BLUETOOTH BASED WIRELES HOME AUTOMATIONSYSTEM USING FPGA

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Abstract:
With the development of modern technology and smart phones, intelligent lifestyle has become an important part of human life today. Due to the rapid growth of technology, Bluetooth has revolutionized change. Bluetooth technology aimed at exchanging data wirelessly over short distances by providing the platform needed to create convenience and control. Since it is wireless, it can be used for a wide range of purposes. In this article, we've showcased one of his everyday uses, which is home automation controlled via an Android smartphone. A Bluetooth module (HC-05) is used to control home appliances connected to the FPGA board. Home automation not only reduces human effort, it is also energy efficient and saves time. The main purpose of home automation is to enable disabled and elderly people to control home appliances and be alerted in imminent situations.
Keywords: Androidsmartphone, Bluetooth module (HC-05).

INTRODUCTION:

Today, home automation is one of the hottest trends in this world to control lightning, heating, remote controls, voice communications, password lock systems, and more. Home automation can be done in two ways: wired communication and wireless communication.Wired communication can be done in home automation, but it is more convenient and easier to use wireless while operating the system. Bluetooth modules, Wi-Fi modules, etc. are used to communicate wirelessly. Bluetooth is often used only for short-range communication. For lang range communication, you can use Wi-Fi module or GSM module, but it is very expensive compared to his Bluetooth module on the market. Bluetooth is connected to the FPGA board to develop wireless communication. FPGAs offer high processing power and speed, resulting in faster response times and better overall performance compared to other modern microprocessors. Most people use mobile phones and are aware of the many applications on mobile phones. Using the application to control your home appliances can be very convenient during use. This reduces the risk of electric shock, making it safe and easy for children to operate. Therefore, in all areas, we need to reduce risk and improve the easiest and most convenient way to use it.

LITERATURE SURVEY

This system was developed and implemented using Zigbee to monitor and control home appliances. Device performance is recorded and stored by the network coordinator. It uses a Wi-Fi network using a standard wireless ADSL Modern router with four switch ports. Network SSID and Wi-Fi security parameters are preconfigured. The message is first processed by the virtual home algorithm for security purposes, and once declared safe, is re-encrypted and forwarded to the real home network device[1]. The Zigbee controller has finally sent a message over the Zigbee network. Security of all messages received by the virtual home algorithm. Zigbee communication helps reduce system costs and the hassle of each system installation.Cellular and GSM technologies have

made GSMbased home automation a stimulus for research. SMS- based home automation, GPRS-based home automation, andDTMF based home automation, these options were mainly considered for communication over GSM. Shows how homesensors and devices interact with home networks and communicate via GSM and SIM (Subscriber Identity Module). This system uses transducers that convert machinefunctions into electrical signals that are fed to a microcontroller. The system's sensors convert physical properties such as sound, temperature, and humidity into other quantities such as voltage[2].

METHODOLOGY

COMPONENTS REQUIRED:

Software : Xilinx 10.4.

Language: VHDL

Other Components:

- FPGA Kit
- Fan.
- Light.
- Door.
- Bluetooth Module.
- Relay.
- Power Supply.

Xilinx ISE 10.4:

ISE Simulator is an application that integrates with Xilinx ISE to provide simulation and test tools.Functional Simulation is used to ensure the logic of your design is correct. Xilinx ISE (Integrated Synthesis Environment) provides synthesis andAnalysis of HDL designs primarily for embedded firmware development.Xilinx FPGA and CPLD integrated circuit (IC) product families. Its successor was Xilinx Vivado. Use of The final version published in October 2013 continues for in-system programming of legacy hardware designs. Use old FPGAs and CPLDs orphaned by alternative design tools Vivado Design Suite.

Figure1: Xilinx ISE 10.4

VHDL Language:

VHDL is used as a design input format by various EDA tools, including synthesis tools. Quartus Prime Integrated Synthesis, simulation tools, formal verification tools, and more.VHDL is commonly used to write text models that describe logic circuits. Such a model would be A synthesis program only if it is part of the logic design. A simulation program is used to test the logical design. Use simulation models to represent the logic circuits associated with your design. Thiscollection of simulations. A model is commonly called a testbench

FPGA Kit :

A Field Programmable Gate Array (FPGA) is a matrix- based semiconductor device. Configurable Logic Blocks (CLBs) connected via programmable links. FPGAs are Post-manufacture reprogrammed for desired application or functional requirements.FPGAs are "field programmable" because they are designed to be programmed and reprogrammed after they are placed in the field. This means that logical configurations can be changed without requiring physical replacement or hardware changes. This flexibility allows a single hardware platform to be programmed in real time for different applications and allows on-the-fly switching between

applications, shorteningdevelopment cycles and reducing manufacturing costs.

