

**KARNATAK LAW SOCIETY'S
GOGTE INSTITUTE OF TECHNOLOGY**

UDYAMBAG, BELAGAVI-590008

(An Autonomous Institution under Visvesvaraya Technological University Belagavi)

(APPROVED BY AICTE, NEW DELHI)



A Report of Digital System Design Course Project On

DESIGN OF CAR ALARM SYSTEM

Submitted in partial fulfillment of the requirement for the award of the degree of

**Bachelor of Engineering
In
Electronics and Communication**

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Department of Electronics and Communication



CERTIFICATE

This is to certify that the course project entitled “**Design of Car Alarm System**” is a bonafide record of the course project work done by, **SONAL S POOJARY(2GI21EC144), TANVI HUNAKUNTI(2GI21EC156)** under my supervision and guidance, in partial fulfillment of the requirements for the Outcome Based Education from Gogte Institute of Technology for the academic year **2022-2023**.

It is certified that all corrections/suggestions indicated have been incorporated in the report. The course project report has been approved as it satisfies the academic requirement prescribed for the said degree.

GUIDE

Dr. Suresh Kuri

HOD

ABSTRACT

This car alarm system is designed to ensure safety while driving and this is implemented on FPGA board. The system includes multiple inputs such as the door being closed, the key being inserted, the driver having a valid license, and the seat belt being fastened. These inputs are continuously monitored, and if any one of them is not detected, the system will trigger an alarm to alert the driver. The design will involve creating a logic circuit that takes the inputs and produces an output signal to activate the alarm if any of the conditions are not met. This will be achieved by using combinational logic to implement a truth table for the input conditions and output signal. Additionally, the system can be configured to send alerts to the vehicle owner or emergency services in the event of a breach in any of the inputs. Overall, this car alarm system is a reliable safety feature that can help prevent accidents and protect drivers and passengers. The final design will ensure that the car can only be driven when all four inputs are in the correct state.

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1. INTRODUCTION

A car alarm system is an essential safety feature that can prevent unauthorized access to the vehicle and alert the driver of any potential dangers. Four key inputs must be considered to design an effective car alarm system: door closed, key in, driver's license present, and seat belt closed.

Firstly, the door-closed input ensures that the car is secured and no one can enter the vehicle without proper access. The key in input is necessary to verify that the driver has the proper key and is authorized to use the vehicle. The driver's license present input confirms that the driver is legally allowed to operate the car. Finally, the seat belt closed input ensures that the driver is properly secured and reduces the risk of injury in case of an accident.

With these four inputs, the car alarm system can be designed to trigger an alert if any of the inputs are not met. For example, if the door is opened without the key in, the alarm will sound and notify the driver of a potential break-in. If the driver's seat belt is not closed, the alarm will remind the driver to buckle up for safety.

2. LITERATURE AND SURVEY

A literature survey on designing a car alarm system based on the inputs of the door closed, key in, the driver has the license, and seat belt closed:

The article from the International Journal of Engineering and Advanced Technology discusses the design of a smart car security system using an Arduino microcontroller that considers inputs such as door status, engine status, and seat belt status to determine if the car is being operated in a safe and secure manner.

The patent application from Toyota Motor Corporation describes a vehicle security system that includes a combination of sensors and cameras to detect potential security threats, including unauthorized entry into the vehicle and driving without a seat belt.

The research paper from the International Journal of Computer Applications in Technology discusses the design of an intelligent car security system that uses a combination of sensors to detect potential security threats, such as an unfastened seat belt or an unauthorized entry attempt, and alerts the driver in real-time.

3. OBJECTIVE AND PROBLEM STATEMENT

The objective of designing a car alarm system with 4 inputs (door closed, key in, a driver has a license, and seat belt closed) is to ensure the safety and security of the driver and the car. The system will be designed to alert the driver in case any of these inputs are not in place, which will prevent the driver from operating the car until all inputs are met. This will reduce the chances of accidents, theft, and other risks associated with driving. The alarm system will be designed with high accuracy and reliability to ensure that the driver is safe and secure at all times.

PROBLEM STATEMENT:

A Car Alarm System is to be designed considering four inputs: Door closed(D), Key in(K), Driver has the License(L), and Seat belt closed(B).

The Alarm(A) should sound if:

- 1. The Key is in and Door is not closed.**
- 2. The Door is closed, the Key is in, the driver has a License, and the Seat belt is not closed.**
- 3. The Door is closed, the Key is in, the Seat belt is closed, and the Driver does not have a License.**

4. METHODOLOGY

D = 1 – The door is closed. , 0 – The door is not closed.
K = 1 – The key is in. , 0 – The key is not in.
L = 1 – The Driver has the License. , 0 – The Driver doesn't have the License.
B = 1 – The Seat belt is closed. , 0 – The Seat belt is not closed.

