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# Fingerprint Based Licensing System for Driving

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**Abstract:** The paper presents the designing of finger print identification in cars to avoid car theft using GSM and FPGA. Fingerprint identification is one of the most popular and reliable personal biometric identification methods. The proposed system was designed on keyless car instead of going with key based authentication we are providing with biometric based authentication. A person, who wishes to drive the vehicle, should verify with their face reorganization and finger print whether he was having license or not, once verification done then ignition unit of car will start automatically. If the person is not verified in the Face recognition the alarm unit will be on, SMS and MMS will be sent to the owner.

**Keywords:** Alarm Unit, Authentication, Face Recognition and Finger Print Identification.

## I. INTRODUCTION

This paper describes the advance security system in automotives, which consists of a face detection subsystem, a GPS module, a GSM module and a control platform. The face detection subsystem bases on optimized AdaBoost algorithm and can detect faces in cars during the period in which nobody should be in the car, and make an alarm loudly or soundlessly. The other modules transmit necessary information to users and help to keep eyes on cars all the time, even when the car is lost. This system prototype is built on the base of FPGA & VHDL controls all the processes. Experimental results illuminate the validity of this car security system.

### A. *Working of the System*

It consists of PC memory unit it stores the different driver fingerprint images. Fingerprint sensor is used to detect the fingerprints of the driver and compare it with the predefined image. If the image doesn't match then the information is send to the owner through SMS and MMS. Owner can trace the location through GPS. This system owner can identify the theft image as well as the location of the car.

The biometric fingerprint sensor takes a digital picture of a fingerprint. The fingerprint scan detects the ridges and valleys of a fingerprint and converts them into ones and zeroes. Complex algorithms analyze this raw biometric scan to identify characteristics of the fingerprint, known as the "minutiae". In most systems, if 10 to 20 minutiae match, the fingerprint is considered a match.

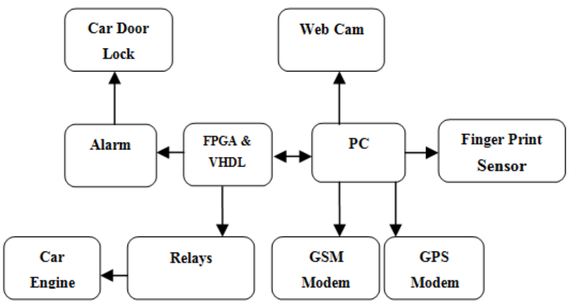


Fig. 1. Block Diagram of The System

## II. FPGA & VHDL

### A. *FPGA*

A Field-programmable Gate Array (FPGA) is an integrated circuit designed to be configured by the customer or designer after manufacturing hence "field programmable".

*i. Introduction of FPGA:*

The FPGA configuration is generally specified using a hardware description language (HDL), similar to that used for an application-specific integrated circuit (ASIC) (circuit diagrams were previously used to specify the configuration, as they were for ASICs, but this is increasingly rare). FPGAs can be used to implement any logical function that an ASIC could perform. The ability to update the functionality after shipping, partial re-configuration of the portion of the design and the low non-recurring engineering costs relative to an ASIC design offer advantages for many applications.

FPGAs contain programmable logic components called "logic blocks", and a hierarchy of reconfigurable interconnects that allow the blocks to be "wired together" somewhat like many (changeable) logic gates that can be inter-wired in (many) different configurations. Logic blocks can be configured to perform complex combinational functions, or merely simple logic gates like AND and XOR. In most FPGAs, the logic blocks also include memory elements, which may be simple flip-flops or more complete blocks of memory.

*ii. Architecture of FPGA:*

The most common FPGA architecture consists of an array of logic blocks (called Configurable Logic Block, CLB, or Logic Array Block, LAB, depending on vendor), I/O pads, and routing channels. Generally, all the routing channels have the same width (number of wires). Multiple I/O pads may fit into the height of one row or the width of one column in the array.

An application circuit must be mapped into an FPGA with adequate resources. While the number of CLBs/LABs and

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I/Os required is easily determined from the design, the number of routing tracks needed may vary considerably even among designs with the same amount of logic. For example, a crossbar switch requires much more routing than a systolic array with the same gate count. Since unused routing tracks increase the cost (and decrease the performance) of the part without providing any benefit, FPGA manufacturers try to provide just enough tracks so that most designs that will fit in terms of LUTs and IOs can be routed. This is determined by estimates such as those derived from Rent's rule or by experiments with existing designs.

