

# FPGA Based Home Security System

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**ABSTRACT:** Nowadays, house security system becomes the best solution to overcome house intrusion problem when user is in house or not in house. As we know, there are many types of house security system which are too expensive and difficult to use. For that reason, an effective house security system at low cost is built where user can also program the security system by their own. This project is focusing on developing a house security system with an active infrared motion detector, pressure sensor, magnetic sensor and light sensor which are controlled using FPGA programmed by VHDL language. The overall project is divided into two parts. The first part is concern on the hardware development. The second part is based on software programming to operate the hardware structure. As the result, the infrared detector, pressure sensor, magnetic sensor, Gas sensor light sensor and smoke sensor are capable to detect motion while the programmed FPGA is capable to control the whole operation of the security system.

**KEYWORDS:** FPGA- Field Programmable Gate Array, VHDL- Hardware Descriptive Language

## I. INTRODUCTION

Automation is the use of scientific and technological principles in the manufacture of machines that take over work normally done by humans. The manual security provided to the property of individuals or industries is costlier and labourers. Human errors may affect the whole security drastically and single mistake may fail the whole purpose. Hence automation in the security purpose is necessary. There are some high quality security systems already available in the market. It is easier to just pay to have professional company to install security system. However majority of homeowners simply do not have sufficient funds to pay for a professionally installed security system. In addition to this, many homeowners may not feel the need to actually invest in a professionally installed security system. Many individuals who rent their homes, such as apartment owners, are usually not allowed to install permanent devices in their homes. Also most inexpensive home security devices and components are nothing more than cheap and ineffective noise makers.

We desired to innovate a security system assembled using VLSI technology that would be:

- AFFORDABLE in order to appeal to the general public.
- RELIABLE in order to operate without failure.
- EFFECTIVE in order to provide a sense of security.

This report presents an investigation and implementation of security system based on VLSI technology. The different types of sensors are mounted at the places from where the person may enter in the house. On compound wall wire sensor may be used together with fence, in the yard pressure sensor can be put, at the door or window entrance IR sensor can be fixed, a magnetic sensor senses the opening of window or door, gas sensor used to monitor the gas leak in the air, smoke sensor used to monitor the Smoke in the air, LDR mounted on safe to detect the intrusion.

Advantages of VLSI-FPGA based project are smaller size, lower cost, lower power, higher reliability, more functionality. There are now two industry standard hardware description languages, VHDL (Very high speed integrated circuit Hardware Description Language) and Verilog. The complexity of FPGA designs has meant an increase in the number of specialist

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design consultants with specific tools and with their own libraries of macro and mega cells written in either VHDL or Verilog. so, the objective of minimising human efforts is going towards completion.

## II. RELATED WORK

As per our survey currently there exists no system at cheaper rates. Various systems are hard to install, difficult to use and maintain. Current systems are generally proprietary and closed, not very customisable by the end user.

N. Sriskanthan [1] explained the model for home automation using blue tooth via PC. But unfortunately the system lacks to support mobile technology.

Muhammad IzharRamli [3] designed a prototype electrical device control system using Web. They also set the server with auto restart if the server condition is currently down.

Hasan [5] has developed a telephone and PIC remote controlled device for controlling the devices pin check algorithm has been introduced where it was with cable network but not wireless communication.

D. Javale [8] explained the model for home automation and Security System Using Android ADK to control various home appliances with Android smart phone but wait for and detect connected devices

Al-Ali and Al-Rousan [7] presented a design and implementation of a Java-based automation system through World Wide Web. It had a standalone embedded system board integrated into a PC-based server at home.

AmulJadhav [4] developed an application in a universal XML format which can be easily ported to any other mobile devices rather than targeting a single platform.

R.Piyare [6] have introduced design and implementation of a low cost, flexible and wireless solution to the home automation.

## III.IMPLEMENTATION OF SECURITY SYSTEM

The project chosen is “FPGA Based Home Security System” can be used as security alert system. The project combines features of VHDL (Very high speed integrated circuit Hardware Description Language) and various sensor based circuitry for detecting and alerting the human beings for security purposes. This project comprises of outstanding features of VLSI FPGA chip. Designing of multifunctional systems using this FPGA chip is possible. The project constructed has control system based on HDL (Hardware Description Languages) called VHDL. Though this system can be designed using other basis, VLSI is taken as basis because VLSI system operate at real time with very high speed.

IR Transmitter Receiver- Infra-red beam is invisible and operated at 36 KHz frequency. In infra red transmitter section, we used IC 555 in an a stable oscillator mode to generate 36 kHz beam from infra red LED and IR receiver, which is placed away from transmitter, can sense this beam. The receiver has 3 pins as +VCC, output & GND. When IR beam falls on receiver its output becomes logically Zero. This IR pair is placed near home boundary. When anyone tries to enter into home, the IR beam will cut and output of receiver becomes high .This low to high transition is detected by VLSI and output devices will turn ON.

Wire Sensor-Simple aluminium wire is used. This wire is cut down its logic changes from LOW to HIGH.

Light Sensor-The light dependent resistor, LDR is used to detect if anyone tries to cross boundary at night, he turns ON his battery. The light of this battery will fall on LDR and it will be detected. In normal position, setting of LDR output is such that voltage is logically zero position at day, when light falls on LDR output changes from low to high and it is detected by VLSI.

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**Pressure Sensor**-This pressure mat sensor is designed for underground use and is perfect for providing reliable protection in difficult coverage areas. The false fault due to animals is carefully avoided by its higher-weight-tolerance design. This can be cut in exact lengths to conceal under the ground.

**Gas sensor**-This Gas sensor is continuously monitor the gas leak in the air sends this information to the FPGA.

**Display**-In this, the whole system connects to computer and show sensor status connected or not connected. Sends this status to mobile which sensor is break.