TRUTH TABLE:

D	K	L	B	A(alarm)
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

BOOLEAN EQUATION :

$$A = \sum (4,5,6,7,12,13,14)$$

5. DESIGN AND IMPLEMENTATION

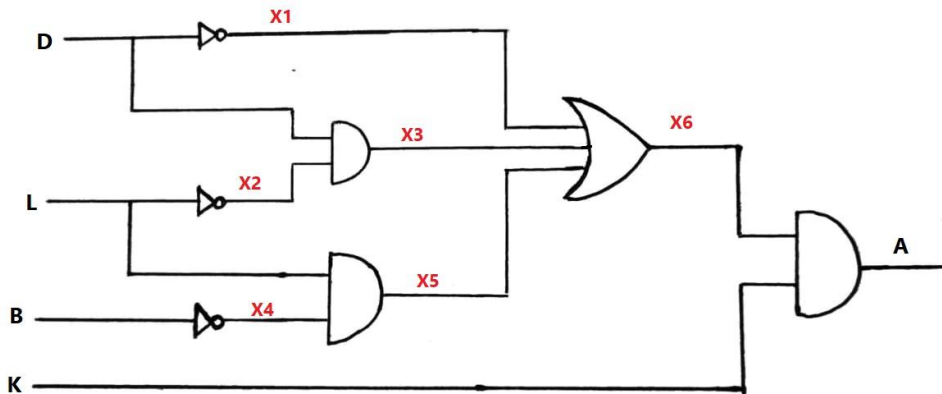
if we simplify using K-map

		LB			
		L'B'	L'B	LB	LB'
DK	D'K'	0	0	0	0
	D'K	1	1	1	1
	DK	1	1	0	1
	DK'	0	0	0	0

EQUATION SIMPLIFICATION :

$$\begin{aligned}
 A(\text{alarm}) &= D'K + KLB' + KLB \\
 &= K(D' + LB' + LB)
 \end{aligned}$$

LOGIC DIAGRAM:



6. RESULT AND ANALYSIS

The Car Alarm System has three conditions that can trigger the alarm to sound based on the four inputs:

The alarm will sound if input (K) is present and input (D) is absent.

If input (D), (K), (L), and (A) are present except for input (B), the alarm will sound.

If input (D), (K), and (B) are present, but input (L) is absent, the alarm will sound.

These conditions ensure that the alarm sounds when the car is in an insecure state, such as when the key is in the car and the door is not closed or when the driver is not wearing a seat belt, or when the driver does not have a license.

