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# FPGA Based Security System

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## ABSTRACT

Security and power efficiency is the most important thing in present day situation. Need of security and saving of power is increasing rapidly. Security system becomes the best solution to overcome the intrusion problem. This project focuses on the security system which is controlled using FPGA programmed by VHDL language. Field Programmable Gate Array (FPGA) delivers breakout performance capacity and most power efficient system integration while optimizing to develop FPGA devices based on CAD tools in the Hardware Description Language (HDL). The overall project is divided into two parts. The first part is concerned with the hardware development. The second part is based on software programming to operate the hardware structure. PIR motion detectors are most frequently used for security devices. Surveillance is the monitoring of the location, behaviour or activities for the purpose of directing, managing and detecting intrusion by means of electronic equipment. Passive IR motion detectors are usually designed to provide an indication to an alarm panel in response to detecting IR that is indicative of motion of the object. The alarm panel is responsive to receipt of the breach indication to cause an alarm condition to occur. PIR motion detectors are commonly used in conjunction with indoor or outdoor to turn on a light in response to a person moving in the field of view monitored by the motion detector. PIR sensor is capable to detect motion while the programmed FPGA is capable to control the whole operation of the security system.

**Keywords:** Security, FPGA, Video Surveillance, PIR Sensor

## I. INTRODUCTION

As FPGAs have become larger and more capable, the value of the IP of the application designs has grown, motivating significant investment in built-in security functions. Further, the value of the data handled by the FPGA has also increased significantly, including such information as decrypted digital cinema and personal-data databases. As a result, today we find FPGAs deployed in a security hostile environment, protecting data of great commercial value. Besides this measures were also taken to improve protocols and implementations to secure designs in the field. These include not only cryptography on the configuration files but also development of fault tolerant design methodologies for the base array and for applications. Design of automated video

surveillance systems is one of the exigent missions in computer vision community because of their ability to automatically select frames of interest in incoming video streams based on motion detection. This paper focuses on the real-time hardware implementation of a motion detection algorithm for such vision based automated surveillance systems Today, FPGA security is strong enough that they are deployed in security-sensitive applications in commercial and government systems.

## II. IMPLEMENTATION OF FPGA BASED SECURITY SYSTEM

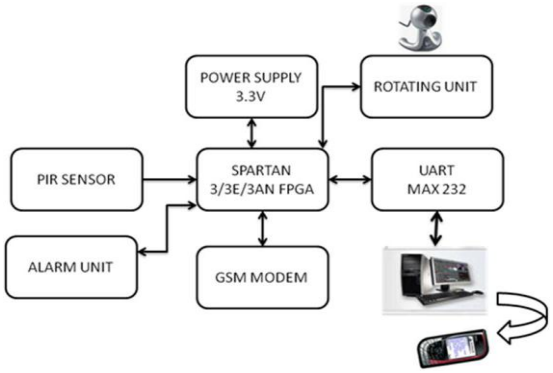


**Figure 1**

When a person enters a monitored area, the target is monitored by sensors which include PIR sensors. These are used to detect motion of the person. Passive infrared sensors (PIR) are electronic devices which are used in some security alarm systems to detect motion of an infrared emitting source, usually a human body.

The pyro-electric sensor is made of a crystalline material that generates a surface electric charge when exposed to heat in the form of infrared radiation. Someone enters secured places, Spartan3an FPGA Starter Kit immediately send SMS for the corresponding people through GSM modem.

The FPGA is more advantageous compare to other models due to its re-configurability and its parallel processing. The GSM modem is connected to the FPGA through serial cable. The people can understood something happens in host section, when they receive message. UART MAX232 stands for Universal Asynchronous Receiver/Transmitter which can be used to receive data from the server through the serial cable.

If user response is received in default time, the system will be in user control mode, where user can establish a remote connection to observe the target area and make relevant control with the help of rotating unit called stepper motor. According to the instructions given through the mobile, then the corresponding operations performed by stepper motor will be rotated either in clockwise or in anti-clockwise. At the same time camera keep on capturing images at the host place and saved into the computer.

