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Improved Microprocessor Based Smart System for Home Appliances

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ABSTRACT

The work is aimed at stimulating microprocessor based smart system for home appliances. The system design was first analyzed considering the voltage and ampere rating of the home appliances then the analyzed consideration were conceptualized into physical design of one bedroom apartment which was simulate using a Proteus and test was carried fulfilling the objective of the research. In the design many component were tested and tried but the chosen component that made the work achievable in the following component are Arduino 328, relay, multimeter, voltmeter connectors, remotes diode etc. These were used to achieve the aim. In the simulation of the proposed microprocessor based smart system adjustment of voltage rating were made and recommend that a mobile application can be built to control such design to enable ease and seamless transmission and reception of signal from smart system. From the current and voltage analysis of each of the home appliances, the current rate form of analysis was 49.49A, and the voltage rate was 219.1V which is in agreement with the standard electrical voltage rates of 220/230/240 respectively.

Key words: Microprocessor, Arduino328, Timer, Relay and Distribution board

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INTRODUCTION

Microprocessor are usually silicon chip on which millions of transistor are embedded and other components that process instructions per second, integrated with memory chips and special purpose and directed by software [3]. A microprocessor programmable microchip that make use of digital data as its input and form results as an output once it processes the input according to the knowledge or instructions stored in its memory. Microprocessor use sequential gates as they have internal memory element and work on numbers and symbols represented in the binary numeral system [3]. The plan is based on microprocessor smart based system module which is used for long distance communication. A modern home can be controlled using microprocessor chips that serve as a remote control for all the home appliances.

The microprocessor based smart device module uses computer-based microprocessor chips that are battery powered, making the smart home system safer and frees from the internet hacks.The microprocessor chips module can be applied in many ways by interrupting many appliances such as vehicle and can also be interfaced such as smoke detecting sensors, temperature sensor, fire sensor, and others. By using all these equipment a modern home can be made too smarter so that the human effort can totally be reduced. The microprocessor can also be used in industrial areas and agricultural areas. This is done only by interfacing the required components with a microprocessor and a smart based system. In additional, the automatic smart homes system has installed safety precaution element to alert people, according to some studies by the U.S fire administration, more than 600,000 tons of fire and rescue services are needed every year, resulting in more than 800 deaths and more than 17,000 accidents [1]. These issued have arisen because there is no earning while the home temperature rises rapidly and reach maximum temperature. The buzzer has therefore been mounted to warn individual when the temperature responds to the maximum value [4]. The concept of smart home have been a topic of experimenting and improving by researchers. With theadvancement in technology with time, electronic devices and internet became morepopular and affordable, so, the concept of home automation and people's expectation from a smart home has changed dramatically. Modern home is a sophisticated mix of a range of ubiquitous, computing devices and wireless sensor/actor networks. All these modern user preferences, complicated electronic and unpredictable user actions have introduced new security challenges to the home automation front. The idea of home automation security has developed over times with, sensors and actuators built integrated into the home to identify, warn, and

prevent intrusions [2]. Smart home is the also seen as the residential home of building automation. It initially involved the control and automation of systems that ensure human comfort such as lighting heating, ventilation, air conditioning and protection. Recently, it has expanded to include most home appliances that use Wi-Fi for remote monitoring. Technological innovation has increased the ubiquity of smart home systems resulting in better standards of living condition. Commercial home automation systems are still unaffordable for the vast majority of the middle and lower class families. However, the introduction of cheap micro controllers such as Arduino, has made it possible to introduce low-cost smart home systems to be implemented incorporating the majority of features present in commercial systems.Furthermore, the incorporation of intelligence to the home environment can facilitate increased quality of life for the elderly and disabled people who might per adventure need care givers or institutional care. There has been a drastic increment in home automation in recent years due to advancement and higher affordability in smart phones and tablets which permits a broadband connectivity. Through the aid of internet of things, the research and implementation of home automation are getting more popular than ever [5]. Further studies have shown that Bluetooth based phones without internet control are connected to a Bluetooth sub-controller which is then accessed and controlled by the smart phone using built-in Bluetooth connectivity. Due to a restricted range of operation (maximum to 100m) the system is unable to cope with mobility and can only be attempted to provide network interoperability and remote access to control devices and appliances at home control devices and appliances on a pc-based home control system using PC based web server which manages the connected devices.

