-Fi signal. When a computer or a mobile device is connected to the host device it transmits the control commands to the Wi-Fi module which in turn sends it to the L293D Motor Driver IC which drives the motor asper the commands.

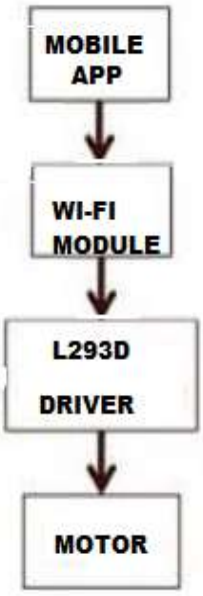

Figure 2: Block diagram for mobility phase

Now let us see the hardware used in a little detail.

A solar cell is a sandwich of two different layers of silicon that have been specially treated or doped so they will let electricity flow through them in a way. The lower layer is doped so it has slightly too few electrons. It's called p-type or positive-type silicon (because electrons are negatively charged and this layer has too few of them). The upper layer is doped the opposite way to give it slightly too many electrons. It's called n-type or negative-type silicon. It generates electricity by using sunlight to make electrons hop across the junction between the different flavours of silicon. When sunlight shines on the cell, photons (light particles) bombard the upper surface. The photons (yellow blobs) carry their energy down through the cell. The photons give up their energy to electrons (green blobs) in the lower, p-type layer. The electrons use this energy to jump across the barrier into the upper, n-type layer and escape out into the circuit. Flowing around the circuit, the electrons provide an output voltage. To track the sunlight, it is necessary to sense the position of the Sun and for that an electro-optical sensor is needed. The proposed Sun tracker uses the electro-optical sensor for self-calibration. A LDR or photoresistor is a variable resistor whose electrical resistance depends on the intensity of the light falling on it. The LDR resistance decreases with incident light intensity increasing.

ATmega32 is has a 32K bytes of In-System Programmable Flash Program memory with Read- While-Write capabilities. it is simply a device which compares two voltages, and outputs a one bit binary. The comparator in the ATmega and ATtiny MCU's is an analog component in that it compares analog values, but it is used as a digital component to trigger an interrupt when the state of the comparator output changes.

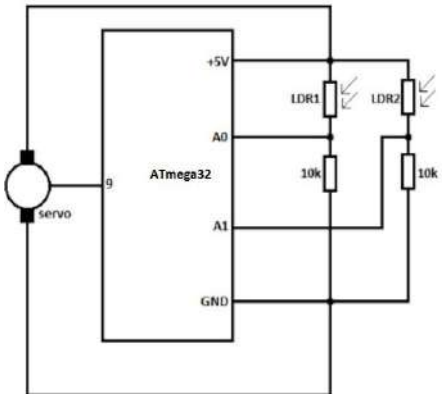

Figure 3:ATmega32 comparator

Servos are controlled by sending them a pulse of variable width. The control wire is used to send this pulse. The

parameters for this pulse are that it has a minimum pulse, a maximum pulse, and a repetition rate. Given the rotation constraints of the servo, neutral is defined to be the position where the servo has the same amount of potential rotation in the clockwise direction as it does in the counter clockwise direction. It is important to note that different servos will have different constraints on their rotation but they all have a neutral position, and that position is always around 1.5 milliseconds (ms).

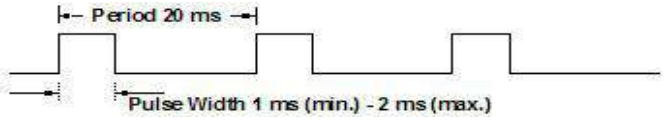

Figure 4 Min. and Max. pulse width

The angle is determined by the duration of a pulse that is applied to the control wire. This is called Pulse Width Modulation. The servo expects to see a pulse every 20 ms. The length of the pulse will determine how far the motor turns. For example, a 1.5 ms pulse will make the motor turn to the 90-degree position (neutral position).When these servos are commanded to move, they will move to the position and hold that position. If an external force pushes against the servo while the servo is holding a position, the servo will resist from moving out of that position. The maximum amount of force the servo can exert is the torque rating of the servo. Servos will not hold their position forever though; the position pulse must be repeated to instruct the servo to stay in position.

When a pulse is sent to a servo that is less than 1.5 ms the servo rotates to a position and holds its output shaft some number of degrees'counter clockwise from the neutral point. When the pulse is wider than 1.5 ms the opposite occurs. The minimal width and the maximum width of pulse that will command the servo to turn to a valid position are functions of each servo. Different brands, and even different servos of the same brand, will have different maximum and minimums. Generally, the minimum pulse will be about 1 ms wide and the maximum pulse will be 2 ms wide.

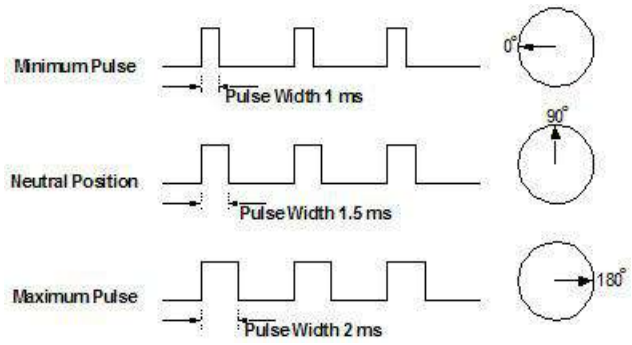

Figure 5 Various width of pulses

Another parameter that varies from servo to servo is the turn rate. This is the time it takes from the servo to change from one position to another. The worst case turning time is when the servo is holding at the minimum rotation and it is commanded to go to maximum rotation. This can take several seconds on very high torque servos.

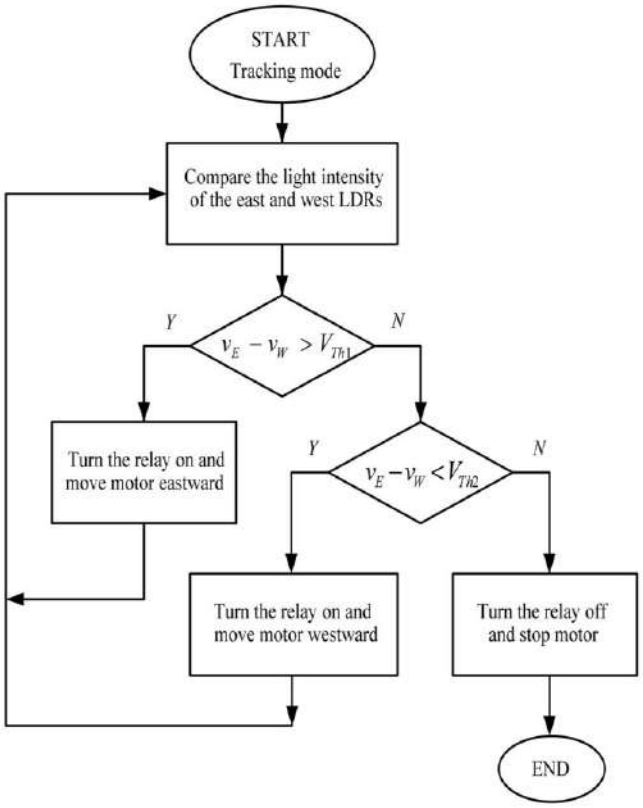

Figure 6: Algorithm for servo motor

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community. This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth

co-existence interfaces; it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

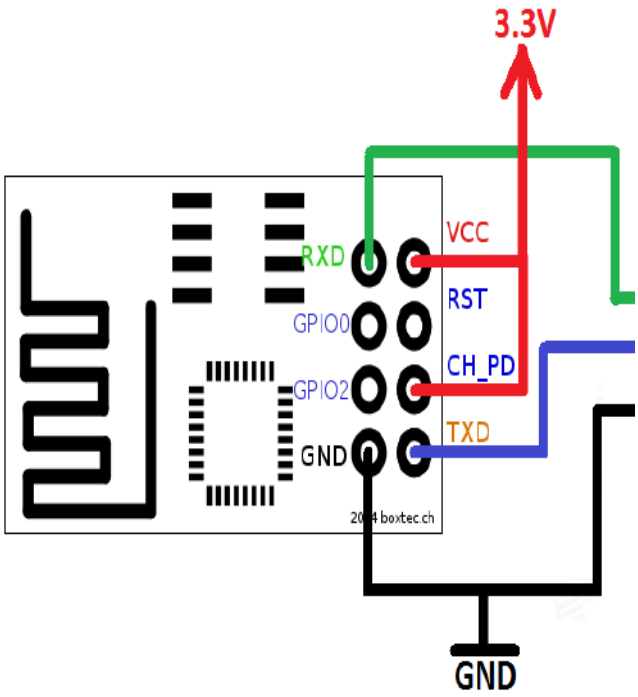

Figure 7: Wi-Fi module

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D.It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, hence H-bridge IC are ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller. There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low, then the motor in the corresponding section will suspend working.

• Pin 2 = Logic 1 and Pin 7 = Logic 0 | Clockwise Direction

• Pin 2 = Logic 0 and Pin 7 = Logic 1 | Anticlockwise Direction

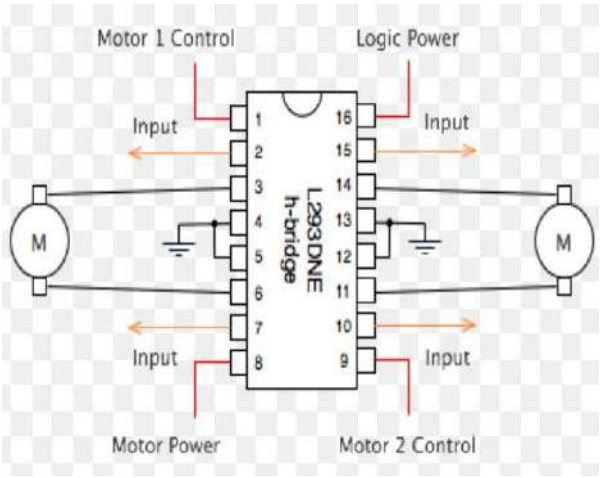

Figure 8: L293D motor driver

IV. Conclusion

The use of sensors provides a new dimension to the robot and increases the scope of its application. The project can be extended by using sensors which detects any leakage of LPG gas, smoke or any fire and alerts the user through alarm. It can be used for Warfield and monitoring applications in far off areas. The solar tracking robot involves wired connections which makes it water sensitive. It can be made more powerful by more mechanical advancements. The results of this research indicate that the STR is capable to track the movement of sun and perform a self-alignment once the robot is out of position. By attaching a solar panel on the solar tracker robot, the efficiency of the solar panel can be increased. The average power can be increased up to 19.72 percent compare to static.

