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Home Automation System for Disable People using Bluetooth Technology and Android Application

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Abstract - *According to Home Automation System for Disabled People using Bluetooth Technology and Android Application, this is a research project system called as assistive domestics which focuses on the carrying out the daily activities safe and comfortable. This research project works using Bluetooth system. This system can be easily operated through android application. This system can be helpful to disabled people, people taking bedrest or people who are handicapped, etc. This system can benefit by saving electricity. This system is based on microcontroller, relay, etc. This system can be provided for safety, security or aid. The software works on mobile phone, computer, laptop and tablets. This system has two types of implementation 1) hardware 2) software. This system has two purpose 1) save electricity 2) helpful to people. In this research project we will create a circuit and connect various instrument such as sensor, wire, etc. We also connect the circuit to the software which will be remotely controlled using a remote-controlled app made by us. The app controls a switch which controls the circuit and otherwise conduct purchases order. With this research project we will able to provided safety, security, aid to the user. By this research achievement the disabled people will be able to live their daily life better using this technology.*

***Key Words*: *Smart home, Bluetooth, Android Application,* etc…**

1. INTRODUCTION

According to Home Automation System for Disabled People using Bluetooth Technology and Android Application, this is a research project system called as assistive domestics which focuses on the carrying out the daily activities safe and comfortable.

The home application is remotely controlled [1]. This issue is not connected multiple pair. This interface should also provide some diagnostic services so that if there is any problem with the system, it can be tracked down. This issue is sub system not integrated and many control app and subsystem supplier lacking smart knowledge. . The reasons are as follows: 1) Architecture Complexity: The architecture behind this technology is somewhat complex as lots of coding, equipment's integration as well as central controller installation requires lots of skills and circuits understanding is really challenging.2) Equipment's Costs: As lots of systems, requires physical wires and sophisticated sensors and also with tight integration of Wireless and ZigBee modules, the system can land into huge expenses on users.3) Inflexible Interface: The existing systems offer various interfaces to the users to control and monitor the devices but as the control land in single hand so flexibility becomes a challenge4) Equipment's Damage: Sometimes with huge electric power failures, surge and spike problems, sensors and other components can face damage and lead to entire system failure. The Allied Business Intelligence (ABI) research [2] reports that almost l.5 million automatic home appliances were installed in United States of America (USA) during 2012 and their increasing rate is 45.2%. In Smart Home Automation System for Disabled People using Bluetooth Technology and Android Application different types of application such as ZigBee [3], Z-Wave [4] , Global System for Mobile (GSM) [5], General Packet Radio Service (GPRS) [6] , Infrared [7], wireless fidelity (Wi-Fi) [8-9] and Bluetooth [10] are used.

Smart Home Automation System for Disabled People using Bluetooth Technology and Android Application can be implement with a low cost and it is easy to install in an existing home [11].

The project of design is based on Arduino board, Bluetooth module, smartphone application. These system work on Bluetooth system. Bluetooth is a wireless technology standard for exchanging data between fixed and mobile devices over short distances using from 2.400 to 2.485 GHz, and building personal area networks. The transceiver transmits and receives in a previously unused frequency band of 2.45 GHz that is available globally -- with some variation of bandwidth in different countries. The maximum Bluetooth range is 10 meters. Data can be exchanged at a rate of 1 megabit per second -- up to 2 Mbps in the second generation of the technology. Bluetooth with globally available frequencies of 2400HZ is able to provide connectivity up to 100 meters at speed of up to 3 mbps depending on Bluetooth device class and Arduino refers to an open-source electronics platform or board and the software used to program it and Different Types Of Arduino Boards :Arduino Uno (R3), Lily Pad Arduino,Red Board, Arduino Mega (R3), Arduino Leonardo, etc… or A microcontroller (MCU for *microcontroller unit*) is a small computer on a single integrated circuit.

Microcontroller is available bits like 8bit, 16bit, 32 bit. The memory devices are divided into two types, they are Embedded memory microcontroller, External memory microcontroller. DIFFERENT TYPES OF COMPONENT such as Central Processing Unit (CPU), Program Memory (ROM – Read Only Memory), Data Memory (RAM – Random Access Memory), Timers and Counters, I/O Ports (I/O – Input/Output), Serial Communication Interface, Clock Circuit (Oscillator Circuit), Interrupt Mechanism, etc… The instruction set are divided into two types, they are CISC- CISC means complex instruction set computer, RISC- RISC means Reduced Instruction Set Computers The microcontroller are divided into four types, they are 8051 , Peripheral Interface Controller (PIC) , Advanced Virtual RISC(AVR), ARM and A relay is an electrically operated switch and Electronics instrument like fan,blub,etc…An ultrasonic sensor is used for water level detection and soil moisture sensor is used for automatic irrigation system to provide more ease and facilities to users this research proposal presents the Bluetooth system proper work or not, otherwise customer purchase a product.