Bluetooth Module:

A serial Bluetooth module allows all serial-enabled devices to communicate with each other via Bluetooth. The HC-05 Bluetooth module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module. Transparent setup of wireless serial connections. Its communication is via serial communication that powers Easy connection with controller and PC. Wireless communications are rapidly replacing wired connections when it comes to electronics and communication. Designed to replace wired connections, the HC-05 communicates using serial communications with electronic devices. It is typically used to connect small devices such as mobile phones over short distances.Wireless connectivity for sharing files. Uses the 2.45 GHz frequency band. data transfer speed. It varies up to 1 Mbps and has a range of 10 meters.

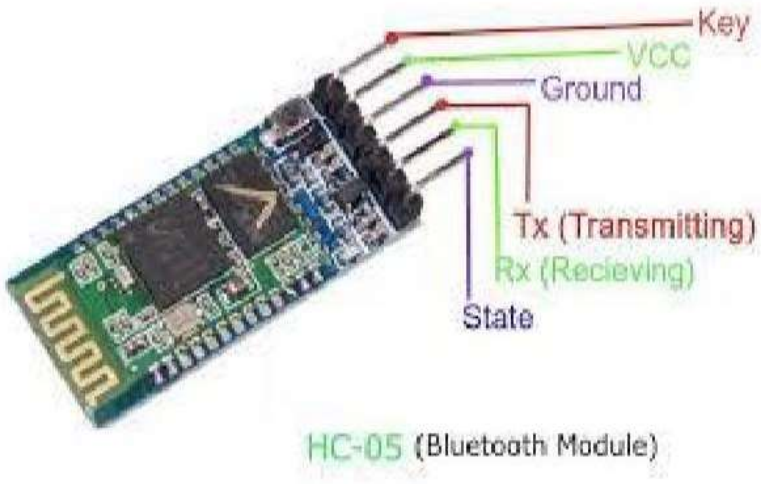


Figure 2: Bluetooth Module

Relay:

A relay is an electrically actuated switch. Consists of a series of single or multiple input connectors. Control signals and a series of operating contacts. A switch can have any number of contacts some contact forms. B. NO, NC, or any combination thereof. A relay is an electromechanical device that can be used to make or break electrical connections Flexible moving mechanical parts that can be electronically controlled by electromagnets.
A relay is basically like a mechanical switch, but can instead be controlled by an electrical signal Manually turn it on or off.

Power Supply:

A power supply is an electrical device that supplies power to an electrical load. A power supply consists of converting the current from the source into electricity at the correct voltage, amperage and frequency price. Therefore, power supplies are sometimes called power converters. The power adapter is a separate standalone device, otherwise it is built into the charger. An example of the latter is the power supplies found in desktop computers and consumers. Electronics. Other functions a power supply can perform include limiting the current it draws. Load to a safe level, disconnect power in the event of an electrical fault, and provide power conditioning Prevents electronic noise and input voltage spikes from reaching the load, power factor correction andIt stores energy so that it can continue to powerloads in the event of a momentary power failure.