MATERIALS AND METHOD

The method of this research involves the simulation of microprocessor-based smart system for home appliances.Simulation is an imitation of the operation of a real-world process or system. Before live implementation, testing of the developed technique is required. Most of the time, testing and evaluating the protocols or theories proposed is not practically feasible through real experiments as it would be more complex, time consuming and even costly. So, to overcome this problem, SIMULATORS and TESTBEDS are effective tools to test and analyze the performance of protocols and algorithms proposed [6]. Furthermore, the emulation of the operation of a real live system or process is called simulation [7]. The incorporation of the building plan in the simulation of the microprocessor-based system involves the use of infrared sensor and remote switching between the relay from the mains supply and automatic switching between the power supply to trigger the on and off buttons.

Household Materials: includes the bulks,electrical points,distribution board.the analysis were done using a block diagram.

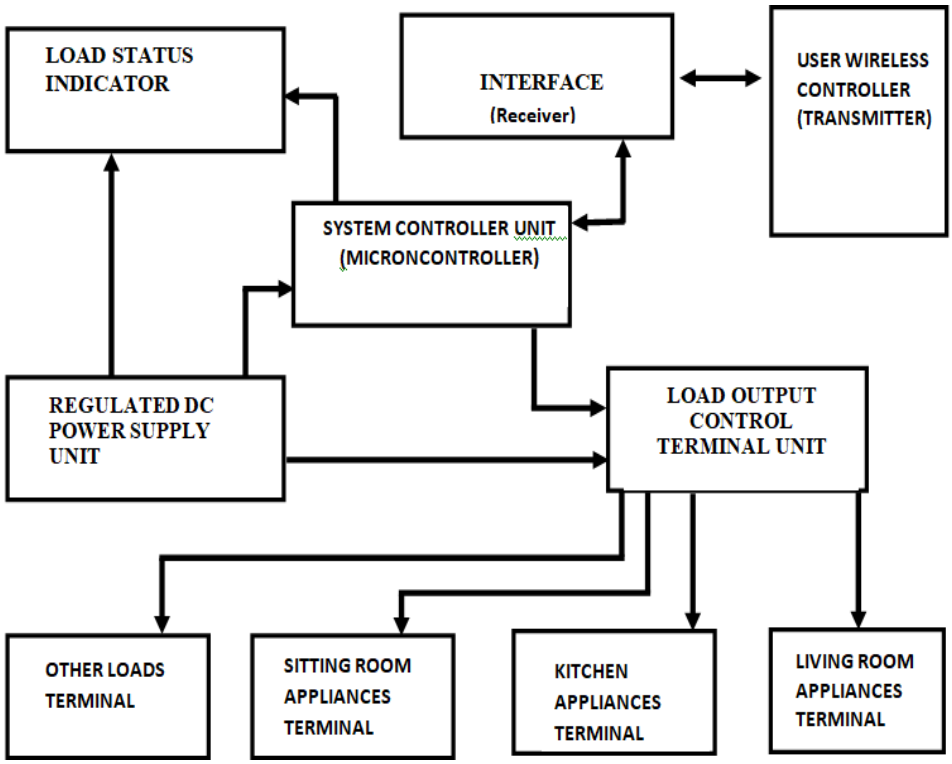

Fig. 1 System Block Diagram for Microprocessor Based Smart Home Appliance

The Block diagram showed the different compartments of the design of the Microprocessor based system.

Load output control terminal unit: it controls the output load from the DB, it stands to be the central unit between the living appliance and the microcontroller unit which is also interface with regulated Dc power supply unit, this unit also connect directly to the home appliances.
Regulated Dc power supply: this area tells us how the voltage rating are on each components,the rating tells us weather the component are in 12volts or 24 volts are they now regulated to use same rating pattern 12 volts or 24 volts in all. In 24volts rating it means that 12volts voltage are connected in series, if it were 12volts then meaning that 12v is transfer from the input and output. The RDC supply unit is them connected to the System control unit which is the microcontroller, this microcontroller regulates the power into the system that if it is 12volts voltage rating is will maintain the 12volts rating in all component (appliances).
System communication interface: which is the receiver, is interface with the microcontroller that send and receive every signal in that interface,the receiver only receives signal from the microcontroller but the microcontroller double check what is receive.
Transmitter is directly interfacing with the receiver all of which are using wireless sensors to do the double checks of each other.
Load Status indicator: that every electrical appliance using different rate, this area analyse the loading rting but indicating the load of the component.