Home automation systems have varying degree of intelligence and automation. It can range from simple remote control of lighting to complex microcontroller-based networks. The main characteristic of home automation system is remote monitoring and access of home appliances and systems. Use of home automation systems causes home appliances to communicate in an integrated manner. It helps to obtain several factors such as convenience, energy efficiency and safety benefits. Most of the present systems are not reasonable for many people due to their high costs and exhausting maintenance. Some systems provide solutions that are not very useful for household applications.[12]

Customer can be purchased product.

1.1 Working of the system

This system work on following steps:

1. User logs in to the system with the authentication id and credentials that is being coded in the program.

2. The system will search for the discoverable Bluetooth devices. The system will pair the discovered Bluetooth device with the control board.

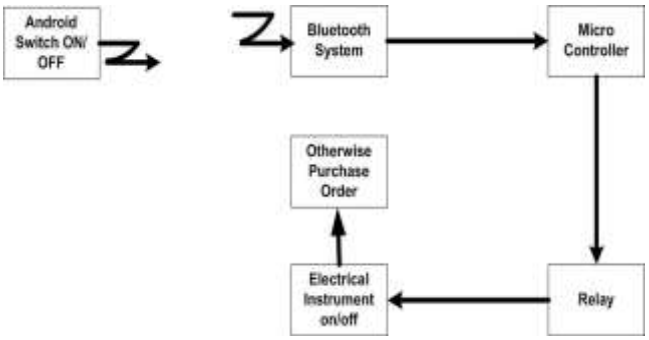
3. Once the pairing is done, the user will send signals for controlling the home appliances (ON/OFF).

4. The system will receive signals from the user and forward them to the appliances in the form of electrical signals.

5. The appliances will get either turn ON or turn OFF.

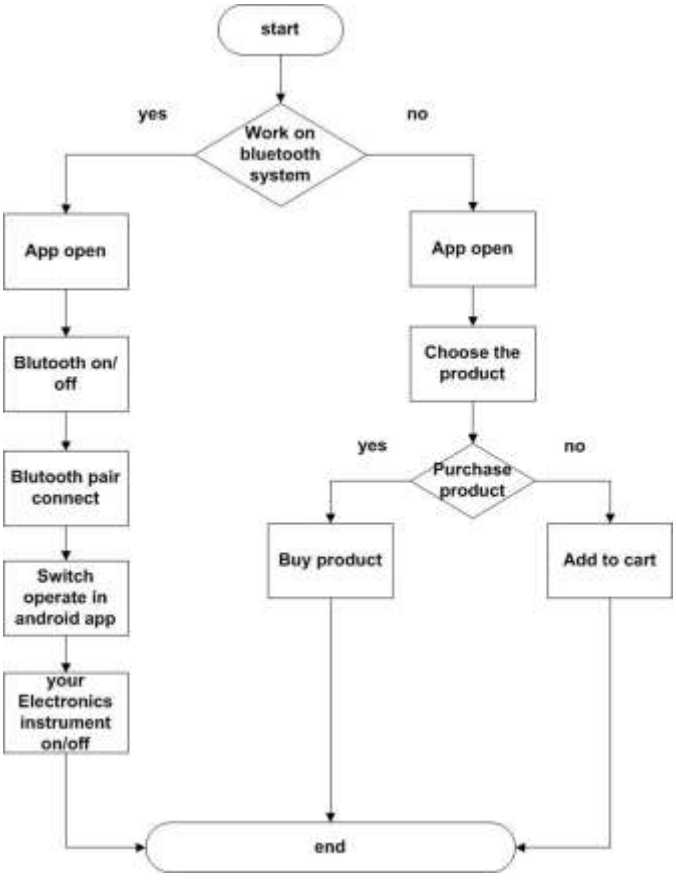
6. After completing the operations, the user can terminate the connections by logging out of the system.