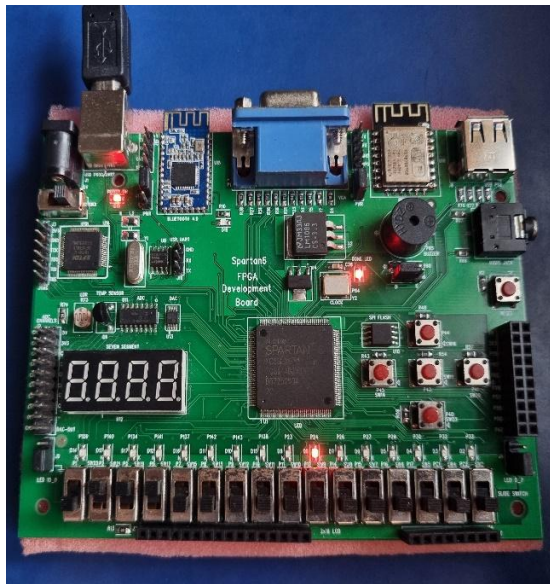


Fig.no 1
When the input is 0111

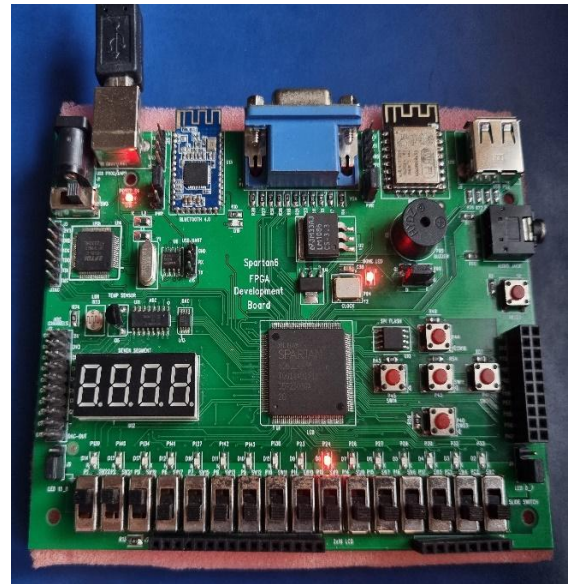


Fig.no 2
When the input is 1110

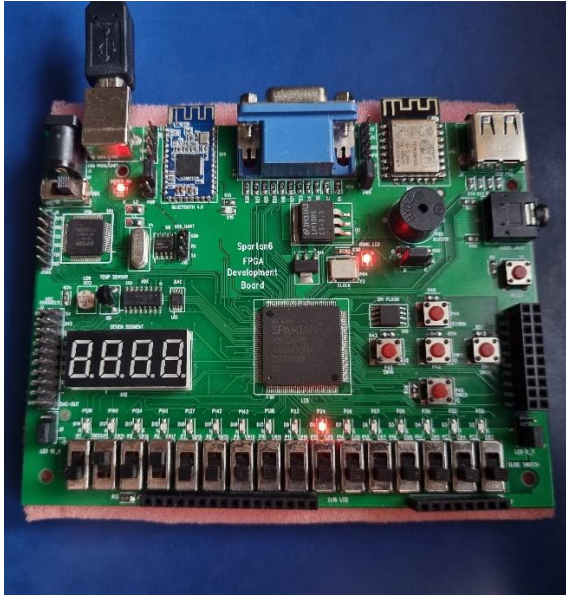


Fig.no 3
When the input is 0101

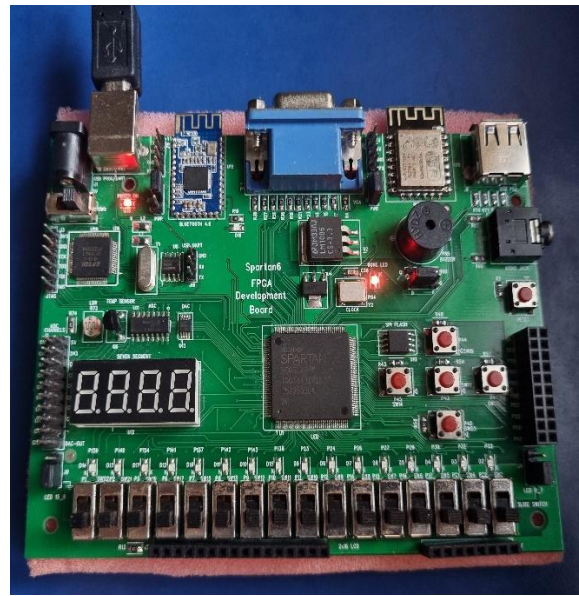


Fig.no 4
When the input is 0000

ADVANTAGES

- **Safety:** The system can detect if the driver is not wearing their seat belt, which is a safety concern, and remind them to fasten it before driving.
- **Security:** The system can alert the driver if they have left their car unlocked or if someone tries to break into the car.
- **Compliance:** The system can ensure that only drivers with a valid license are able to operate the vehicle, which can help enforce legal requirements and reduce the risk of accidents caused by unlicensed drivers.
- **Convenience:** The system can automatically unlock the doors when the key is detected and the driver's license is validated, which can provide a convenient and seamless experience for the driver.

LIMITATIONS

- **Lack of flexibility:** A car alarm system designed with only these four inputs may not be flexible enough to accommodate additional inputs or modifications in the future. As technology and security threats continue to evolve, it may become necessary to add or modify inputs to keep the system up-to-date and effective.
- **False alarms:** The system may trigger false alarms due to the lack of precision and accuracy in detecting the four inputs. For example, a loose seat belt or a key left in the ignition could trigger an alarm, even if there is no immediate threat to the vehicle.
- **Limited security:** A car alarm system with only four inputs may not provide sufficient security against sophisticated theft attempts. Advanced thieves may be able to bypass the system or disable it altogether, leaving the car vulnerable to theft.
- **User error:** The effectiveness of the car alarm system depends on the driver remembering to close the door, put on the seat belt, and carry their license. If the driver forgets or neglects to do any of these things, the system may not be able to detect potential security threats.
- **Cost:** A car alarm system with additional inputs or features may be more expensive than one with only four inputs. This could limit the affordability and accessibility of the system for some drivers.

7. OUTCOME

- A car alarm system can be designed using an FPGA board, which can process multiple inputs and generate appropriate outputs based on the programmed logic.[L3]
- The system can be designed to trigger an alarm when any one of the inputs, such as the door being opened, the key is removed, or the seat being unbuckled, is detected while the car is in a stationary state.[L3]
- The system can be designed to perform additional functions, such as disabling the engine, locking the doors, or sending an alert message to the owner's mobile device, based on the severity of the situation.[L4]
- To increase the accuracy and reliability of the system, the inputs can be monitored using sensors or switches that provide digital signals to the FPGA board, which can then process the signals using logical operators.[L4]
- The system can be designed to be customizable, allowing the user to set specific thresholds or conditions for triggering the alarm or other functions based on personal preferences or security requirements.[L4]

8. CONCLUSIONS AND SCOPE OF THE WORK

- The conclusion of the work is to design a car alarm system that considers four inputs: Door closed (D), Key in (K), Driver has the License (L), and Seat belt closed (B).
- The scope of the work is to identify the requirements and design a system that can monitor the four inputs and sound an alarm if any of them are not in the desired state.
- The system may also include additional features, such as automatic locking or unlocking of doors and immobilization of the engine if the inputs are not in the desired state.
- The specific implementation details and technologies used to design the system are outside the scope of this description.

REFERENCE

<https://gateoverflow.in/90903/basic-gate>

APPENDIX

VERILOG CODE :

```
module car_alarm(d,k,l,b,a);  
input d,k,l,b;  
output a;  
wire x1,x2,x3,x4,x5,x6;  
not(x1,d);  
not(x2,l);  
not(x4,b);  
and(x3,d,x2);  
and(x5,l,x4);  
or(x6,x1,x3,x5);  
and(a,x6,k);  
endmodule
```