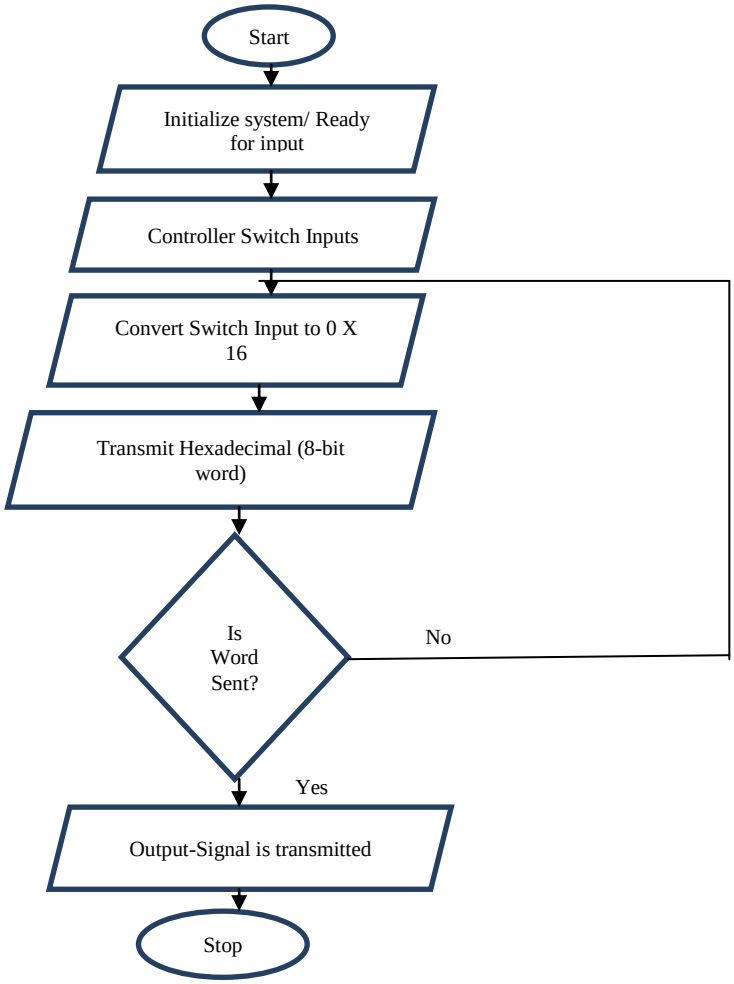

Fig. 2 System Transmitter Flowchart

The system actually starts when there is power connected to the unit(transmitter unit) which theninitialize the system and ready to send an input which then move to the controller switch input, what is it receive, receiving of input of byte and bit. When triggered, the switch input is then converted to 16 bits and the transmitted ask a word. If the word is receive at the output, it will end the process.Meaning that message has beensent in bit or byte then if not sent. It moves back to the controller switch input point were another inputwill be trigger to ensure that a signal is sent or not. If by the second time nothing is been sent it means transmission device is not working so we have to go back to maintain it unit.