7. Otherwise purchase a product.



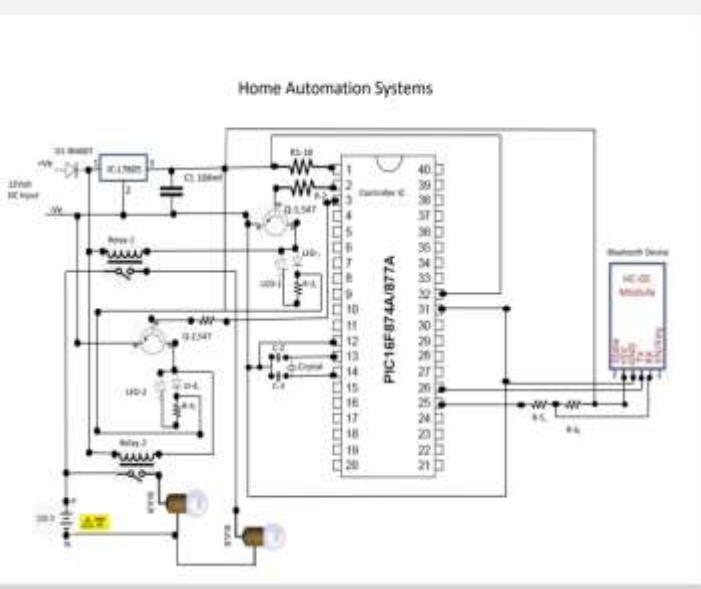
(fig. shows Home Automation System using Bluetooth System and Android Application)

1.2 Flow chart of the system



(fig. shows Flow chart of Home Automation System)

1.3 Circuit Diagram of the system



(fig. shows Circuit Diagram of Home Automation System)

1.4 Algorithm of the system

This part describes our Smart Routing Algorithm (SRA): that all the nodes communicate with each other, if the first node detects an event it will look for its successor, it broadcasts the request message. If a neighbor node receives that request message, it will store the ID of the sender in its list-neighbor firstly and then broadcast its own power and receiver ID and its positioning (x, y) as a response, and then wait for an acknowledgement, if the acknowledgement is received. Hence, these nodes, sender and receiver, are connected and can communicate between them. When all the recipients finish doing the same thing, the node that will send data has its neighbors list, it calculates the probability, p i, j, for each candidate j belongs to the list of neighboring nodes, and then executes line 7 to line 14 of Algorithm 1 for choosing its next best node and sends data to it. After that, the next node receives data, aggregates it with its own and sends all data, using the SRA (Smart Routing Algorithm), to its successor, and this process is repeated until the data arrives at the base station. The first iteration is Information **2018**, 9, 23 3 of 11 counted when the data arrives at the base station. This mechanism is repeated until some number of iterations; in our case, we stop at 50 iterations (the nodes are all alive). The probability that node i sends to node j is given by Equation (1):

$$p_{i,j} = \frac{(\tau_{i,j})^{\alpha} \cdot (\eta_{i,j})^{\beta} \cdot (E_{res}(i))^{\gamma} \cdot (E_{res}(j))^{\delta}}{\sum (\tau_{i,j})^{\alpha} \cdot (\eta_{i,j})^{\beta} \cdot (E_{res}(i))^{\gamma} \cdot (E_{res}(j))^{\delta}},$$

, equation (1)

where:

- $\tau_{i,j}$ is the pheromone amount on edge (i, j),
- $\eta_{i,j}$ is is the opportunity of the edge (i, j),
- α is a variable to adjust the effect of $\tau_{i,j}$,
- β is a variable to adjust the effect of $\eta_{i,j}$,
- $E_{res}(i)$ is the residual energy of node i,
- $E_{res}(j)$ is the residual energy of node j,
- γ is a variable to adjust the effect of $E_{res}(i)$,
- δ is a variable to adjust the effect of $E_{res}(j)$.

The pheromone quantity is renewed and applied to the retraced arcs (backtracking) as shown in the Equation (2):

$$\tau_{i,j} = (1 - \varrho)\tau_{i,j} + \Delta\tau_{i,j},$$

, equation (2)

where:

- ϱ is the evaporation rate of pheromones,
- $\Delta\tau_{(i,j)}$ is the amount of pheromone put, generally offered by :

$$\Delta\tau_{(i,j)} = \begin{cases} \frac{1}{L}, & \text{if node } i \text{ sends data to node } j, \\ 0, & \text{otherwise,} \end{cases}$$

equation (3)

where:

- L is the length of the path,

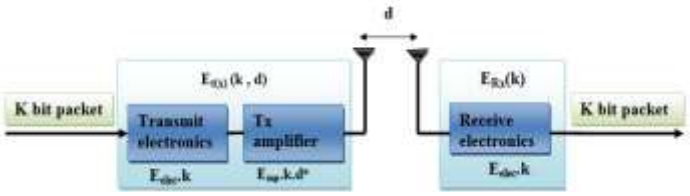
The opportunity of the edge (i, j) is given by this equation