## III. RESULTS AND DISCUSSION

**Figure 2**

### A. Pir Sensor Interfacing With Fpga

Most PIR modules have a 3-pin connection at the side or bottom. The pin-out may vary between modules so triple-check the pin-out! It's often silk screened on right next to the connection. One pin will be ground, another will be signal and the final one will be power. Power is usually 3-5VDC input

but may be as high as 12V. Sometimes larger modules don't have direct output and instead just operate a relay in which case there is ground, power and the two switch connections. The output of some relays may be 'open collector' - that means it requires a pull-up resistor. An easy way of prototyping with PIR sensors is to connect it to a breadboard since the connection port is 0.1" spacing. Some PIRs come with header on them already; the ones from Ad fruit don't as usually the header is useless to plug into a breadboard. By soldering in 0.1" right angle header, a PIR is easily installed into a breadboard. PIR sensors are rather generic and for the most part vary only in price and sensitivity.

### B. Camera Interfacing With Fpga

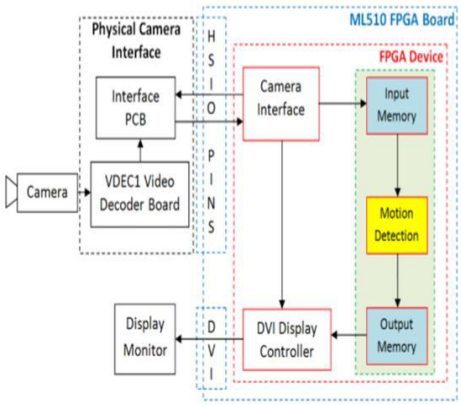


Figure 3. Dataflow Diagram of the Proposed and Developed Motion Detection System.

In current surveillance scenario, motion detection is one component of a potentially complex automated video surveillance system, intended to be used as a standalone system. Therefore, in addition to being accurate and robust, a successful motion detection technique must also be economic in the use of computational resources on FPGA development platform. This is because many other complex algorithms of an automated video surveillance system also run on the same FPGA platform. The problem of motion detection can be stated as "given a set of images of the same scene taken at several different times, the goal of motion detection is to identify the set of pixels that are significantly different between the last image of the sequence and the previous images".

In order to achieve real-time performance, as required in an automated video surveillance system, we have proposed a dedicated hardware architecture for clustering-based motion detection scheme and its implementation as a prototype system using the Spartan3an FPGA board for real-time motion detection. A simplified conceptual block diagram of the proposed and developed FPGA-based motion detection system is shown in figure to illustrate the data flow within the system. The main components of a complete FPGA-based standalone motion detection security system are: analog Camera, VDEC1 Video Decoder Board for analog to digital video conversion, custom designed Interface PCB, Spartan3an FPGA platform for performing real-time motion detection, and a display device (Display Monitor).

### C. Ethernet Interfacing With Fpga

Our application implemented on the FPGA works in this simple example with primarily four registers, referred to as R0, R1, R2, R3. These registers provide the storage space for communicating with the host, and are associated with four different channels of the communication between host and FPGA. From the host, writes to R0 are simply displayed on the Atlys board's eight LEDs. Reads from R0 return the state of the board's eight slide switches. Writes to R1, R2, and R3 are registered and may be read back. The circuit implemented on the FPGA simply multiplies the R1 with R2 and places the result in R3. A simplified block diagram of the entire system (host + FPGA) is shown in the Figure 2 below.

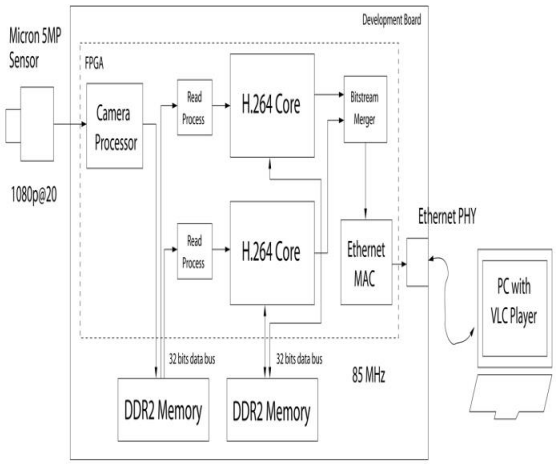


**Figure 4**

## IV. CONCLUSION

Security is the art of restricting admittance to certain entities and is a huge concern for our global society. So in this paper we present the FPGA based security system using with the help of Xilinx ISE design. The design is verified or tested on the FPGA SPARTAN3 Board. 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. Hence we are using FPGA for building our security system as it provides reliability, flexibility and low power consumption. 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. On the whole, this system is used in numerous applications like in Military, Medical Equipments, Home security system, Car security etc. Due to this security System, we can protect our system or documents.

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