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UNDERGROUND CABLE FAULT DETECTION USING ARDUINO

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***Abstract*-This paper proposes underground fault location model using ARDUINO. Underground distribution cables faces with various technical difficulties regarding detecting and locating their faults. Different factors like remarkable charging currents, cable construction and variations from the variety of bonding and grounding methodologies. ARDUINO is basically an open source hardware used to create interactive electronic objects consisting of various analog and digital pins, serial communication interfaces, including USB on some models, for loading programs (C++, C, and java) from personal computers. The LCD (liquid crystal display) used is of 16*2 displays. In this paper, concept of ohm's law is used. To detect a fault in the cable, the cable must first be tested for faults. When any fault like short-circuit occurs, voltage drop will vary depending on the length of fault in cable, since the current varies. A set of resistors are therefore used representing cable length in kilo meters and fault creation is made by a set of switches at every known kilo meters (km's) to cross-check the accuracy . The fault occurring at what distance and which phase is displayed on a lcd interfaced with the ARDUINO. The underground cable system is especially used for distribution in metropolitan cities, airports and defense service, because underground cables are not affected by any adverse weather conditions.**

Keywords: Underground cable, fault location, ARDUINO, LCD, USB.

I. INTRODUCTION

Concerns about the reliability of overhead lines, increases in their maintenance and operating costs, and issues of public safety and quality-of-life are leading more and more utilities and municipalities to the realization that converting overhead distribution lines to underground is the best way to provide high-quality service to their customers, under-grounding provides potential benefits through reduced operations and maintenance costs, reduced tree trimming costs, less storm damage and reduced loss of day-to-day electricity sales when customers lose power after storms[1]. The underground cable system is very important for distribution especially in metropolitan cities, airports and defense service, because underground cables are not affected by any adverse weather condition such as storm, snow, heavy rainfall. But when any fault occur in cable, then it is difficult to locate fault.

The aim of this project is to determine the distance of underground cable fault from base station in kilometers. Now the world is become digitalized so the project is intended to detect the location of fault in digital way. The underground cable system is more common practice followed in many urban areas. In case if any fault occurs for any reason at that time the repairing process related to that particular cable is difficult due to not knowing the exact location of cable fault[2]. The fault can be any defect, inconsistency, weakness, current diversion from its intended path caused by breaking of conductor and failure of insulation.

SIGNIFICANCE

The system provides way for finding out the location of damaged cable thereby reducing human efforts an

II. METHODOLOGY

The Project detects the location of fault in underground cable lines from the base station in kilometers using an ARDUINO board. It uses the standard concept of ohms
law i.e., when a low dc voltage is applied at the feeder end through a series resistor to the cable lines, then current would vary depending upon the location of fault in the short circuited cable. When there is a short circuit , the voltage across series resistors changes accordingly and fed to an ADC to develop precise digital data which the programmed ARDUINO would display using lcd in kilometers[4]. The project consists of series of resistors representing cable length in kilometers and fault creation is made by a set of switches at every known km.

III. COMPARING WITH EXISTING TECHNOLOGY

The existing technology is not fast as compared to using controller in the system. It is much convenient way to locate a fault with efficient way.

IV.SENSORS AND CONTROLLER:

MICROCONTROLLER (ARDUINO UNO):-

It is a powerful single board computer, an open source hardware platform allowing creating interactive electronic objects. It consists of ARDUINO board, set of various analog and digital I/O pins, serial communication interfaces, including USB on some models, for loading programs from personal computers. Its platform provides an integrated development environment (IDE) based on the processing project, which includes support for C, C++ and Java programming languages. This method features an Atmel Atmega328 operating at 5v with 2Kb RAM, 32kb of flash memory for storing programs and 1kb of EEPROM for storing parameters. The clock speed is 16 MHz which translates to executing about of 300,000 lines of C source code per second.

The microcontroller used is Atmega 328.The Atmel 8-bit AVR RISC-based microcontroller combines:

32 kB ISP flash memory with read-while-write capabilities. 1 KB EEPROM, 2 kB SRAM,23 general purpose I/O lines, 32 general purpose working registers, 3 flexible, timer/counter with compare modes, internal and external interrupts, Serial programmable USART, A byte-oriented 2-wire serial interface, SPI serial port,6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, five software selectable power saving modes, operating frequency of 20MHz.The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.

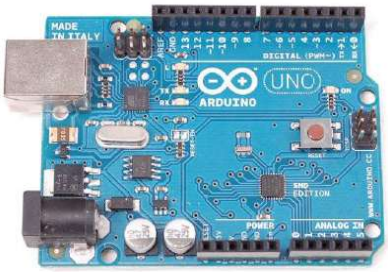

Figure 1Atmega328 ARDUINO Board

Relay and Relay Driver ULN2003:-

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

It is a monolithic high voltage and high current Darlington transistor arrays. It consists of seven NPN Darlington pairs that feature high voltage outputs with common cathode clamp for switching inductive loads [5]. It has high current carrying capability of about 500mA.

Figure 2 RELAY

*LCD MONITOR (16*2) :*-Liquid Crystal Display (LCD) screen is an electronic display module and finds a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over other seven segments and other multi segment LEDs.The reason being LCDs are economical, easily programmable, have no limitation of displaying special and even custom characters(unlike 7 segments),animation and so on.

Figure 3 16*2 LCD

V.WORKING

The project uses the simple concept of OHMs law where a low DC voltage is applied at the feeder end through a series resistor. The current would vary depending upon the length of fault of the cable in case there is a short circuit of LL or 3L or LG etc. The series resistor voltage drop changes accordingly which is then fed to an ADC to develop precise digital data which the programmed microcontroller would display the same in Kilo meters. The project is assembled with a set of resistors representing cable length in KMs and fault creation is made by a set of Switches at every known KM to cross check the accuracy of the same.

The devices which are connected/interfaced with the microcontroller (ARDUINO) can be represented in a block diagram as shown below:

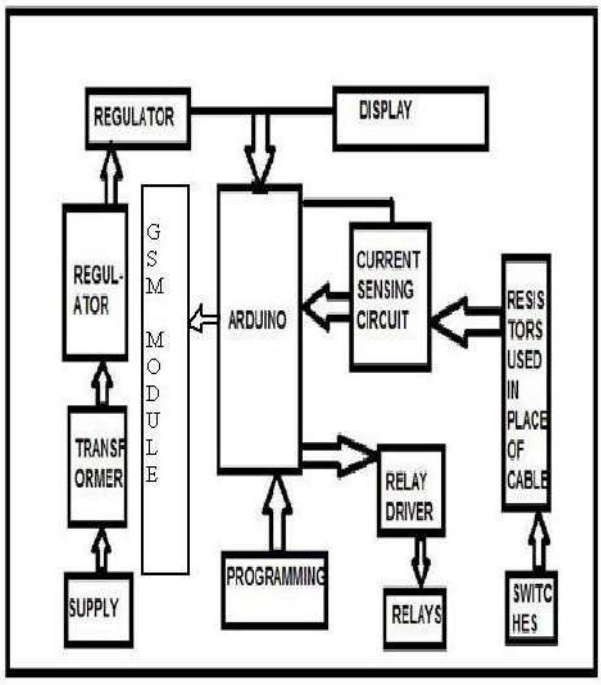

Figure 4 Block Diagram

ALGORITHM AND FLOWCHART:-

Algorithm of programming used in underground able fault detection-

1. Step: Initialize the ports, declare timer, ADC, LCD functions.
2. Step: Begin an infinite loop; turn on relay 1 by making pin high.
3. Step: Display ―R:NF Y:NF B:NF at the starting of first line in lcd.(NC=NO FAULT)
4. Step: Call ADC Function,
5. Step: check for any fault
6. Step: depending upon ADC output, displays the fault position.
7. Step: give input for led and alarm, GSM module and send an alert message to authorized person and technician.
8. Step: if fault is cleared then switch back the relay position.
9. Steep: Repeat step 3 to 8.

FLOWCHART:-

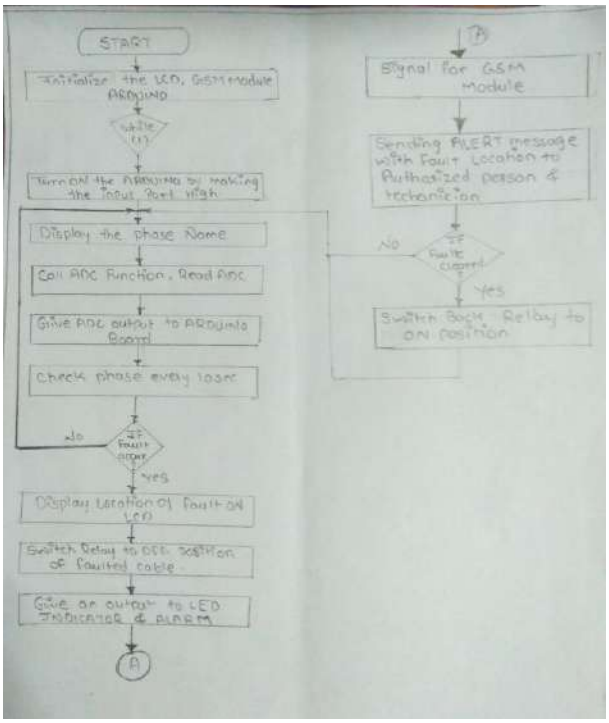

Figure 5 Flowchart

VI. ADVANTAGES AND APPLICATION

1) Less maintenance.
2) It has higher efficiency
3) Less fault occur in underground cable
4) Underground cable fault location model are applicable to all types of cable ranging from 1kv to 500kv&other types of cable fault such as-Short circuit fault, cable cuts, Resistive fault, Sheath
Faults, Water trees, Partial discharges.
5) Improved public safety.

Application:-

This type of system can be used in industrial as well as commercial areas

VII.CONCLUSION

In this paper we detect the exact location of short circuit fault in the underground cable from feeder end in km by using ARDUINO. For this we use simple concept of OHM's law so fault can be easily detected and repaired.

ACKNOWLEDGEMENT

We express our deep sense of gratitude to Mrs. Swati patil for encouraging us to work on this project and providing her support and guidance throughout the implementation of the project.