4. BLOCK DIAGRAM:

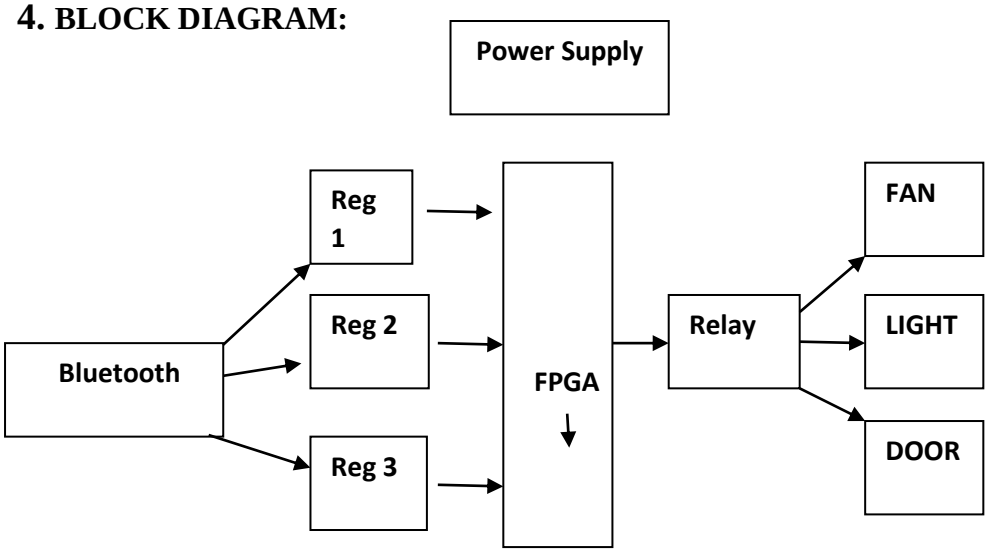
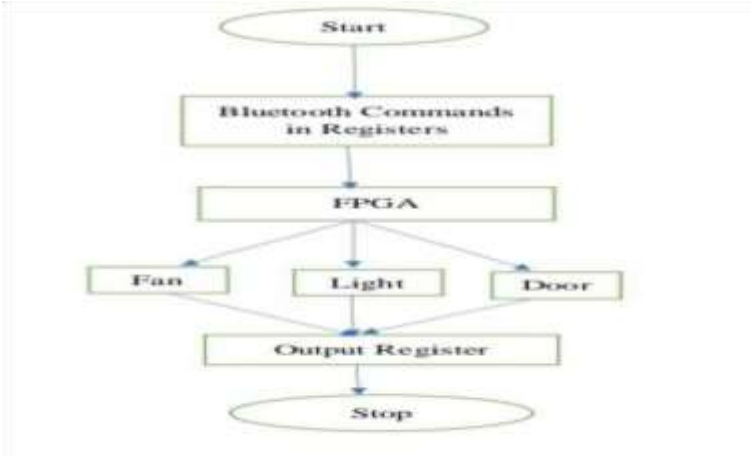


Figure 3: Block Diagram

5. FLOW CHART

Figure4: Flow Chart



6. WORKING

In this Project, FPGA is the basic building block. Toget the output, Power supply is given to the FPGA. We used Bluetooth, Registers, Relay and Home appliances like fan, light and Door. Bluetooth is given to the registers. Registers store the binary information and each device has unique code. If we give 001 as the input, then the fan will be active. If we give 010 as the input to the FPGA board, then the lights will be active. If we give 011 as the input to the FPGA board, then the door will be active. Relay is connected to the FPGA Board, Relay acts as an operational switch.in this way this project will work. Registers store the binary information i.e.,0 and 1.

7. RESULTS:

RTL Schematic:

Figure 5: RTL Schematic

Simulation Output:

Figure 6: Simulation Diagram

Simulation output When Fan is ON:

Figure 7: Simulation output when fan is ON

Simulation output when Light is ON:

Figure 8 : Simulation output when light is ON

Simulation output when Fridge is ON:

Figure 9: Simulation output when fridge is ON

Simulation output when Door is ON:

Figure 10: Simulation output when door is ON

ADVANTAGES:

- Smart Home
- Better than Micro-Controller.
- Multi-tasking.
- High speed response.

LIMITATIONS:

- Some lazy ness can be increased for young People.
- High Complexity.
- High Delay.

APPLICATIONS:

- Home applications.
- Industrial applications.

8. CONCLUSION:

Due to tremendous growth in technology and advancements in wireless communication, smart way of living has turned out to be a major part in the present era of human life. We have proposed a smart home automation system which is operated with the help of android smart phone by using Bluetooth Technology and home appliances will be controlled through FPGA using relays. Work is implemented in real time and appliances are controlled according to the commands from android mobile.

9. FUTURE SCOPE:

Home Automation is undeniably a resource which can make a home environment automated. People can control their electrical devices via these Home Automation devices and set up the controlling actions in the mobile. We think this product have high potential for marketing in the future.

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