$$\eta_{(i,j)} = \frac{1}{\delta_{(i,j)}}.$$

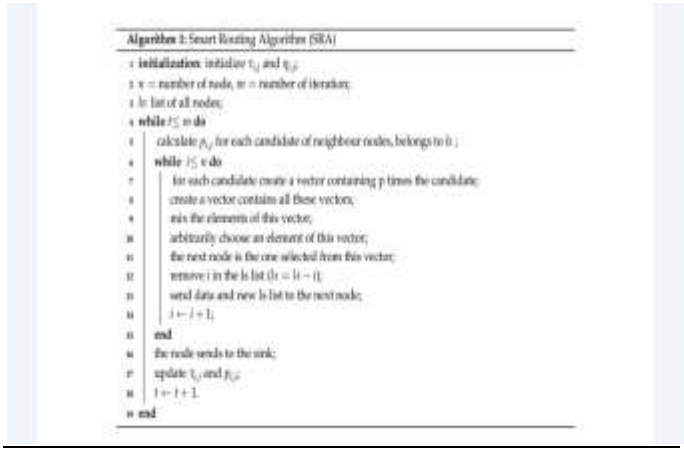
equation (4)

In this work, the WSN nodes send collaboratively their captured data to the sink. We employ the dissipation energy model [17, 18] = as shown in Figure 1. In this figure, $E_{T(x)}(k, \delta)$ is the energy expended for the transmission of k bits along a distance δ, and E_{Rx} is the energy expended to receive a k-bit of data. The element E_{elec} depends on

modulation, filtering, digital coding, and the spreading of the signal [18]. This element is the energy dissipated per bit to work both the receiver and the transmitter circuits.



(Figure . Radio energy dissipation model, adopted from [17])



The energy expended by the radio sender is offered in Equation (5) and by the receiver in Equation (6). Equation (7) is the power needed to aggregate data:

$$E_{T(x)}(k,\delta) = \begin{cases} k.E_{elec} + k.E_{fs}.\delta^2 & \text{if } \delta < \delta_0, \\ k.E_{elec} + k.E_{mp}.\delta^4 & \text{if } \delta \geq \delta_0, \end{cases} \quad (5)$$

$$E_{Rx} = k.E_{elec}, \quad (6)$$

$$E_{agr} = k.E_{DA}, \quad (7)$$

where:

- δ is the distance among the sender and the addressees,
- E_{fs} and E_{mp} are the amplifier energy, for the first, in the free-space model, and, for the second, in the multipath model.

If δ is below a threshold δ_0, then the parameters δ^2 and E_{fs} are used; otherwise, the elements δ^4 and E_{mp} are employed. The value of the threshold δ_0 is shown in [17], and presented in Equation (8):

$$\delta_0 = \sqrt{\frac{E_{fs}}{E_{mp}}} \quad (8)$$

In this paper, the first sensor that will send its data takes the value 1, the second takes the value 2, and so on until reaching the base station. These numbers given by the path will be followed along each iteration, using SRA: 1 is the first node that will transmit its data, the number 2 will receive the data of 1, aggregate with its own data and will then send all to node 3. The sensors will receive the data of their predecessors, aggregate with their own data and then send the whole to their successors. This is will repeat until the base station. The routing follows a path that will be chosen using SRA as dynamically. Using Equations (5)–(8), it is possible to adjust for each sensor, 1 to 25, its consumed energy during iterations in Equation (9). Information **2018**, 9, 23 5 of 11

$$E_{iter}(i) = \begin{cases} k.(i-1).(E_{elec} + E_{DA}) + k.i.(E_{elec} + E_{fs}.\delta^2) & \text{if } \delta < \delta_0, \\ k.(i-1).(E_{elec} + E_{DA}) + k.i.(E_{elec} + E_{mp}.\delta^4) & \text{if } \delta \geq \delta_0, \end{cases}$$

, equation (9)

where:

_ i is the sensor number. The average energy consumed in a network at each iteration, Equation (10), is the sum of energy consumed by each sensor up to this iteration divided by the number of sensors participating in this network:

$$E_{avg_{iter}} = 1/n \cdot \sum_{i=1}^{n} E_{iter}(i),$$

, equation (10)

where:

_ n is the number of participating sensors in this network.

The total consumed energy by a sensor, Equation (11), is the energy consumed until the

last iteration:

$$E_{total_{iter}}(i) = \sum_{iter=1}^{it} E_{iter}(i).$$

, equation (11)

The average consumed energy of network, Equation (12), is the total energy consumed by all sensors divided by sensor number:

, equation (12).

3. CONCLUSION

In this research work a low cost and user-friendly design for home automation system is presented. It has better performance than existing Bluetooth based conventional home automation systems, it provides a general approach for home automation which is not only suitable for elderly and handicapped people but it is also beneficial to reduce save energy with the help of sensors. The users are expected to acquire pairing password for the Arduino BT and the cell phone to access the home appliances and otherwise purchases order. The full functionality of the home automation system

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