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Raspberry Pi And Wifi Based Home Automation System

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***Abstract*—In current years, the complete home environment has seen a rapid need of network(in this wi-fi) enabled digital technology. Automation of the surrounding environment of a modern human being allows increasing his work efficiency and comfort. In the present times, we can find most of the people using their mobile phones and smart devices throughout the day. Hence with the help of his companion – a mobile phone, some daily household tasks can be accomplished by personifying the use of the mobile phone. Analyzing the current smart phone market, novice mobile users are opting for Android based phones. . Home Automation System (HAS) has been designed for mobile phones having Android platform to automate an Raspberry pi which controls a number of home appliances like lights, fans, bulbs and many more using on/off relay. This paper presents the automated approach of controlling the devices in a household that could ease the tasks of using the traditional method of the switch. The most famous and efficient technology for long range wireless communication- Wi-Fi is used here to automate the system. The HAS system for Android users is a step towards the ease of the tasks by controlling one to many different appliances in any home environment.**

***Keywords: Home Automation system, Raspberry Pi, Relays, Android, Python*.**

I. INTRODUCTION

Today's homes require sophistication control in its different gadgets which are basically electronic appliances [1]. This has revolutionized the area of home automation with respect to an increased level of affordability and simplicity through the integration of home appliances with smart phone and tablet connectivity. Smart phones are already feature-perfect and can be made to communicate to any other devices in an ad hoc network with a connectivity options like Wifi [2]. With the advent of mobile phones, Mobile applications development has seen a major outbreak. Utilizing the opportunity of automating tasks for a smart home, mobile phone commonly found in normal household can be joined in a temporary network inside a home with the electronic equipments. Android, by Google.provides the platform for the development of the mobile applications for the Android devices VNC viewer [1]. Home automation system is a mobile application developed using Android targeting its vast market which will be beneficial for the masses. The home automation refers to domestic environment that improves the quality of the resident's life by facilitating a flexible, comfortable, healthy, and safe environment. Internet based home automation systems become the most popular home automation system in international markets . The remote controlling and monitoring of a house using internet requires android phone, which is large in size and heavy to carry around. The most available home automation systems use different wireless communication standard to exchange data and signaling between their components, like Bluetooth, Zigbee, Wi-Fi, and finally the Global System for Mobile Communication (GSM). Wireless based home automation systems decrease installation cost and effort, we are using raspberry pi a credit card size complete computer and enhance system flexibility and scalability.

In Home automation systems there are collections of interconnected devices for controlling various functions within a house. Mobile devices are ideal in providing a user interface in a home automation system, due to their portability and their wide range of capabilities. . Within the house, the user might not want to go to a central control panel, or not even to the laptop, but use the phone that is usually placed in closer proximity to the user. When far from the house, the user might want to check its current status or even schedule actions for his return. In concept of android based home automation system we can provide end users with simple secure and easily configurable home automation system .Also the concept can overcome the barriers facing home automation systems and will enable a home technology ecosystem that allows people to easily adopt the subset of home automation technology that appeals to their household.

Automation systems are available in a number of varieties. A few have been discussed here. Java-Based Home Automation System. Home Automation using GSM. Zigbee based Home automation. SMS based Home automation. Even if many varieties of home automation systems are available,Home Automation is becoming an inevitable thing in our fast developing environment and current life style. New trends in lifestyle have enhanced the installation of automated home appliances in many places. Home automation not only refers to the automation of appliances in a house but also the

automation of things that we use in our daily life such as cars, telephones etc. Automation of appliances was firstly introduced in offices for ease of use and also for reduction in time and cost consumption. Nowadays, home auto current system has got a number of limitations. Currently home automation systems are implemented with a large amount of hardware. The installation and maintenance of the current system is a difficult task. It also imposes a huge installation cost on the user or consumer. Current home automation systems are inefficient in security. They are also very poor in bandwidth utilization. They may either leave a large amount of bandwidth or it will be very less. In case of Zigbee the bandwidth is too low and in case of GSM it is too high. The java based home automation is very poor in security as the uses web pages to access and control the appliances. SMS based and GSM based home automation is costly for the consumer as it becomes expensive to communicate via SMS. The varieties of home automation system improves the quality of the resident‟s life by facilitating a flexible, comfortable, healthy safe environment.

II. BLOCK DIAGRAM

The new system we have used will provide the following features which will ease the use of this system

- It allows more flexibility through android device.
- It allows a good range of scalability.
- It provides security and authentication.
- Additional vendors can be easily added.

Home appliance network (home automation) is required to be without new wiring and to be very easy installation. Field of home appliance network is still young, many initiatives and standardization efforts have already been made. the new kind of system brought android and raspberry-pi into home automation implementation.

Typical Hardware You Will Need

While the RPi can be used without any additional hardware (except perhaps a power supply of some charger 5V), it won't be much use as a general computer. As with any normal PC, it is likely you will need some additional hardware.

The following are more or less essential:

1. Raspberry Pi board
2. Prepared Operating System SD Card
3. USB keyboard
4. Display (with HDMI, DVI, Composite or SCART input)
5. Power Supply

The proposed system architectures generally incorporate a raspberry-pi computer [3] for the purposes of network management and provision of remote access .raspberry-pi can be configured according to our home system. The user will communicate to raspberry-pi through wifi network. The system is flexible and scalable, allowing additional home appliances designed by multiple vendors, to be securely and safely added to the home network with the minimum amount of effort. The wifi network should be having adequate strength also. we can use a wifi-modem for steeping a wifi. the user can have a nice android interface for using the system. The serial data coming from wifi unit is connected to raspberry-pi circuit. The core of the home automation system consists of raspberry-pi board. it can be viewed as a mini computer capable of doing many functions.

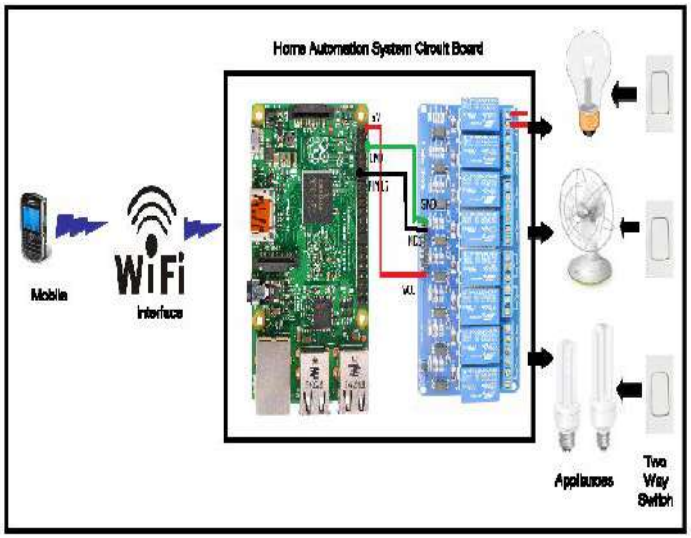

Figure 1 Block diagram

Figure 2 Required things for system

i. Cables

ii. Highly suggested extras include:

iii. USB mouse

iv. Internet connectivity- a USB WiFi adaptor (Model A/B) or a LAN cable (Model B)

v. Powered USB Hub

vi. Case (optional)

The Raspberry Pi allows peripherals and expansion boards to access the CPU by exposing the input and outputs. The production board which has a 26-pin (2.54mm) expansion header, arranged in a 2x13 strip. This will provide 8 GPIO pins and access to I2C, SPI, UART, as well as +5V ,+3V3 Pin one is column 0 on the bottom row., and GND supply lines. Voltage levels are 3v3. There is no over-voltage protection on the board -the intention is that people interested in serious interfacing will use an external board with buffers, level conversion and analog I/O rather than soldering directly onto the main board.

The raspberry-pi board is so configured for each home appliances, that according to user intervention the matched out will make high and the corresponding relay will switch on and device start function. The system is scalable and allows multi vendor appliances to be added with no major changes to its core. This project mainly consist of five modules as follows.

Five modules needed are:

- User Interface
- Wifi Router Configuration
- Raspberry Pi
- Relay circuit
- Appliances

III. System Requirement

A. User Interface

User interface is everything that the user can see and interact with. In this module the android enabled phone makes control of the home automation system. Android provides a variety of pre-build UI components such as structured layout objects and UI controls that allow you to build the graphical user interface for your app. Android also provides other UI modules for special interfaces such as dialogs, notifications, and menus. the interface should allow user to view device status and to control device.

B. Wifi Router Configuration

The wifi unit provides the medium for communication. it can be also configured to make security services. The wifi should be configured with a certain address and user commands will be directing through wifi unit. you may use sudo nano /etc/network/interfaces for configuring wifi with raspberry-pi.

C. Raspberry Pi

The Raspberry Pi is a low cost single-board computer which is controlled by a modified version of Debian Linux optimized for the ARM architecture. the core of the home automation system is this mini computer. Here we are using modelB ,700 MHz ARM processor with 512 MB RAM. The setting up of raspi consists of selecting raspbian OS from noobs package. The noobs package consists of raspbian, arclinux, pidora, open ELEC, risc OS operating system. After the os selection we need to configure raspberry-pi using Raspi-config command. We can enter into raspi desktop using startx command.

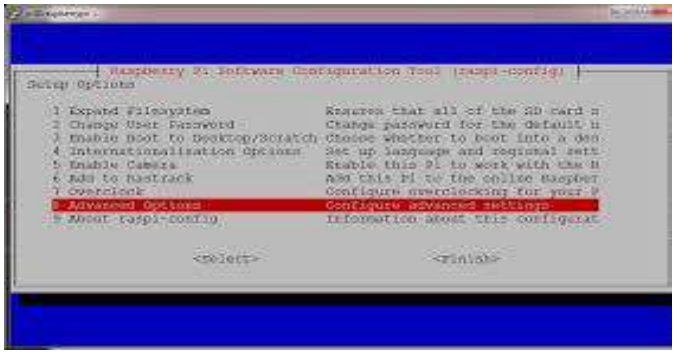

Figure 3 Noobs OS installation window

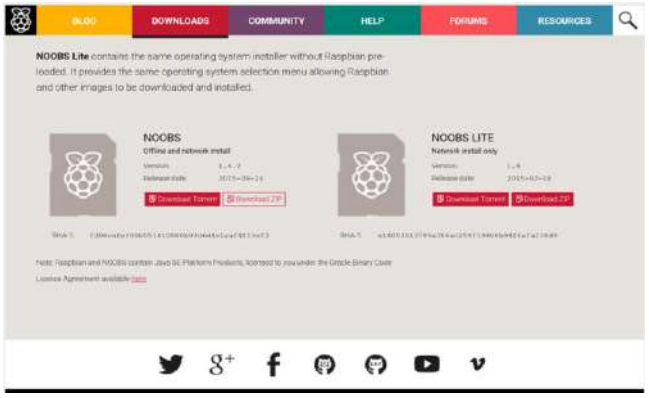

Figure 4 Raspberry-pi configuration using Raspi-config command.

We can use WebIOPi [4] to interface raspberry-pi with external world. A WebIOPi (web application) that allows user to control Raspberry Pi's GPIO. It Support's REST API over HTTP and Co-AP .It can also handle more than 30 devices including ADC, sensors, DAC. The webIoPi interface allows better control of raspi. and makes raspi control more efficient, The webIoPi Extensible and highly customizable as shown in Fig.5.

