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DRIVER SLEEP DETECTION AND ALARMING SYSTEM

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ABSTRACT

In our fast-paced lives, maintaining alertness while driving can be challenging amidst hectic schedules. Envision a scenario where you're driving home fatigued after a demanding day, and drowsiness sets in unexpectedly. Such situations pose a grave risk of accidents with potentially severe consequences. In this paper we have Introduced a cutting-edge safety innovation – the Driver Sleep Detection and Alarming System. This intelligent device serves as a vigilant guardian, issuing timely warnings when signs of drowsiness emerge, effectively preventing accidents and safeguarding lives. Particularly beneficial during extended journeys and late-night drives, this system employs an infrared sensor. Upon detecting closed eyes for more than 3 seconds, it triggers an audible alert to rouse the driver. Should drowsiness persist beyond 5 seconds, the system takes immediate action by automatically halting the vehicle. This affordable solution is geared towards minimizing accidents, presenting an invaluable contribution to enhancing road safety.

KEYWORDS: *IR Sensor Module, Vehicle, Relay*

1. INTRODUCTION

Driver fatigue stands as a pervasive and alarming contributor to car accidents, leading to approximately 488 fatalities and 76,000 injuries each year attributed to tired driving. The profound impact of exhaustion on road safety is underscored by studies revealing its pivotal role in increasing the likelihood of accidents, rendering drivers more susceptible to distractions. The gravity of fatigue-related incidents is further heightened by higher speeds, as fatigued drivers grapple with delayed reactions and struggle to apply brakes in a timely manner. Addressing the challenge of developing technology capable of detecting and preventing driver tiredness is paramount in the ongoing efforts to enhance accident prevention measures. Given the serious and potentially fatal risks associated with drowsiness on the road, it becomes imperative to formulate comprehensive strategies for monitoring and mitigating its impact on driver performance [1].

Despite the alarming global toll of 1.25 million annual road crash fatalities, there exists a beacon of hope in the form of the potential for prediction and prevention emphasized by the World Health Organization. By leveraging advancements in technology and a deeper understanding of the physiological markers of fatigue, we have the opportunity to avert tragic events on the road and cultivate a safer driving environment for all. This exploration aims to delve into the nuanced dimensions of driver fatigue, examining the challenges, opportunities, and strategies essential in the ongoing pursuit of road safety [2-3].

2. BLOCK DIAGRAM

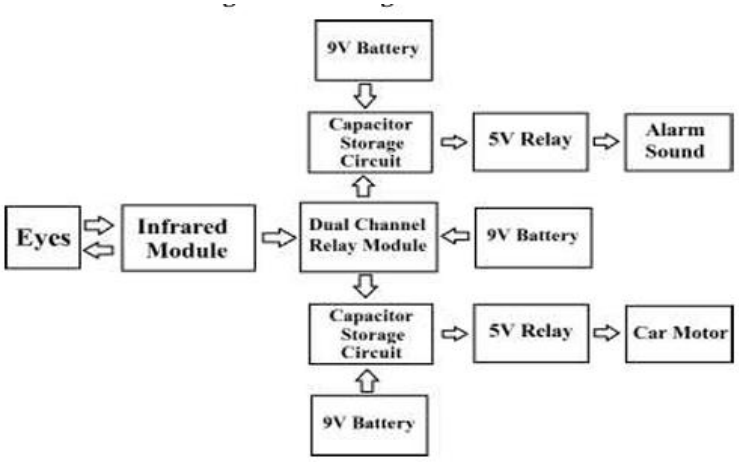

Figure 1. Basic Block diagram of project.