**Buzzer**-Is an audio signalling device which may be mechanical, electromechanical or piezoelectric. Typical uses of buzzers and beepers include alarm devices.

**Mobile**- FPGA system sends SMS to mobile.

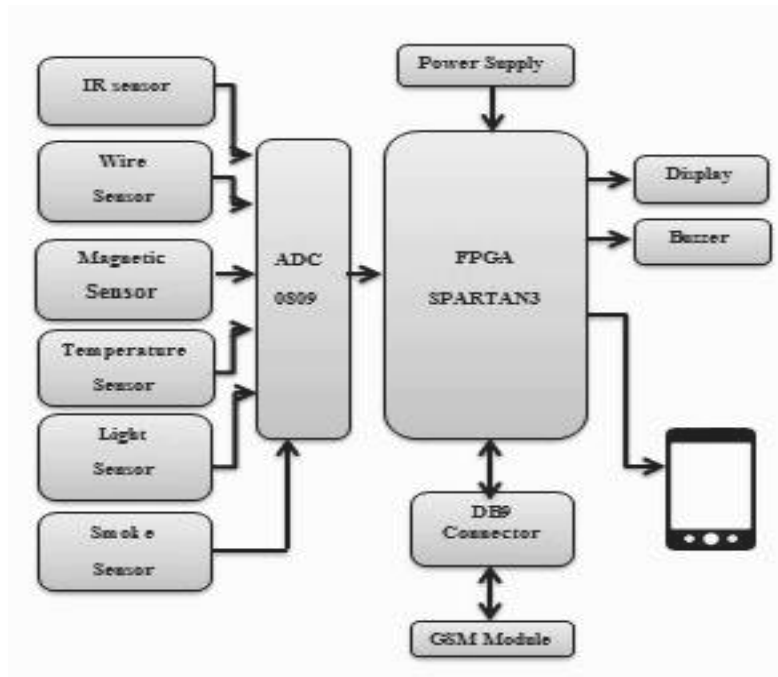


Fig.1. Block diagram of FPGA Based Home Security System

### IV. EXPERIMENTAL RESULTS

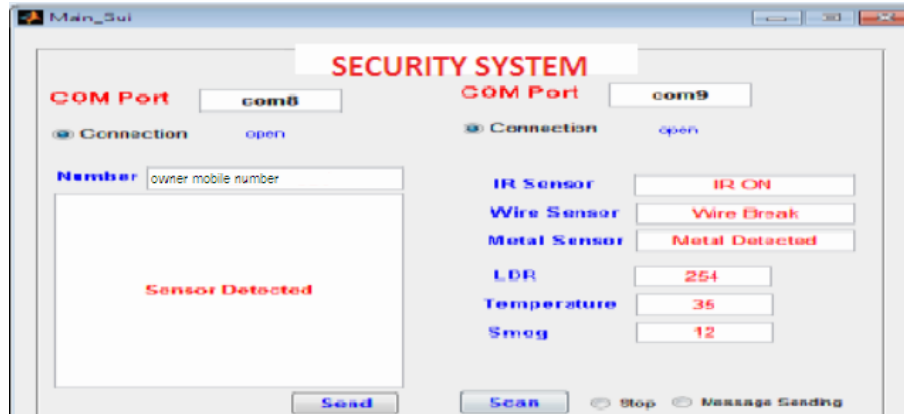
Figures show the detection of sensor by connecting GSM system and FPGA to PC and scan all sensor status to send proper output to owner. If you want to stop message then click on stop. Here port is essential for connecting system. This image used to display sensor status also that helps which sensor in working process.

This system also having Mat lab coding which helps to display this image. Both figure having different status of sensor

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(a)



(b)

Fig.2. Security system (a) shows IR sensor on, Wire break and Metal sensor detected. (b) Shows IR sensor off.

## V. CONCLUSION

The home security system entitled above is most useful application which can be extensively maintained in any house or industrial premises, which provides automatic porch light switching, mail detection, corporation water detection and filling water tank and most important are detection of fire and during night, detection of any unwanted person's entry into our home or office.

If you built the same circuit out of discrete ICs and other components, each IC has to be tested for the many different ways it could be used in different applications. For this is a lot of testing time utilized. In a VLSI the components are dedicated to a

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single use. Further, most are located in the middle of the VLSI and there is no access to them for testing. All that can be tested is the function the entire circuit was designed, for reliability. Over time, results have been found that the reliability of an IC is a function of how many connections it has to the outside world. So if the function is constructed with many smaller ICs connected together, then there are many connections, and the reliability is lower. The VLSI has fewer connections, and higher reliability.

## VI. FUTURE SCOPE

This VLSI system is further modified for the many applications. It can be used in office for automatic door close system. The system can be used for automatic switching of street lights according to availability of daylight. It can also be used in automatic door lock system in houses, cars and offices after fixed time slot or fix duration. It can be used in remote interface which give a more reliable program. It is also use in industry in many applications. By adding video camera (for cost effective purpose), this system can be used as low cost home security system for apartments. We can provide 6V, 4 or 5 Ah battery back up to our system so that in case of power failure our project works properly.

The process of home automation works by making everything in the house automatically controlled using technology to control and do the jobs that the persons would normally do manually. It is much easier to install home automation in a house while it is still being built, since you have the ability to put things inside the walls to save space. Though, people who have houses already built can still have home automation done in a less intrusive way through wireless systems.

Home automation takes care of a lot of different activities in the house. Some of these things are as simple as turning on the sprinklers at a certain time every day and detecting burglars in the middle of the night. Others are much more advanced like sensing the presence of the person in a room and adjusting light ambiance, the temperature in the room, the volume of the music, according to different factors like the day of the week and the time.

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