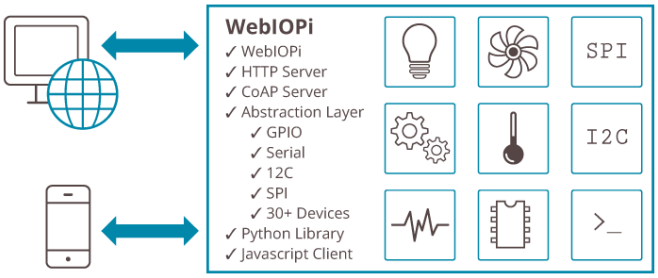

Figure 5 webIoPi supported features

D. Relay Circuit

A relay [5] is an electro-mechanical switch operated as mechanical switch. 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. In our system the output from rapi is directly giveb to relay circuit. According to the out of raspi , curresponding relay will turn on and makes it‟s device working.we are using a NPN transistor in relay and it works based on concept of emf. The relay can be selected according to our application purpose as shown in Fig.7.

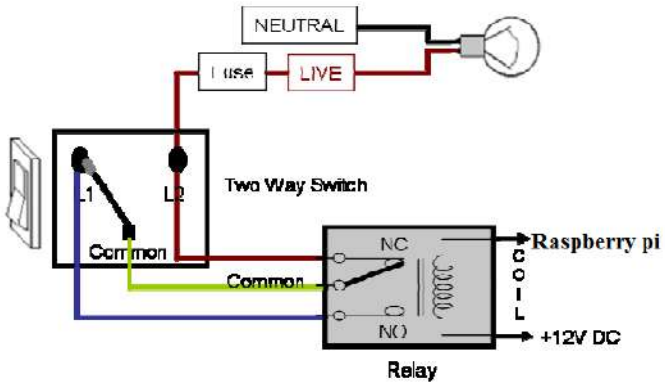

Figure 6 Relay connected with bulb.

The home automation system [6] ends up with the working of relay circuit. In this home automation system we can add devices very easily into system. Also it can be configured with more security and functional services. The raspi mini computer can be make use more better to incorporate variety of applications to our home automation system. Since our system makes running in low power compared to other system, it is having a tremendous application view. The webIoPi Extensible and highly customizable and makes raspi control more efficient.

Any application must be user-friendly. To make user-friendly application, start with wire-frame. Assume that you are going to use your own application and find out the main objectives and how to integrate them in such way that they will be most easy to end-user.

In this application's scenario, our main objectives are:

a. Room Management

b. Device Management and

c. External Services like GSM Communication, Internet Communication, etc.

TABLE I: Status of Appliances

Status of devices connected with the system		
Name of device	**Relay number**	**Status**
LED (light)	1	On
Fan	2	Off
Speaker	3	On
TV	4	On

IV. Conclusion

The system as the name indicates, „Android based home automation‟ makes the system more flexible and provides attractive user interface compared to other home automation systems. In this system we integrate mobile devices into home automation systems. A novel architecture for a home automation system is proposed using the relatively new communication technologies. The system consists of mainly three components is a wifi module, raspberry pi board and relay circuits. Wifi is used as the communication channel between android phone and the raspberry pi board. We hide the complexity of notions involved in the home automation system by including them into a simple, but comprehensive set of related concepts. This simplification is needed to fit as much of the functionality on the limited space offered by a mobile device‟s display.

Acknowledgement

We have taken a lot of effort in presenting this idea. However, it would not have been possible without the kind support and help of many individuals. We find immense pleasure in expressing my sincere thanks towards all those who helped me in presenting this work. We are highly indebted to our professor Mr.Ravi Biradar for his guidance and constant

supervision as well as providing necessary information regarding the project and also for his support in completing this paper.

I would like to express my gratitude towards my project partner for his kind cooperation and encouragement which helped us in completing this work. We would like to express our special gratitude and thanks to our teacher guide for giving us his attention and time. Lastly we would thank and appreciate our friends and people who have willingly helped us with their abilities.

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Fire Fighting Robot Using RF Technology

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Abstract: Firefighting is the act of extinguishing fire. A firefighter suppresses and extinguishes fires to protect lives and to prevent the destruction of property and of the environment. Firefighters are often the first responders to people in critical conditions which may be hazardous to their lives as well. One of the major hazards associated with firefighting operations is the toxic environment created by combustive materials. Toxic combustion products including carbon monoxide, hydrogen cyanide, nitrogen dioxide, benzene, and polycyclic aromatic hydrocarbons. The four major hazards associated with these situations are smoke, oxygen deficient atmosphere, elevated temperatures and toxic atmospheres. Additional risks of fire include falls and structural collapse. To combat some of these risks, firefighters carry self- contained breathing apparatus. In an attempt to reduce the intensity of the risks that they undertake on a daily basis, a robot can be designed to reach places which prove to be dangerous for direct human intervention. Such a robot becomes very useful for remote operation in risk-prone areas thereby minimizing casualties. The project is aimed at developing such a robot that senses any fire-outbreak through use of fire sensors and extinguishes fire with the help of remote human control. There are a number of subsystems that must be designed to fit together into an appropriate package suitable for carrying out robot tasks. A firefighter robot is one that has a small fire extinguishing mechanism added to it. The fire detection scheme to be deployed in the robot includes a variety of options – water source, extinguishing cylinder, blower, etc. This project uses a water source driven by a motor as a fire extinguishing mechanism.

Keywords: RF Technology, Microcontrollers, Sensors, Fire Extinguishing.

I. INTRODUCTION

Firefighting is the act of extinguishing fire. The firefighting robot designed in this project is an amateur attempt at creating a moving machine to aid the rescue team in fighting the emergency of fire. When fire occurs in buildings, factories or any other closed spaces, fighting it is quite risky as one may get trapped in such closed spaces. In such cases, a robot can be used for firefighting with least risky human intervention. A robot comes in handy for such remote operations. Building the robot requires both software and hardware modules. It involves integration of various systems and devices like motors, sensors, controllers or processors, etc. in order to serve specific purposes. This project bases itself on microcontrollers for both transmitter and receiver module to which other devices are connected. The control of a basic robot involves three distinct phases: perception, processing and action. Although the appearance and capabilities of robots vary vastly depending upon the designer and its applications, all the robots share the basic feature of a mechanical structure under some form of control.

This project uses RF technology for communicating with the robot remotely. The transmitter processes information received from the fire sensor via the microcontroller on the transmitter side and sends commands to the receiver accordingly. The microcontroller on the receiver side interprets the commands and performs the necessary actions. The microcontrollers are programmed using a suitable programming language. The project will use motor drivers to give sufficient torque to the wheels for clean movement. A sensor is incorporated for detecting the fire and a buzzer for notifying about the same. On detection of fire, the user directs the robot to the fire by remote operation using RF technology for extinguishing the same.

II. IMPLEMENTATION

RF transmitter and receiver

Signals through RF can travel through large distances making it suitable for long range applications. This RF module comprises of an RF transmitter and an RF receiver. The transmitter/receiver pair operates at a frequency of 434MHz. an RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin 4. The transmission occurs at the rate of 1Kbps-10Kbps. The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. The RF module is often used along with a pair encoder/decoder.

encoder/decoder pair used in this project is HT12E-HT12D.

Figure 1Transmitter – Receiver pair

Microcontroller

A microcontroller has been used on both sides of the project, i.e. the transmitter and the receiver module.

The AT89C2051 which is a 20 pin IC is used on the transmitting side. It is a low voltage high performance CMOS 8-bit microcomputer with 2K bytes of flash programmable and erasable read only memory. The AT89C2051 provides the following standard features: 2K bytes of flash, 128 bytes of RAM, 15 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplex serial port, a precision analog comparator, on-chip oscillator and clock circuitry.

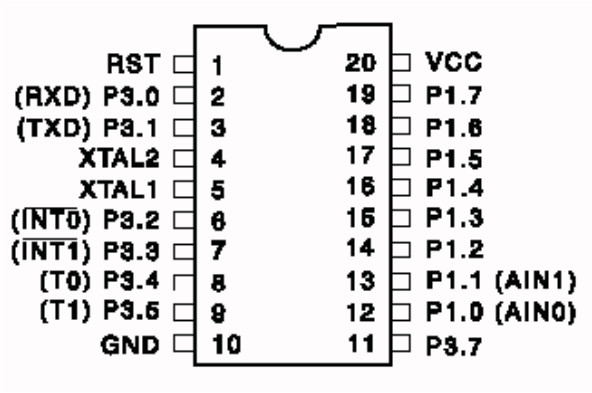

Figure 2 Pin diagram of AT89C2051

The AT89C51 is a 40 pin IC used on the receiving side. It is a low power, high performance CMOS 8-bit microcomputer with 4K bytes of flash programmable and erasable read only memory. The device is manufactured using Atmels high density nonvolatile memory technology and is compatible with the industry standard MCS-51 instruction set point. The on-chip flash allows the program memory to be reprogrammed in system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications.

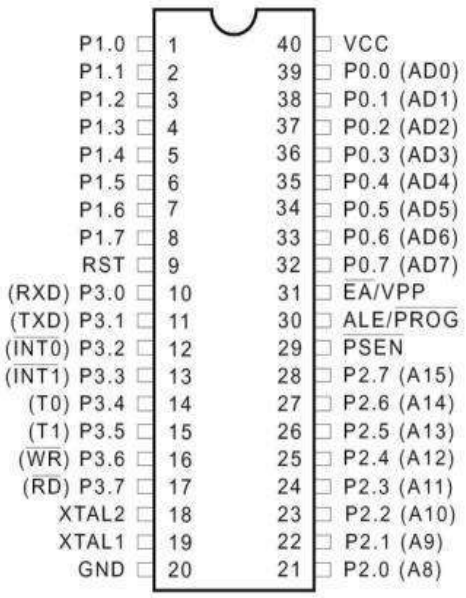

Figure 3 Pin diagram of AT89C51

Fire sensor

The fire sensor used in this project is LM393. This module is sensitive to the flame and radiation. It can also detect ordinary light source in the range of a wavelength 760nm-1100nm. The detection distance is up to 100cm. The flame sensor can output digital or analog signal. It has an adjustable detection range and its operating voltage is 3.3V-5V.

Encoder-decoder

The 2^{12} decoders are a series of CMOS LSIs for remote control system applications. They are paired with 2^{12} series of encoders. For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from a programmed 2^{12} series of encoders that are transmitted by a carrier using an RF or an RF transmission medium. They compare the serial input data three times continuously with their local address. If no error or unmatched codes are found. The input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission. The 2^{12} series of decoders are capable of decoding information that consist of N bits of address and 12-N bits of data. Of this series, the HT12E is arranged to provide 8 address bits and 4 data bits and HT12D is used to decode 12 bits of address information.

III. FUTURE SCOPE

The motto of this project was to design a robot that could detect fire and notify about the same upon which one can instruct it to move towards the fire in order to extinguish it. However, the same can be fully automated. Efforts may be put to design an autonomous robot. This means that it will be capable of guiding itself towards the fire without human intervention. This is necessary because RF technology can be used only where explicit human control is difficult to achieve. Also considering the number of lives lost regularly in firefighting, the automation provides us the opportunity to pass on to robots tasks that traditionally humans had to do but were inherently life threatening.