In this an initial Infrared Module is employed, seamlessly connected to a Relay Module that draws power from a single 5V battery. The primary purpose of this setup is to discern when the driver closes their eyes, subsequently activating the relay switch. Furthermore, we integrate two additional simple relays, each tasked with controlling sound and the vehicle independently. These supplementary relays are intricately linked to the primary relay module and draw power from distinct batteries. To enhance efficiency, each simple relay is equipped with a capacitor, enabling precise determination of the relay activation duration following a power interruption. The operational sequence is uncomplicated: when the driver halts the vehicle and the alarm is triggered, one of the simple relays engages. Conversely, upon deactivating the alarm, the car seamlessly initiates its start-up sequence. This concise explanation provides a fundamental overview of the block diagram in more accessible terms

3. BASIC CIRCUIT DESIGN

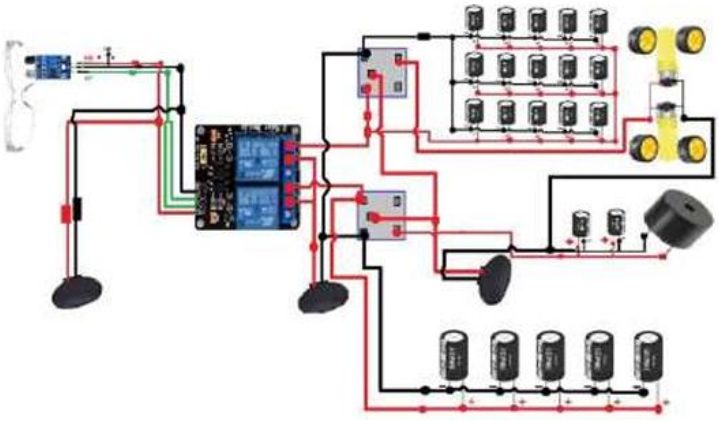

Figure Circuit Diagram.

Figure 3. Circuit diagram

3.1 Infrared Module / IR Sensor Module

The Infrared Module, also recognized as an IR Sensor Module, stands as a pivotal element within electronic systems crafted for proximity sensing and object detection. As shown in figure 3, these modules leverage infrared light, featuring sensors capable of discerning the presence or absence of objects based on their reflectivity or emissivity. In practical applications like driver sleep detection systems, the Infrared Module assumes the critical function of detecting alterations in the driver's eye

state, particularly when they close their eyes. This real-time information serves as a cornerstone for triggering subsequent actions, ranging from activating alarms to initiating essential safety measures. In summary, Infrared Modules play a central and indispensable role in converting physical phenomena, with a specific focus on infrared radiation, into actionable electronic signals across diverse technological applications [5].

Figure 3: Infrared module

3.2 5V Single Channel Relay Module

The 5V Single Channel Relay Module is a crucial element in electronic systems, serving as a switch for managing high-power devices through low-voltage microcontrollers or digital circuits. Designed with a singular relay channel, it streamlines the control of external devices like lights, motors, or alarms. Powered by a 5V source, it aligns seamlessly with standard microcontroller voltages. Acting as an electromagnetically controlled switch, the relay facilitates the enablement or interruption of current flow to the connected device. In essence, the 5V Single Channel Relay Module functions as a highly efficient interface, bridging low-voltage control systems and higher-voltage devices, thereby providing adaptability for the automation and oversight of diverse electronic applications [4].

Figure 3: 5V Single Channel Relay Module

3.3 5Volt Relay

A 5V relay serves as an automated switch extensively utilized in control circuits to manage high-current devices using a low current signal. The relay signal operates within an input voltage range of 0 to 5V. The pin configuration of the 5V relay comprises five pins, each with specific functionalities outlined below:

- Pin1 (End 1): Activates the relay; typically, one end is connected to 5Volts, while the other end is linked to the ground.
- Pin2 (End 2): Serves as an additional activation point for the Relay.
- Pin3 (Common (COM)): Connects to the primary terminal of the Load, rendering it active.
- Pin4 (Normally Closed (NC)): Links to the second terminal of the load, offering the option to connect to either NC or NO pins. When connected to the load, it remains ON before the switch.