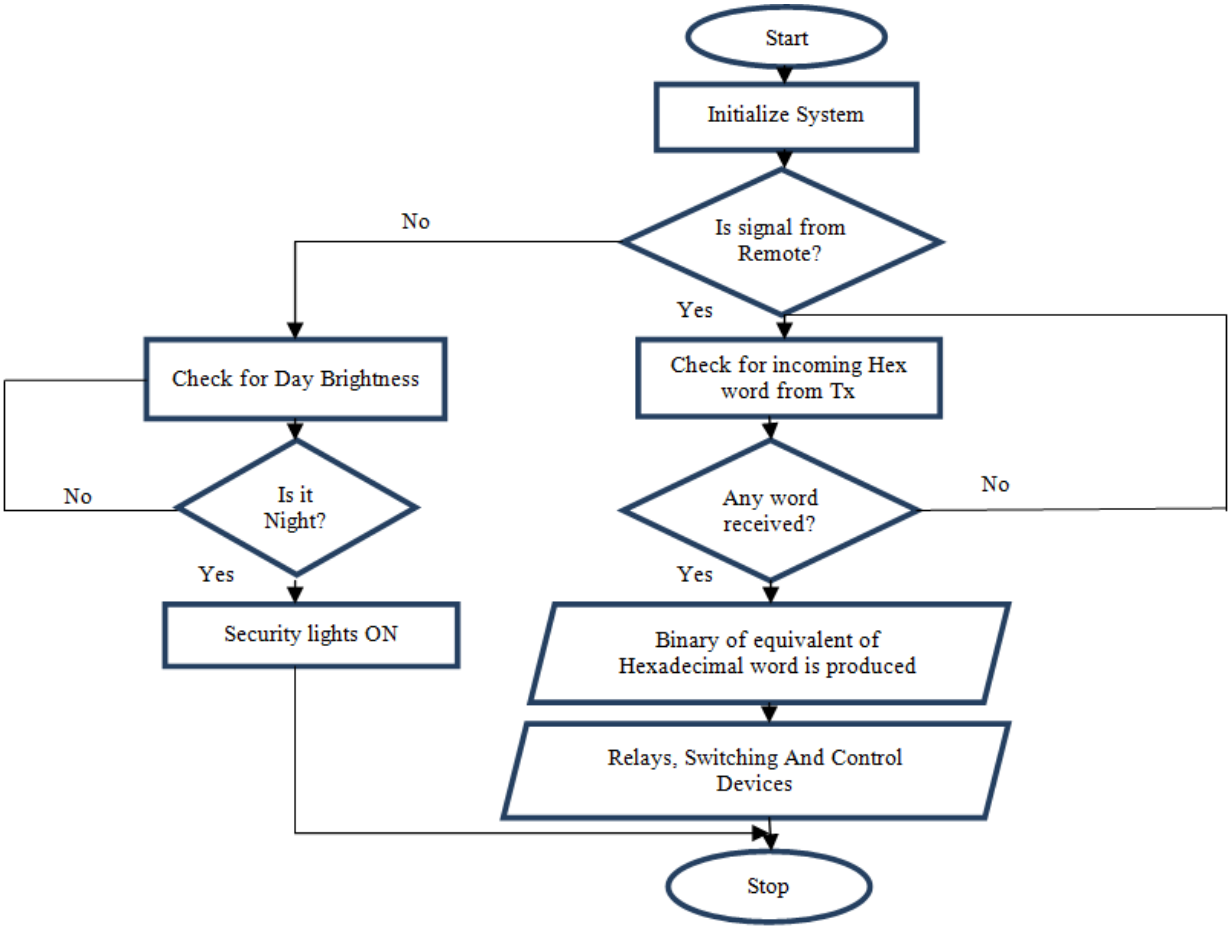

Fig. 3 System Receiver Flowcharts

The initialize start the system initialling himself ready to accept an input,when an input is sent in the form of signals,bit or byte a conditional statement is been processed.if the signal was sent through the transmitting end successfully that is a yes, the receiver checks the transmitter word in bits or byte, after it has checked another conditional statement was done to ascertain whether what was sent was right or wrong. if it is wrong is goes back resent, then if it is right the binary code is processed and the relay, or switch comes ON, but if at the point of sent there is a power failure or the signal was not receive a check was also done to ascertain the difficulties.

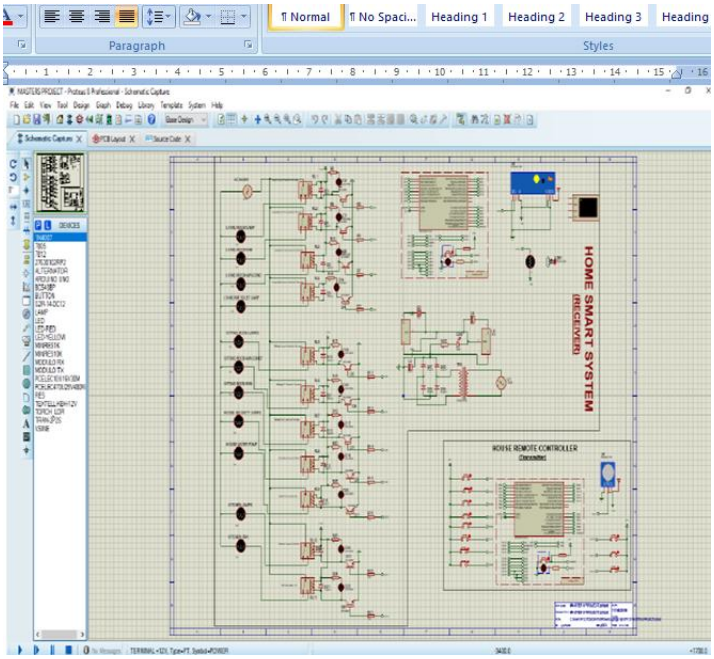

Fig. 4 Schematic Diagram Proteus Microprocessor Based Smart Appliance

The schematic diagram of the research was obtained from Proteus 12 version of the software showing all the appliance used in the simulation of the research work. In the schematic design contain the transmitter end and the receiving end. On the transmitting end, the components used includes: Ardruino 328, Modulo Tx transmitter device, remote switch and at the receiving end the components U4 Modulo, D32,Ardruino 328 and remote sensor.