IV. CONCLUSION

The need for a device that can detect and extinguish a fire on its own is long past due. Many house fire-outbreaks originate when someone is either sleeping or not home. With the implementation of such a device, people and property can be saved at a much higher rate with relatively minimal damage caused by fire. The challenge of creating a fire extinguishing robot to operate in lighting conditions that are not fixed is a difficult one. These systems provide us greater efficiency to detect the same and it can be extinguished before it becomes uncontrollable and a threat

to life. This project is aimed at serving as a base for further improvement of the design so as to make the process of firefighting more reliable and systematic

ACKNOWLEDGEMENT

This paper is an efficient contribution of its authors to the field of surveillance system. The work done here is expected to bring a change in the current trend of the system by switching to this system.

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Wireless Gesture Controlled Animatronics Robotic Hand

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***Abstract*—Animatronics refers to a robotic device that emulates a human or an animal which seems animate rather than robotic. It is a multi-disciplinary field which integrates anatomy, robots, mechatronics, and puppetry resulting in lifelike animation [1]. This paper discusses the use of XBEE wireless technology and its implementations in the field of Animatronics. In this project a wireless gesture controlled robotic hand is designed using Arduino Uno and XBEE S2 modules. Motion of this robotic hand is controlled using a control glove which measures the amount of bending of human fingers using flex sensors and uses these readings to control the movement of robotic fingers using servo motors. As the whole body of the robot would have been of much cost, we decided to make a shadow hand instead. Approximating the kinematics of the human hand was our top priority when developing this animatronics hand. Each joint of this hand has a movement range again the same as or very close to that of a human hand, including the thumb and even the flex of the palm for the little finger.**

Keywords—XBEE S2, Arduino Uno, XBEE shield, flex sensors, servo motors.

I. INTRODUCTION

In this section literature survey and problem definition of the project is defined.

A. Literature Survey

Wireless animatronics hand is basically a robotic hand which is implemented by using XBEE wireless technology. Intension of this project is to obviate human involvement where human hand is must to perform certain task but it is too dangerous for human skin and bones. Here, instead of using actual human hand, we can replace it by this wireless robotic hand. We may allow this robotic hand to complete the same task so that the risk will be avoided and obviously, required task can be achieved. For example, consider a chemical industry where highly hazardous chemicals are to be handled every day. In this case, to handle extremely hazardous substances, if we will allow this wireless animatronic hand, it will be safer for everyone. During bomb diffusing operation in defence field, this Animatronic hand can be mounted on a moving platform along with a camera to diffuse the bomb from a safer distance without any harm to human life. Also this hand can help paralysis patients who can't move their hand by proving a electronic hand which can work on voice commands of the bearer and enables the user perform various tasks like grab something, switch on something etc. This paper intends to implement an affordable electronic product known as wireless animatronic hand based on wireless technology based on XBee-S2 as well as Arduino-UNO board. Arduino-UNO is a microcontroller board which has on-board microcontroller ATmega-328. It has total 14 pins including analog and digital pins. There are 6 PWM(Pulse Width Modulation) output pins on this board. Also, it has 6 analog inputs, a USB connection, a power jack, a 16 MHz ceramic capacitor, an ICSP header and a reset button [2]. The Arduino-UNO differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter [3]; so that this board is used to make this robotic hand. Basically there are two main parts of this project i.e. transmitter (Control glove) and receiver (mechanical-electronic robotic hand). Control glove mainly consists of flex sensors. There are total five flex sensors placed separately on each finger on the glove. Human hand will control another robotic hand; so that it is called as a control glove. Future efforts would be to make this hand to fly as well as to move from one place to another.

B. Problem Statement

In industries, where the production is out of phase of the demand and when the gap is widening with time, there is a necessity of more efficient devices for production. The robots are cost efficient and do their job precisely. Instead of using costly human labor the companies are preferring robots. So there is need for making robots more and more like humans. To fulfill this requirement the animatronics was introduced as a solution. The animatronics robots are based on human parts such as hands. The main purpose of animatronics is to provide a vital replacement to humans. The animatronics robots are more advanced than any other robots used in industries

II. METHODOLOGY

In this section basics of 3D printing, Arduino UNO, XBEE wireless module, Servo Motor and flex sensor is discussed.

A. 3D Printing

Ultimaker[2] 3D printer as shown in Fig.1 is used to 3D print mechanical parts of the robot hand. This printer utilizes a technology called Fused Deposition Modelling (FDM), which

involves the construction of parts in layers using high-grade thermoplastics [4]. To print a 3D model, an STL file of the design must be exported into the printer software. The Ultimaker then creates g-codes that determine a pathway for the extruder. The extruder is the mobile head of the printer that first melts the filament and then deposits the molten thermoplastic into thin layers until the model is fully printed [5]. As needed, the 3D printer will provide scaffolds for the design that act as supports. These are easily removed at the end [6]. The most commonly used filaments in consumer printing are acrylonitrile but a diene styrene (ABS) and polylactic acid (PLA) thermoplastics. Each filament has its own unique characteristics, lending to different usages. While ABS is tougher and more flexible than PLA, due to the nature of the plastic, ABS requires a heated bed to prevent the outer layers from curling in or warping; this guarantees an even distribution of heat to both the outer and inner layers. PLA, however, does not require a heated bed and is more resistant to substances such as acetone, which dissolves ABS filament [7].

Figure 1 Ultimaker[2] 3D printer [8]

B. Arduino UNO

Arduino is a brand of open-source microcontrollers frequently used in at-home, do-it-yourself electronics projects. It can be programmed using open source Arduino IDE [9]. Arduino UNO is Atmega-328 based microcontroller board. It is very simple and powerful board with ISP mode. It has total 14 pins including analog and digital pins. There are 6 PWM (Pulse Width Modulation) output pins on this board. Also, it has 6 analog inputs, a USB connection, a power jack, a 16 MHz ceramic capacitor, an ICSP header and a reset button [10]. In this project 5 PWM pins are used to control positions of 5 servo motors and 5 Analog pins are used to take the readings from 5 flex sensors.

C. XBEE Wireless Module

XBEE is a wireless communication module that Digi built to the 802.15.4/Zigbee standards. These modules use the IEEE 802.15.4 networking protocol for fast point-to-multipoint or peer-to-peer networking. They are designed for high-throughput applications requiring low latency and predictable communicating timing. XBee-S2 stands for series-2 ZigBee protocol. It has a small wired antenna placed on it. Before using this XBee-S2, it is mandatory to first configure it and then use for a wireless communication; so that you may allow your XBee to update the firmware on the radios [11]. This configuration can be done easily by using X-CTU software.

D. Servo Motor

To handle the finger movements and rotations, micro servo motors are being used in this project. A rotary actuator that allows for a precise control of velocity, acceleration as well as an angular position is known as a servomotor [12]. Servomotor is a motor suitable for use in a closed loop control system. It includes suitable motor coupled to a sensor to get a position feedback. It needs a relatively sophisticated controller, often a dedicated module which is designed specifically for use with servomotors. Servomotors can be used in various applications such as robotics, CNC machinery or automated manufacturing. Servo motor gives different angles for different duty cycles [13]. In this project, at the receiver side, these five motors are connected so that, we can achieve a smooth movement of a finger of a robotic hand.

E. Flex Sensor

The Flex Sensor patented technology is based on resistive carbon elements. As a variable printed resistor, the Flex Sensor achieves great form-factor on a thin flexible substrate. When the substrate is bent, the sensor produces a resistance output correlated to the bend radius—the smaller the radius, the higher the resistance value [14]. In this project flex sensors are used in control glove to measure the bending in the finger by change in the resistance. As the bending angle increases, the resistance increases and this variable resistance is converted into voltage by a voltage divider network and given to analog input of Arduino for digital conversion.

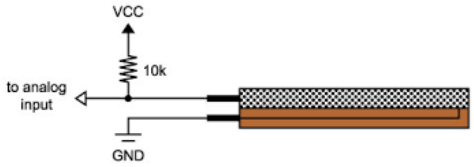

Figure 2 Flex Sensor

III. IMPLEMENTATION

This section deals with hardware and mechanical design, hand and forearm assembly.

3.1 Hardware and Mechanical Design

A. Design

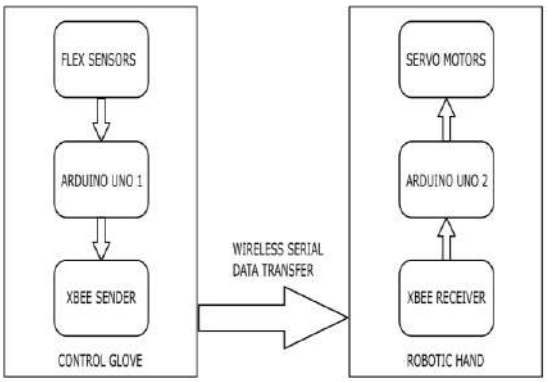

Figure 3 Block diagram of Wireless Animatronics Hand

As shown in the Fig.3, there are basically two parts of a wireless animatronic hand i.e. Transmitter and another is a Receiver. In the first block, there are two boards Arduino-UNO and XBee-S2 respectively. This part is known as a control glove which contains flex sensors. These flex sensors are connected to the analog input pins of the Arduino board. This voltage value was serially sent to the XBee transmitter pin. This data is then wirelessly sent to the another XBee-S2 (which is there in the receiver part). XBee at the receiver side received the voltage value and this value was sent serially to the second Arduino board. So that, the motors connected to the second Arduino will start rotating.

B. Hand Assembly

The hand used in the prototype was a 3D printed version of the hand model which we designed using Solid Works. The STL file was exported into the Ultimaker platform and directly printed without any scaling or modification. Taking into account the separate parts of the hand, printing took about 15 hours. The completed hand was strung with nylon thread and a stretched disposable pipette. The pipette was used to break up any excess material from the 3D printing that would hinder the fishing line's path through the interior of the hand and fingers, and to help thread the line through the palm of the hand. Each finger was strung with about two feet of fishing line to ensure that there would be enough material to reach down the length of the arm and attach to the servos.

C. Forearm Assembly

Forearm was also designed using Solid Works and 3D printed using Ultimaker^2 3D printer. A servo bed was designed for housing of 5 servo motors. Circular pulleys were designed and used with the servos in the forearm to tie the nylon threads to. Pulley uses the full 180 degrees from a servo. With a 180 degrees turn it will move the finger Up and Down. This gives a higher resolution and a better torque.