- Pin5 (Normally Open (NO)): When the second terminal of the load is connected to the NO pin, the load is turned off before the switch.

Figure 4: 5V Relay

2.4 25V/1000uf Capacitor

Figure 5: 25V/1000uf Capacitor

This particular capacitor features a capacitance value of 1000uF and a voltage rating of 25V, rendering it well-suited for a diverse array of electronic applications. Designed with a radial lead configuration and compact dimensions, the ECA-1EM102 facilitates seamless integration into a variety of circuit designs. It's essential to note that these capacitors are polarized, and it is crucial not to connect them backward. The negative polarity is indicated by a white line running down the side of the capacitor alongside a negative symbol.

3.4 Gear Motor

A gear motor is a specialized type of motor that incorporates an integrated gearbox. The gearbox serves a dual purpose: it amplifies the motor's torque, enabling it to handle heavier loads, and it reduces the motor's speed, allowing for precise control. This integration of motor and gearbox creates a system that requires less power to efficiently move a specific load. The design of the gearbox, the type of gears used, the lubrication method, and the coupling type all play a significant role in determining the overall performance of the gear motor. A meticulously designed gearbox ensures efficient torque conversion and speed reduction, enhancing the motor's adaptability to a wide range of applications with varying load requirements.

Figure 6: Gear Motor

3.5 Buzzers

These buzzers trace their origins to Japanese manufacturers and found integration into a diverse range of devices during the 1970s to 1980s. This technological leap was a consequence of collaborative initiatives among Japanese manufacturing companies. In 1951, these companies collectively formed the

Application Research Committee of Barium Titanate, fostering cooperative competition among corporations and paving the way for the advancement of various piezoelectric innovations.

3.6 Jumper Wire

Jumper wires stand as fundamental electronic elements widely employed in circuit prototyping and breadboarding. Comprising insulated conductive material with connectors at both ends, these wires facilitate convenient and temporary connections between different points on a circuit. Offering a versatile and effective method for establishing electrical connections, jumper wires empower engineers, hobbyists, and students to swiftly create and modify circuits during the developmental and testing stages. Available in diverse lengths and colors, jumper wires contribute to the organization and clarity of intricate circuits

4. RESULTS

Preventing accidents caused by driver fatigue is achievable, and this project idea is designed to be budget-friendly, ensuring accessibility for any driver. This project is currently operational and in use.

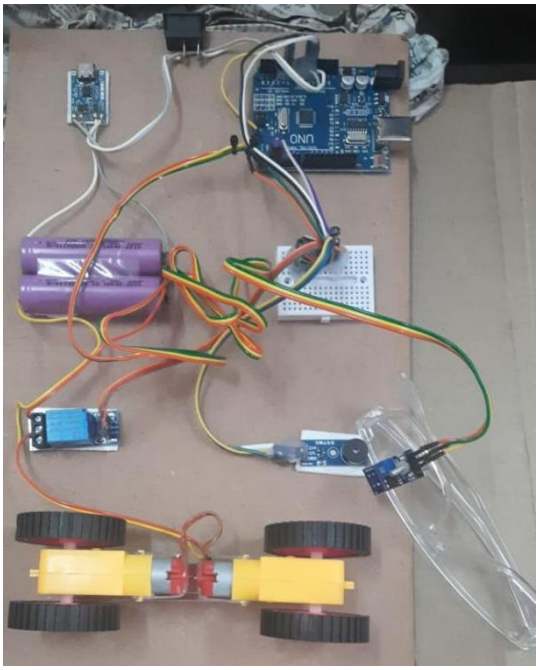

Figure 7. Model of the project

5. CONCLUSION

While the Driver Sleep Detection and Alarming System can be a valuable tool in preventing accidents caused by drowsy driving, its effectiveness is optimized when complemented with other strategies that encourage safe driving practices. Ultimately, the responsibility lies with the driver to ensure they are well-rested and alert when operating a vehicle.

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