In general, a logic block (CLB or LAB) consists of a few logical cells (called ALM, LE, Slice etc).

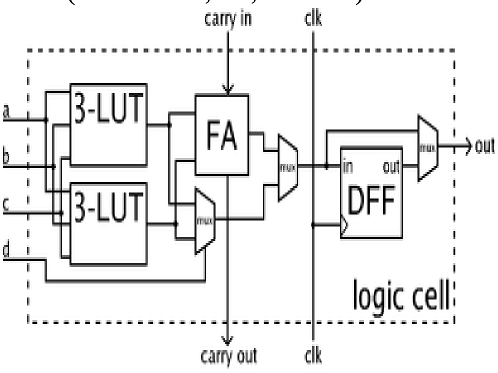


Fig. 2. FPGA Architecture

A typical cell consists of a 4-input Lookup table (LUT), a Full adder (FA) and a D-type flip-flop, as shown below. The LUTs are in this figure split into two 3-input LUTs. In normal mode those are combined into a 4-input LUT through the left mux. In arithmetic mode, their outputs are fed to the FA. The selection of mode is programmed into the middle mux. The output can be either synchronous or asynchronous, depending on the programming of the mux to the right, in the figure example. In practice, entire or parts of the FA are put as functions into the LUTs in order to save space.

B. *VHDL*

VHDL (VHSIC hardware description language) is a hardware description language used in electronic design automation to describe digital and mixed-signal systems such as field-programmable gate arrays and integrated circuits.

*i. Design of VHDL:*

VHDL is commonly used to write text models that describe a logic circuit. Such a model is processed by a synthesis program, only if it is part of the logic design. A simulation program is used to test the logic design using simulation models to represent the logic circuits that interface to the design. This collection of simulation models is commonly called a testbench. VHDL has constructs to handle the parallelism inherent in hardware designs, but these constructs (processes) differ in syntax from the parallel constructs in Ada (tasks). Like Ada, VHDL is strongly typed and is not case sensitive. In order to directly represent operations which are common in hardware, there are many features of VHDL which are not found in Ada, such as an extended set of Boolean operators including NAND and NOR. VHDL also allows arrays to be indexed in either ascending or descending direction; both conventions are used in hardware, whereas in Ada and most programming languages only ascending indexing is available.

VHDL has file input and output capabilities, and can be used as a general-purpose language for text processing, but files are more commonly used by a simulation testbench for stimulus or verification data. There are some VHDL compilers which build executable binaries. In this case, it might be possible to use VHDL to write a testbench to verify the functionality of the design using files on the host computer to define stimuli, to interact with the user, and to compare results with those expected. However, most designers leave this job to the simulator.

*ii. VHDL Advantages:*

- It allows the behavior of the required system to be described (modeled) and verified (simulated) before synthesis tools translate the design into real hardware (gates and wires).
- It allows the description of a concurrent system. VHDL is a dataflow language, unlike procedural computing languages such as BASIC, C, and assembly code, which all run sequentially, one instruction at a time.
- It is multipurpose. Being created once, a calculation block can be used in many other projects.
- It is portable. Being created for one element base, a computing device project can be ported on another element base, for example VLSI with various technologies.

## III. HARDWARE TOOLS

*A. Relay*

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches.

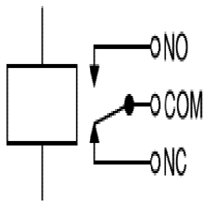


Fig. 3. Circuit symbol of a relay

Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between two circuits the link is magnetic and mechanical.

Relays are very simple devices. There are four major parts in every relay. They are:

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- Electromagnet
- Armature that can be attracted by the electromagnet
- Spring
- Set of electrical contacts

*B. DC Motors*

The steel can forms the body of the motor in addition to an axle, a nylon end cap and two battery leads. If the battery leads of the motor are hooked up to a flashlight battery, the axle will spin. If leads are reversed, it will spin in the opposite direction. Here are two other views of the same motor. The nylon end cap is held in place by two tabs that are part of the steel can. By bending the tabs back, the end cap can be made free and remove it. Inside the end cap are the motor's brushes. These brushes transfer power from the battery to the commutator as the motor spins.