3.2 Software Design

A. Algorithm

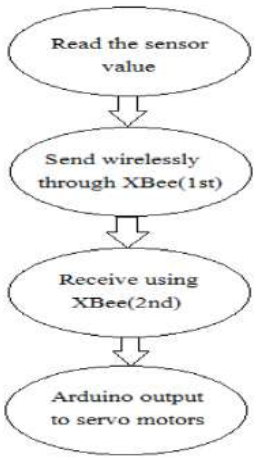

Figure 4 Flowchart of working of Robotic hand

B. Arduino IDE

Programs for this project were written and compiled using Arduino IDE. The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board. Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information [15].

C. XCTU Software

XBEE is not a plug and play device. Hence we have to configure XBEE devices to make them communicate with each other by creating a personal area network (PAN). XCTU software is used for this purpose. It is a free multi-platform application designed to enable developers to interact with RF modules through a simple-to-use graphical interface. It includes new tools that make it easy to set-up, configure and test XBee RF modules. XCTU includes all of the tools a developer needs to quickly get up and running with XBEE. Unique features like graphical network view, which graphically represents the XEE network along with the signal strength of each connection, and the XBEE API frame builder, which intuitively helps to build and interpret API frames for XBEEs being used in API mode, combine to make development on the XBEE platform easier than ever [16].

IV. Output Measurement

For measuring the bending of flex sensors, each flex sensor is connected to a separate voltage divider as shown in Fig.4 Output voltage is measured by using a mathematical formula. This formula is a voltage divider formula using which, corresponding variable voltage will be measured which will be given as an input to the Arduino-UNO.

Following tables show the output voltage readings of all five flex sensors.

1. Flex Sensor 1

TABLE 1. Resistance and Voltage Readings of Sensor 1

Flat Resistance: 8.54KOhm		
Bend Resistance: 20KOhm		
R2	**Flat Voltage**	**Bend Voltage**
22KOhm	1.398V	2.38V

2. Flex Sensor 2

TABLE 2. Resistance and Voltage Readings of Sensor 2

Flat Resistance: 10KOhm		
Bend Resistance: 18.5KOhm		
R2	**Flat Voltage**	**Bend Voltage**
22KOhm	1.56V	2.31V

3. Flex Sensor 3

TABLE 3. Resistance and Voltage Readings of Sensor 3

Flat Resistance: 9.8KOhm		
Bend Resistance: 23KOhm		
R2	**Flat Voltage**	**Bend Voltage**
22KOhm	1.54V	2.65V

4. Flex Sensor 4

TABLE 4. Resistance and Voltage Readings of Sensor 4

Flat Resistance: 10.7KOhm		
Bend Resistance: 22KOhm		
R2	**Flat Voltage**	**Bend Voltage**
22KOhm	1.63V	2.61V

5. Flex Sensor 5

TABLE 5. Resistance and Voltage Readings of Sensor 5

Flat Resistance: 7.3KOhm		
Bend Resistance: 18.2KOhm		
R2	**Flat Voltage**	**Bend Voltage**
22KOhm	1.25V	2.38V

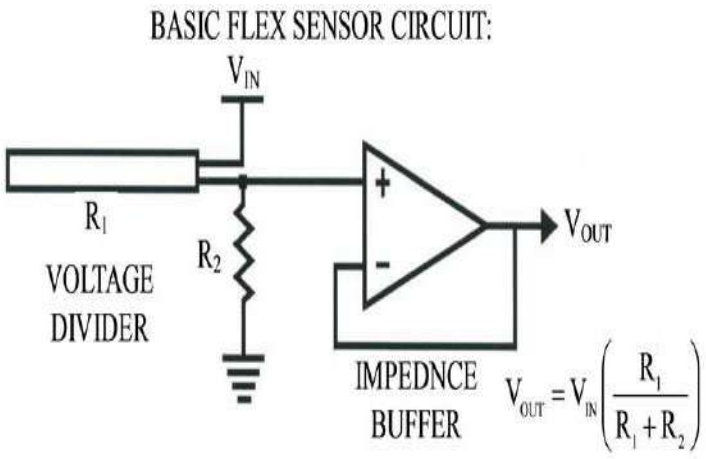

Figure 5 Voltage divider circuit for flex resistance R1 [17]

V. Results

A wireless animatronic hand was first tested with a single finger. It was observed that after bending the single flex sensor at the transmitter side, the corresponding robotic finger moved in the same manner and same angle. Servo motor causes the movement of a robotic finger. With reference to this, all five servo motors moved (or controlled) by five flex sensors on a single control glove. In this way, a wireless communication has been achieved successfully. So, now it is possible that a man can control a robotic hand from a distance wirelessly.

VI. Conclusion

This project presents a wireless animatronic hand which is implemented by using a latest wireless technology. It can be widely used where there are restrictions or a hazard to a human hand. It is basically a futuristic project which will be used to make Humanoid (Human like robots). Future efforts will be made to make this hand movable (from one place to another), more flexible and more precise if possible. Further efforts will be made to make this hand more advanced and movable by using accelerometer sensor.

VII. Applications

1. In industries, animatronics robotic hand can be used where human hand is must to complete required task in a harmful environment.
2. As a part of humanoid robot to perform various tasks.
3. In laboratories, where harmful chemicals are to be handed delicately without causing any injuries.
4. In entertainment industries, animatronics are used in situations where a creature does not exist, the action is too risky or costly to use real actors or animals.
5. For military use in bomb diffusing.
6. In medical applications, it can be used as prosthetic limbs for physically disabled people

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Automated drunk and driving disabling with SMS alert using Raspberry Pi and GSM module

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***Abstract*— This system provides a unique method to curb drunken people. The system has an alcohol sensor embedded on the steering of the car. Whenever the driver starts ignition, the sensor measures the content of the alcohol in his breath and automatically switches off the car if he is drunken. In this system the sensor delivers a current with a linear relationship to the alcohol molecules from zero to very high concentration. The output of the sensor is fed to the Raspberry Pi 3 for comparison. If the measured value reaches the threshold, relay cut off automatically and the buzzer generates sound. Once the buzzer produces sound the system communicates with configured telecom device unique number using the GSM Module.**

Keywords—Raspberry Pi 3, MQ-3 gas sensor, GSM Sim 900 module, L293D IC and Max 232 IC

I. INTRODUCTION

This system is one of the emerging technologies that can be used to curb the accidents related to drunk and driving. The existing systems in the market includes Breathalyzer and Smart helmet which is not sufficient to curb the tragic reality. Hence, we introduce to you our system Automated drunk and driving system with SMS Alert [ADDA]. Automated drunk and driving system with SMS Alert [ADDA] consists of one Raspberry Pi, one GSM Sim 900 module and one Interface circuitry to communicate. The main idea behind using Raspberry Pi instead of cheaper alternatives like Arduino is that for future development we need higher processing power and better device management.

For demonstrative purpose, we have used a 500 RPM DC motor in place of car engine and push button switch in place of Car ignition. In practical implementation, we will directly connect the system to the ABS of the car. We believe our system will curb the tragic reality and make a positive impact in the world. Let us now understand the system in detail.

II. BLOCK DIAGRAM

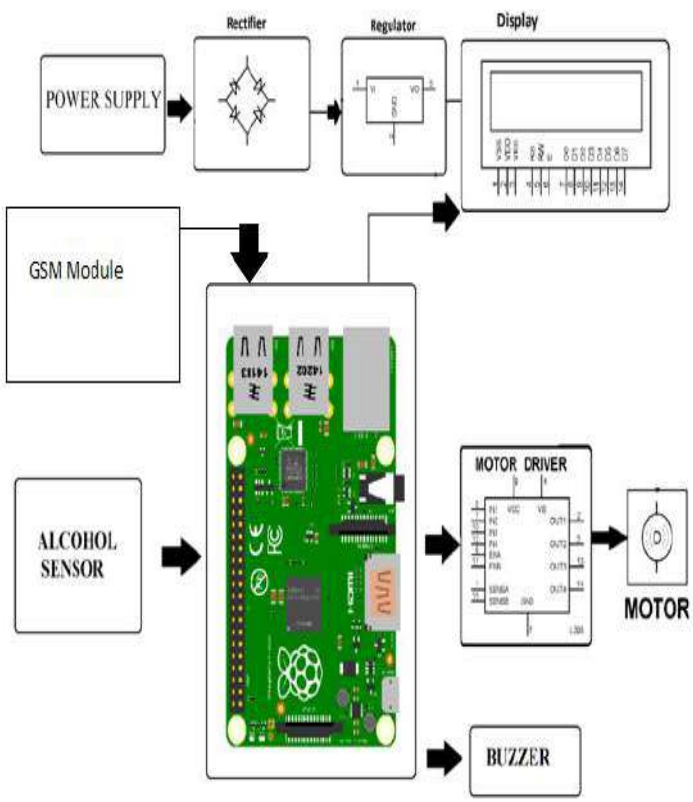

Figure 1 Block diagram of the system

Figure 1 shows the basic block diagram of the system. It consists of Raspberry Pi 3, GSM Module, Power supply section, Alcohol Sensor, Display device, Motor driver IC, Motor and a Buzzer.