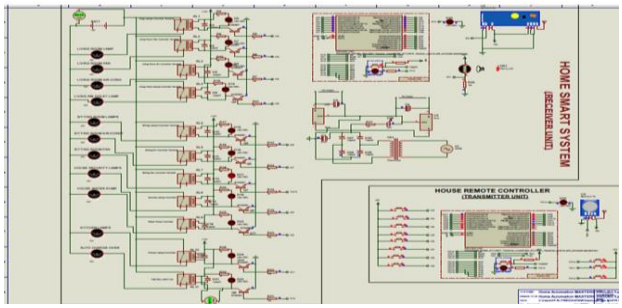

Fig. 5 Simulation of Transmitter and Receiver of the Microprocessor Based Smart Home appliance

This simulation was carried out considering the basic appliances rating and regulation of voltage calculation. In the course of the simulation the remote when clicked transmits hexadecimal code in word and if the code was not transmitted it goes back to check what was sent if correct or not. Thus, if what was sent was correct then the signal will be received at the receiving end to switch on/ off the switches. This switch is time based such that if the switch was triggered during the morning or afternoon period the switch trigger will loopback and no action will be done of the circuitry. However, the light comes up only when it is evening or at Night hours.

RESULT

Table -1 Transmitting End Chart

TRANSMITTING END RESULTS

S/N	COMPONENTS	START TIME (SECONDS)	END TIME (SECONDS)	DIFERENCE
1	Home security lamp	0.1	0.55	0.45
2	HOUSE WATER PUMP,	0.2	0.55	0.35
3	KITCHEN LAMPS,	0.1	0.56	0.46
4	LIVING RM TOILET LAMP,	0.1	0.57	0.47
5	LIVING ROOM AIR-COND,	0.2	0.56	0.36
6	LIVING ROOM FAN,	0.2	0.6	0.4
7	LIVING ROOM LAMP,	0.1	0.52	0.42
8	SITTING ROOM AIR-CONDT,	0.2	0.5	0.3
9	SITTING ROOM FAN,	0.2	0.51	0.31
10	SITTING ROOM LAMPS	0.1	0.54	0.44