Fig. 4. parts of a DC motor

*C. GPS Modem*

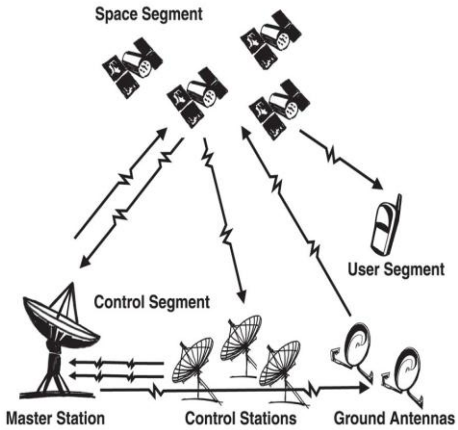
The Global Positioning System (GPS) is a satellite based navigation system that can be used to locate positions anywhere on earth. Designed and operated by the U.S. Department of Defense, it consists of satellites, control and monitor stations, and receivers. GPS receivers take information transmitted from the satellites and uses triangulation to calculate a user's exact location. GPS is used on incidents in a variety of ways, such as:

- To determine position locations; for example, you need to radio a helicopter pilot the coordinates of your position location so the pilot can pick you up.
- To navigate from one location to another; for example, you need to travel from a lookout to the fire perimeter.
- To create digitized maps for example, you are assigned to plot the fire perimeter and hot spots.
- To determine distance between two points or how far you are from another location.

*i. Working of GPS:*

The basis of the GPS is a constellation of satellites that are continuously orbiting the earth. These satellites, which are equipped with atomic clocks, transmit radio signals that contain their exact location, time, and other information A GPS receiver needs only three satellites to plot a rough, 2D position, which will not be very accurate. Ideally, four or more satellites are needed to plot a 3D position, which is more accurate. The three segments of GPS are the space, control, and user.

Space Segment Satellites orbiting the earth the space segment consists of 29 satellites circling the earth every 12 hours at 12,000 miles in altitude. This high altitude allows the signals to cover a greater area. The satellites are arranged in their orbits so a GPS receiver on earth can receive a signal from at least four satellites at any given time. Each satellite contains several atomic clocks. The satellites transmit low radio signals with a unique code on the different



Fig,5. Three segments of GPS

frequencies, allowing the GPS receiver to identify the signals. The main purpose of these coded signals is to allow the GPS receiver to calculate travel time of the radio signal from the satellite to the receiver. The travel time multiplied by the speed of light equals the distance from the satellite to the GPS receiver.

Control Segment tracks the satellites and then provides them with corrected orbital and time information. The control segment consists of five unmanned monitor stations and one Master Control Station. The five unmanned stations monitor GPS satellite signals and then send that information to the Master Control Station where anomalies are corrected and sent back to the GPS satellites through ground antennas.

User Segment receivers owned by civilians and military the user segment consists of the users and their GPS receivers. The number of simultaneous users is limitless.

*D. Finger Print Sensor*

The analysis of fingerprints for matching purposes generally requires the comparison of several features of the print pattern. These include patterns, which are aggregate characteristics of ridges, and minutia points, which are unique features found within the patterns. It is also necessary to know the structure and properties of human skin in order to successfully employ some of the imaging technologies. Matching algorithms are used to compare previously stored templates of fingerprints against candidate fingerprints for authentication purposes. In order to do this either the original image must be directly compared with the candidate image or certain features must be compared.

*E. Face Recognition Sensor*

The temporal lobe of the brain is partly responsible for our ability to recognize faces. Some neurons in the temporal lobe respond to particular features of faces. Some people who suffer damage to the temporal lobe lose their ability to recognize and identify familiar faces. This disorder is

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called prosopagnosia. When the appearance of a face is changed, neurons in the temporal lobe generate less activity.

*F. GSM Modem*

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. Difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

A GSM modem can be an external device or a PC Card or PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

## IV. RESULT

In this paper we get result in the form of MMS and SMS. Programming is done through Xilinx. Whenever the person gets into the car the system recognizes the face and finger print of the person, checks the license if the license is not recognized. The information is sent to the system and the alarm sounds, SMS and MMS will be sent to the authorized user informing that the unauthorized user is using the car and through GPS system the correct position of the car is traced.

## V. CONCLUSION

From this we implement image-recognition techniques that can provide the important functions required by advanced intelligent Car Security, to avoid vehicle theft and protect the usage of unauthenticated users**.** Secured and safety environment system for automobile users and also key points for the investigators can easily find out the hijackers image. We can predict the theft by using this system in our day to day life. This will help to reduce the complexity and improve security.

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