III. SCHEMATIC DESIGN

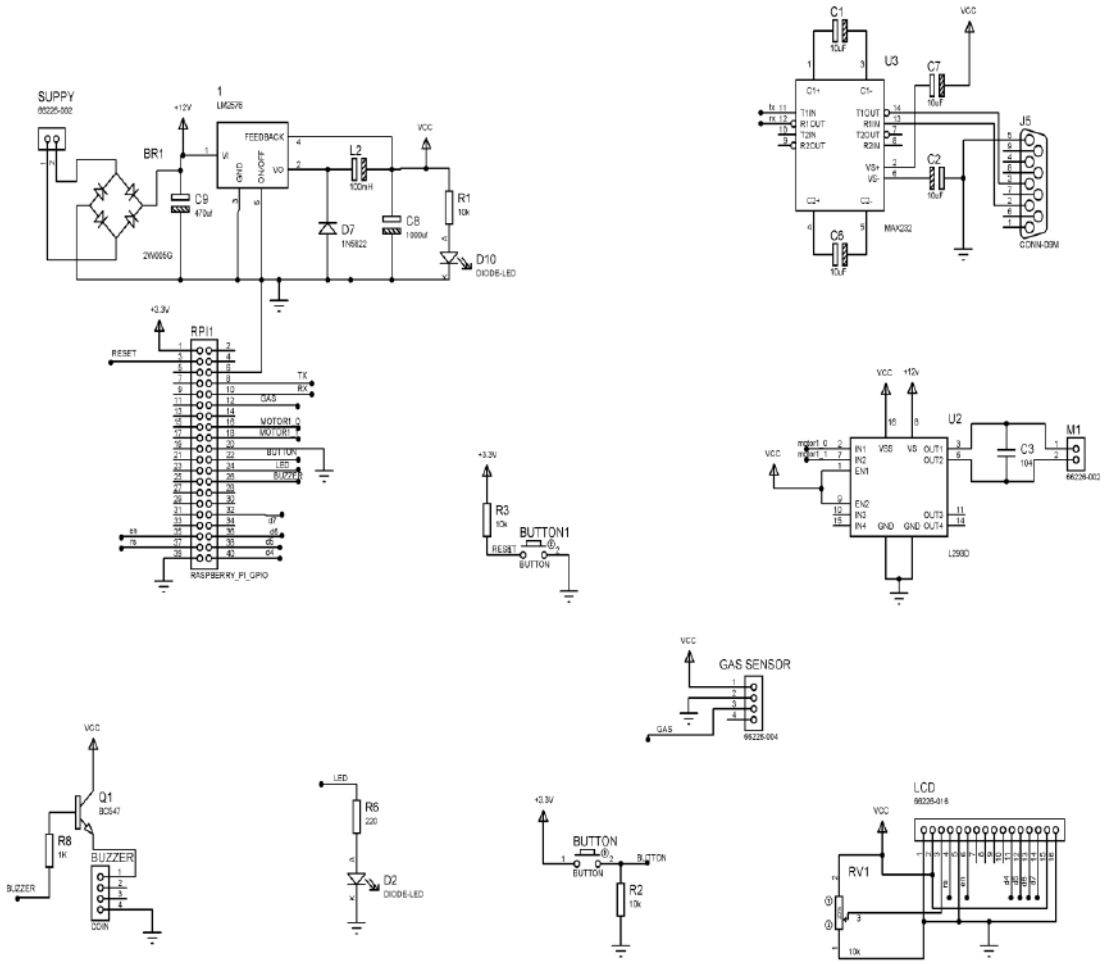

Figure 2 Schematic design of the proposed ADDA System

IV. SCHEMATIC DESIGN DESCRIPTION

A.Gas Sensor

This is an alcohol sensor, which detects ethanol in the air. It is one of the straight forward gas sensors so it works almost the same way with other gas sensors. It costs Rs.38. Typically, it is used as part of the Breathalyzer or breath testers for the detection of ethanol in human breath.

Basically it has 6 pins, the cover and the body. Even though it has 6 pins, we can use only 4 of them. 2 of them are for heating system and other 2 are for connecting power and ground. A little tube is placed inside the sensor. This tube is a heating system that is made of aluminum oxide and tin dioxide and inside of it there are heater coils, which practically produce the heat. Two pins are connected to the heater coils

and others are connected to the tube. The core system is the cube. Basically, it is an Alumina tube cover by SnO2, which is tin dioxide. And between them there is an Aurum electrode. Basically, the alumina tube and the coils are the heating system. If the coil is heated up, SnO2 ceramics will become the semi - conductor, so there are more movable electrons, which means that it is ready to make more current flow. Then, when the alcohol molecules in the air meet the electrode that is between alumina and tin dioxide, ethanol burns into acetic acid then more current is produced. So the more alcohol molecules there are the more current we will get. Because of this current change, we get the different values from the sensor.

B. Display Unit

Liquid Crystal Display LCD display is used for displaying the message that sent from the remote location. The LCD module is a dot- matrix liquid crystal display that displays alphanumeric, kana (Japanese characters) and symbols. The CMOS technology makes the device ideal for applications in hand-held portable and other battery-powered instruments with low power applications. Most LCDs with 1 controller has 14 Pins and LCDs with 2 controller has 16 Pins (two pins are extra in both for backlight LED connections). Above is the quite simple schematic. It consists of 16 pins (8 data lines, 3 control lines, 2 power lines, 1 contrast line and 2 pins for back light LED connection). Data line and control line are connected to the microcontroller. The LCD panel's Enable and Register Select is connected to the Control Port.

The Control Port is an open collector / open drain output. When connecting LCD module to a parallel I/O device, the burden of ensuring proper operation falls on the software. While most Parallel Ports have internal pull-up resistors, there is a few which don't. Therefore by incorporating the two 10K external pull up resistors, the circuit is more portable for a wider range of computers, some of which may have no internal pull up resistors. At the interface of LCD module, there are three power supply terminals- Vdd, GND, Vo. The LCD is driven by a voltage which is determined by Vdd-Vo. The data bus lines are DB7-DB0.When the enable signal is at the low level, this data bus terminals will remain in a high impedance state. When the data bus is open it produces a high output voltage. When the busy flag is at a high level, it indicates that the controller is in the internal operation mode and the next instruction will not be accepted. The next instruction must be written after the busy flag goes low. The delay should be suitable for most machines. If the LCD panel is not initializing properly, you can try increasing the delays.

The LCD module is automatically initialized or reset when the power is turned on using the internal reset circuit. The busy flag holds 1 and does not accept instructions until initialization ends. The busy state lasts for 15 minutes after Vdd rises to 4.5 volts. When power supply restrictions are not met, the internal reset circuit will not operate normally and the initialization will not be performed. In this case, the controller should be initialized by the MPU according to “initializing by instruction”.

C. Power Supply

The circuit diagram of the power supply unit is shown above. It mainly consists of a voltage regulator (here it is 7805). The voltage regulator plays an important role in a power supply unit. Output of the power supply unit is always dc which is given to the controller. The primary purpose of the regulator is to aid the rectifier and filter circuit in providing a constant dc voltage to the device. Power supplies without regulators have an inherent problem of changing of dc voltage values due to variations in the load or due to fluctuations in the input voltage. With regulator connected to the dc output, the voltage can be maintained with a close tolerant region of desired output.

D. Working chart

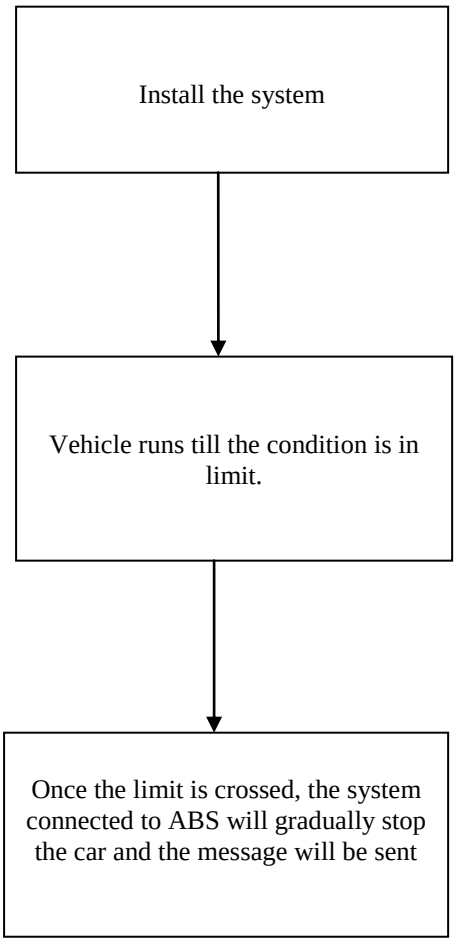

Figure 3 Working Flow

V. Results And Conclusion

The circuit has an alcohol sensor. This sensor measures the content of alcohol from the breath of drunken people. The sensor delivers a current with linear relationship to the alcohol molecules from zero to very high concentrations. Output of the sensor is directly proportional to the alcohol content. When the alcohol molecules in the air meet the electrode that is between alumina and tin dioxide in the sensor, ethanol burns into acetic acid then more current is produced. So the more alcohol molecules more will be the current produced. Because of this current change, we get the different values from the sensor. Output of the sensor is then fed to the microcontroller for comparison. The output of the sensor is in the analog nature which should be converted into digital format. This is done by the Raspberry Pi unit. The Raspberry Pi controls the entire circuit. When the measured value reaches the threshold (here it is 255) the microcontroller switches the ignition ON. Then relay cuts off automatically and buzzer produces sound. Once the buzzer produces the sound, the text message will be sent to configured devices. The LCD displays the message that sent from the Raspberry Pi unit. The working conditions and various constraints were properly studied before carrying out further steps. The components were purchased and the circuit was initially set on the breadboard. The PCB was fabricated as per the requirement and was soldered with components, taking proper care to avoid shorting between various connections. Milling method was used for PCB Fabrication. The output was verified on the PCB. The circuit worked successfully.

VI. Future Scope

The project can be extended to an improved version for preventing drunk drivers from getting on the road with new concept car filled with alcohol- detection sensors. These new sensors check a person's odors, sweat, and driver awareness to see if they are capable of driving their car. If they're not quite sober, the car locks up the ignition system thereby preventing the driver from getting on the road. In this project we embedded the sensor on the steering of the car. In addition to the Breathalyzer, skin sensors can also be provided for more safety. We can also introduce Camera and GPRS system for more effective tracking.

Our project ADDA was implemented successfully. This device provides much advanced facilities in now a day's life as it can be easily implemented in vehicles. Thus we can reduce alcohol related road accidents and hence these kinds of detectors have a great relevance. It can also be used in schools, colleges, offices and some public places such as hospitals, libraries etc.

Acknowledgemnet

We thank our guide Prof. R.H. Khade, Head of the department, Electronics Engineering for the guidance and support we needed to successfully complete the project and thus contributing to the society.

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Nanowire: Fabrication Technique and Electrical Application

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***Abstract*— Nanowires are rod-like materials which are solid in nature, with the diameters in the range 5-100 nm, and are most often made from metals or semiconductor metal oxides. Nanowires are diverse from molecular wires (also sometimes referred to as molecular nanowires); those are molecular bodies with diameters typically less than 3 nm and repeating subunits. One-dimensional nanowires possess unique properties of electrical, electronic, thermoelectrical, optical, magnetic and chemical, which are different from that of their parent matching part. The physical properties of nanowires are influenced by the morphology of the nanowires, diameter dependent band gap, carrier density of states etc.**

Keywords-

I. INTRODUCTION

Nanowires are drawing much interest from those seeking to apply nanotechnology and (especially) those investigating Nano-science. Nanowires, are different from other low-dimensional systems, have two quantum-confined directions but one unconstrained direction which is available for electrical conduction. This allows nanowires to be used in applications where electrical conduction, not the tunnelling transport, is required. Because of their unique density of electronic states, in the limit of small diameters nanowires are expected to exhibit expressively different optical, electrical and magnetic properties to their bulk of 3-D crystalline counterparts. Increased surface area, very high density of electronic states and joint density of states near the energies of their van Hove peculiarities, enhanced exciton binding energy, diameter-dependent bandgap, and enlarged surface scattering for electrons and phonons are just some of the ways in which nanowires differ from their corresponding bulk materials. Yet the size of nanowire are usually largeenough (>1 nm in the quantum-confined direction) as compared to local crystal structures that are closely related to their parent materials, allowing theoretical guesses about their properties to be made based on knowledge of their bulk properties.