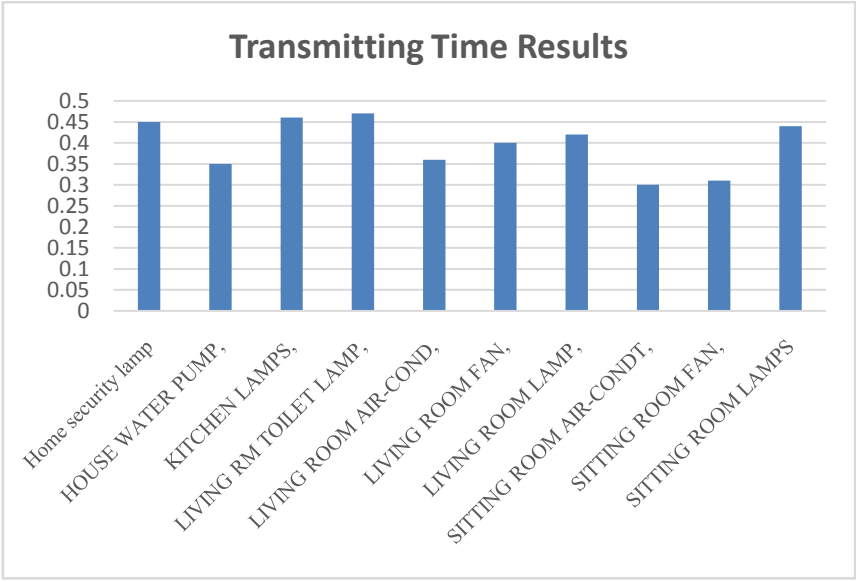

Fig. 6 Graph of the Transmitting Time Results

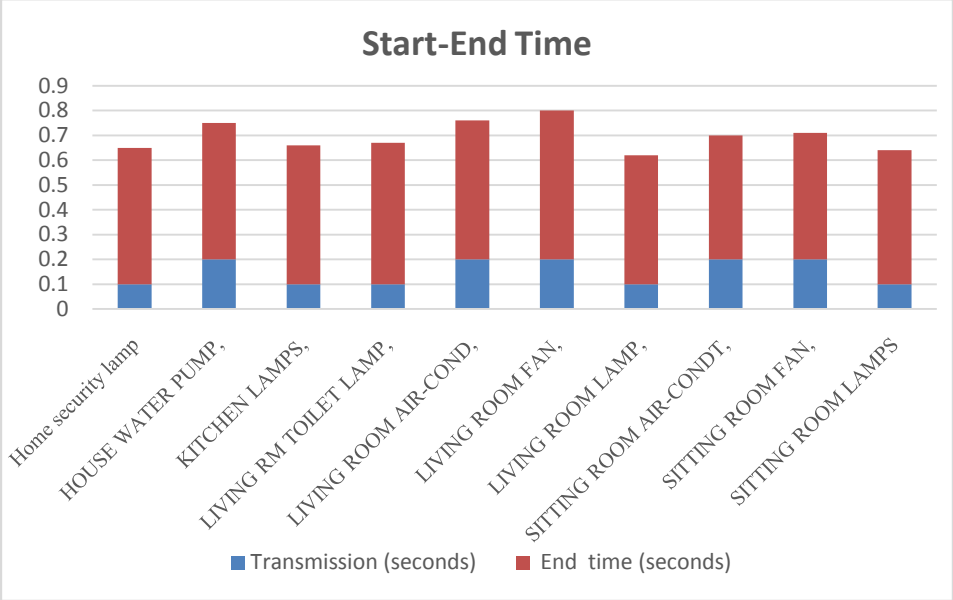

Fig. 7 Graph of the Transmitting Start-End Time Results

Table -2 Estimated Current Rating

Estimated Current Ratings

Appliance	Power Ratings (W)	Current Rating $\frac{\sum_{i=i}^{k} P_i}{V}$	Voltage Rating $\frac{\sum_{i=i}^{k} P_i}{I}$
Television	3000	13.6	61.2
Radio	750	3.40	15.3
Air Conditioner	2000	9.09	40.8
DVDs	2000	9.09	40.8
Standing Fan	1500	7.50	30.6
Play Station	1000	6.81	20.4
Decoder	500	4.16	10.2
Loopback	0	2.27	0
Total	**10,750**		
Sum	$\sum_{i}^{k} P_i =$ **10,750 watt**	$\sum_{i}^{k} P_i =$ **49.49**	$\sum_{i}^{k} P_i =$ **219.1**

$$I = \frac{\sum_{i=i}^{k} P}{V} = \frac{10{,}750}{220} = 49$$

$$V = \frac{\sum_{i}^{k} i = iPi}{l} = \frac{3{,}000}{49} = 61.2$$

$$\sum_{i=i}^{k} V_i = V_1 + V_2 + V_+ \ldots\ldots\ldots V_n$$

$$61.2 + 15.3 + 40.8 \ldots\ldots\ldots + V_n$$

$$= 219.1$$

$$\cong 220V$$

DISCUSSION

From the results obtained from the work, it showed that schematic diagram of the research was obtained from Proteus 12 version of the software showing all the appliance used in the simulation of the research work. In the schematic design contain the transmitter end and the receiving end. On the transmitting end, the components used includes: Ardruino 328, Modulo Tx transmitter device, remote switch and at the receiving end the components U4 Modulo, D32, Ardruino 328 and remote sensor.

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It shows the regulation of the current and voltage parameters on the arduino 328 and the difference switch junction. The detail connection of the difference points where determined in this section. That was done to avid over voltage or under voltage at any instant of time.

The test of the simulation was successful when all the components in the system where duly connected with their appropriate voltages. When the switches are triggered the transmitted hexadecimal code are send to the receiver and the lights or electronic gadgets are switched on/off.

The transmission starts time of the component at each simulation. The graph transmitting time of each component is quick without delay like the manual response of equipment. But the start time prolongment varies for each component. This show that different components uses different prolonged transmitting time in the simulations.

Furthermore, it was shown that the transmission start and end time of the component at each simulation. The graph transmitting time of each component is quick without delay like the manual response of equipment. But the end time varies for each component. This shows that different components use different end time in the simulations.

CONCLUSION

The Microprocessor based smart House appliance been designed. The prototype of the automatic smart switch worked according to the specification and quite satisfactorily. The microprocessor based smart trigger system has immense advantage in every area where uninterrupted power is required. Whenever the reliability of electrical supply from the utilities is low and wherever continuity of supply is necessary, the smart system when triggered switches to the alternative source from main supply and vice versa.

This research designed at voltage low system using remote triggers to active mainly source in residential building.

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