II. FABRICATION TECHNIQUE

Table: Selected syntheses of nanowires by material

Material	Growth Technique	Material	Growth Technique
ABO_4-type	Template[a]	Ge	High-T, high-P liquid-phase, redox VLS[d] Oxide-assisted
Ag	DNA-template, redox Template, pulsed ECD[b]	InAs	VLS[d]
Au	Template, ECD[b]	MgO	VLS[d]
Bi	Stress-induced Template, vapor-phase Template, ECD[b] Template, pressure injection	Mo	Step decoration, ECD[b]+ redox
BiSb	Pulsed ECD[b]	Ni	Template, ECD[b]
Bi_2Te_3	Template, dc ECD[b]	Pb	Liquid-phase[f]
CdS	Liquid-phase(surfactant), recrystallization Template, ac ECD[b]	PbSe	Liquid phase Self-assembly of nanocrystals[g]
CdSe	Liquid-phase(surfactant), Redox Template, ac ECD[b]	Pd	Step decoration, ECD[b]
Cu	Vapor deposition Template, ECD[b]	Se	Liquid-phase, Recrystallization Template, pressure injection
Fe	Template, ECD[c] Shadow deposition	Si	VLS[d] Laser-ablation VLS[d] Oxide-assisted Low-T VLS[d]
GaN	Template, CVD[c] VLS[d]	W	Vapor transport
GaAs	Template, liquid/vapor OMCVD[e]	ZnO	VLS[d] Template, ECD[b]

a Template synthesis
b Electrochemical deposition (ECD)
c Chemical vapor deposition (CVD)
d Vapor–liquid–solid (VLS) growth
e Organometallic chemical vapor deposition (OMCVD)
f Liquid phase synthesis
g Self-assembly of nanocrystals (in liquid phase)

A. Template Synthesis

In template synthesis of nanostructures, the chemical stability and mechanical properties of the template, also the diameter, regularity and density of the pores are important characteristics. Templates frequently used for nanowire fabrication includes anodic alumina (Al_2O_3), nanochannel glass, ion track-etched polymers and mica films. Anodizing pure Al films in selected acids is used for production of porous anodic alumina templates. Under carefully chosen

anodization conditions, the resulted oxide film possesses an even hexagonal array of parallel and nearly cylindrical channels, as shown in Fig. 1a. The self-organization of the pore structure in an anodic alumina template involves two coupled processes: pore ordering and pore formation with uniform diameters. The pores form with uniform diameters because of delicate balance between electric field which determines the growth rate of the alumina, and dissolution of the alumina into an acidic electrolyte. The pores are believed to self-order due to mechanical stress at the aluminium–alumina interface due to expansion during the anodization. A repulsive force produced between the pores due to stress, causing them to arrange in a hexagonal lattice. Depending on the anodization conditions, pore diameter can be systematically varied from ≤ 10 up to 200 nm with a pore density in the range of 109–1011 pores/cm2. The pore size distribution and the pore ordering of the anodic alumina templates can be significantly upgraded by two-step anodization technique, where the aluminium oxide layer is melted after the anodization in an acidic solution followed by a next anodization under the same conditions.

Another type of porous template used for nanowire fabrication is the template type fabricated by chemically etching particle tracks originating from ion bombardment, such as track-etched polycarbonate membranes (Fig. 1b), and also mica films. Other porous materials also be used as host templates for nanowires growth. Nanochannel glass (NCG), contains a regular hexagonal array of capillaries similar to the pore structure in anodic alumina with a packing density as high as 3 × 1010 pores/cm^2. Mesoporous molecular sieves, termed MCM-41, possess hexagonally packed pores with small channel diameters which can be varied between 2 & 10 nm. Conducting organic filaments have been fabricated in the nanochannels of MCM-41.

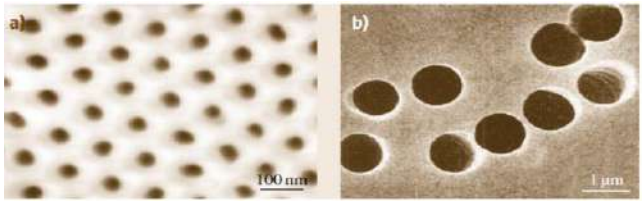

Figure 1 (a) SEM images of the top surfaces of porous anodic alumina templates anodized with an average pore diameter of 44 nm.
(b) SEM image of the particle track etched polycarbonate membrane, with a pore diameter of 1µm.

B. VLS Method for Nanowire Synthesis

This technique was first proposed for the growth of single crystal silicon whiskers 100 nm to 100µm in diameter. The proposed growth technique (Fig. 2) involves the absorption of source material from the gas phase into a liquid droplet of catalyst. Upon super saturation of the liquid alloy, a nucleation event generates a solid precipitate of the source material. This drop serves as a preferred site for further deposition of material at the interface of the liquid droplet, promoting the elongation of the liquid drop into a nanowire or a whisker, and suppressing further nucleation actions on the same catalyst. Since the liquid droplet catalyzes the incorporation of material from the gas source to the growing crystal, the deposit produces anisotropically asa whisker whose diameter is dictated by the diameter of the liquid alloy droplet. The nanowires thus acquired are of high purity, except for the end containing the solidified catalyst as an alloy particle.

Reduction of the average wire diameter to the nanometer scale requires the generation of nano sized catalyst droplets. However, due to the balance between the liquid-vapor surface free energy of condensation, the size of a liquid droplet, in equilibrium with its vapour, is usually limited to the micrometer range. This obstacle has been overwhelmed in recent years by several new methodologies:

1. Alternatively, metal islands of nanoscale sizes can self-form when a strained thin layer is grownup or heat-treated on a nonepitaxial substrate.
2. Laser-assisted catalytic VLS is a method used to fabricate nanowires under non equilibrium conditions. Single crystal nanowires grow as long as the particle remains liquid etc.

A wide variety of elemental, binary and compound semiconductor nanowires has been synthesized via the VLS method, and achieved relatively good control over the nanowire diameter and diameter distribution has been achieved.

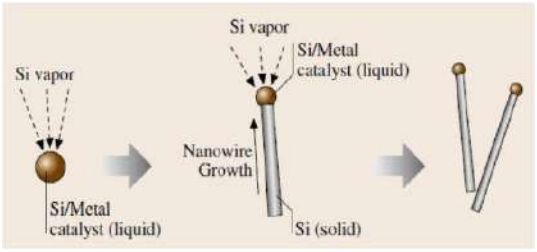

Figure 2 Schematic diagram illustrating the growth of silicon nanowires by the VLS mechanism.

III. Electrical Connection

The microelectronics industry's always faces the challenges that are technological and an economical as the device feature

size is decreased, especially below 100 nm. Devices made from nanowires have several advantages over those made by photolithography. A variety of methods have been devised to organize nanowires via self-assembly, thus eliminating the need for the expensive lithographic techniques.

Transistors made from nanowires could also hold advantages due to their unique morphology. For example, field effect transistors (FETs), the depletion layer formed below the source and drain region results in a source–drain capacitance limits the operation speed. However, the conductor in nanowires is surrounded by an oxide and thus the depletion layer is not formed. Thus, depending on the device design, the source–drain capacitance in nanowires that could be minimized to more extent and possibly eliminated.

Several approaches have been investigated to fabricate nanowire diodes. For example, Schottky diodes can be formed by contacting a GaN nanowire with Al electrodes. Furthermore, p-n junction diodes can be formed by crossing the two nanowires, such as the crossing of n- and p-type InP nanowires doped by Te and Zn, respectively, or Si nanowires doped into phosphorus (n-type) and boron (p-type). In addition to the crossing of two different nanowires, heterogeneous junctions have also been constructed inside a single wire, either along the wire axis in the form of a nanowire super lattice, or perpendicular to the wire axis by forming a core–shell structure of Si and Ge. These various nanowire junctions not only possess the current rectifying properties expected of bulk semiconductor devices, but they exhibit electroluminescence (EL) that may be interesting for optoelectronic applications, as shown in Fig.3 for the electroluminescence of a crossed junction of n- and p-type InP nanowires.

Various logic devices performing basic logic functions has been demonstrated using nanowire junctions, as shown in Fig.4 for the OR and AND logic gates that are constructed from 2-by-1 and 1-by-3 nanowire p-n junctions, respectively.

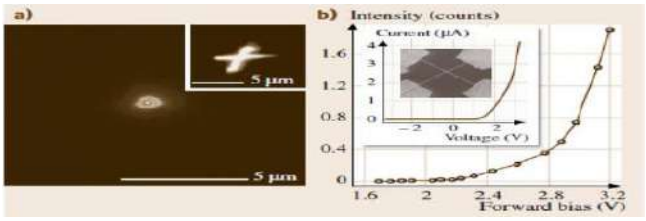

Figure 3 a,b Optoelectrical characterization of a crossed nanowire junction formed between 65 nm n-type and 68 nm p-type InP nanowires.
(a) Electroluminescence (EL) image of the light emitted from a forward-biased nanowire p-n junction at 2.5V. Photoluminescence (PL) image of the junction.
(b) EL intensity as a function of operation voltage. The SEM image and the I–V characteristics of the junction. The scale bar in the inset is 5μm.

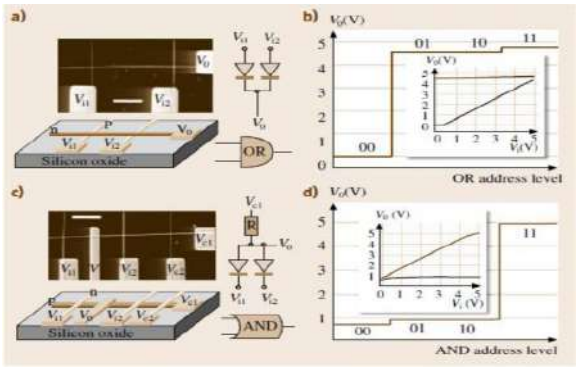

Figure 4 a–d Nanowire logic gates: (a) Schematic of logic OR gate constructed from a 2 (p-Si) by 1 (n-GaN) crossed nanowire junction. The inset shows the SEM image (scale bar: 1μm) of an assembled OR gate and the symbolic electronic circuit. (b) The output voltage of the circuit in (a) versus the four possible logic address level inputs: (0,0); (0,1); (1,0); (1,1), where logic 0 input is 0V and logic 1 is 5V. (c) Schematic of logic AND gate constructed from a 1 (p-Si) by 3 (n-GaN) crossed nanowire junction. The inset shows the SEM image (scale bar: 1μm) of an assembled AND gate and the symbolic electronic circuit. (d) The output voltage of the circuit in (c) versus the four possible logic address level inputs.

IV. Conclusion

This paper reviewed the fabrication synthesis and application of nanowires used in electrical field. It is concluded that (i) Nanowire possess unique physical, chemical and mechanical properties. (ii)Nanowires diameter is dependent on diameter of pores which can be less than 10nm. (iii) Using VLS technique of synthesis the NWs obtained are of diameter 100nm. (iv) Application of NWs in Microelectronics helps to satisfy the Moore's law in IC fabrication and the cost can be reduced to lot of extent.

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