

Safe Blind-Turns: Cross-Circuit Warning & Motion Power

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Abstract—The study aimed to reduce cases of accidents caused by blind U-turns, and as such, an innovative cross-circuit indicator system was developed. The existing road signs and lamps were ineffective in such a case due to lack of visibility and drivers' non-adherence, leading to accidents. Therefore, the new system applied motion-powered sensors to identify vehicles on the roads with blind spots or U-turns. Also, the motion or energy produced during U-turns was captured to produce electrical power that was fed to the indicator. As a result, with the advanced warning of a possible U-turn, visibility was incorporated using the same system for safer driving practices, effective in addressing the identified issues of poor visibility and driver speed miscalculations that caused most of the accidents.

Index Terms— Accidents, Blind U-turns, Cross-circuit, Power motion sensor.

I. INTRODUCTION

Accidents are primarily the result of many reasons, although recent statistics and studies have confirmed that most accidents are often a result of blind spots or blind turns. These blind spots or U-turns are usually perilous, and the aftermath usually involves fatal outcomes. Preventing accidents of this nature is a tedious task that primarily addresses the major problems of drivers, such as lack of visibility, and inaccurate calculation of some important parameters, such as speed and inadequate signage on the roads.

In areas where heavy traffic is present on two-way roads, blind turns pose a significant danger. This is because they create a situation with a high level of risk and a low sense of being able to control that risk. A high-risk situation is one where a collision would have severe consequences, while high perceived risk control refers to the ability to avoid a situation where the negative outcomes outweigh the benefits. In simpler terms, if drivers believe there is a high likelihood of getting into an accident, they should not continue to proceed into a high-risk situation. However, when it comes to blind turns, the high level of mental stress and difficulties in accurately judging the distance and speed of oncoming vehicles has resulted in numerous collisions.

The objective is to minimize the probability of accidents related to blind U-turns by warning the drivers of vehicles from the other side in advance. Current signaling, which includes road signs and lamps, which are inefficient due to poor visibility and the lack of guarantee that the driver will respect the sign.

On this account, the system implemented in the present study employs the concept of a cross-circuit indicator that signals the driver's propensity for a U-turn on detecting the vehicle on the parallel road. Along with this, the use of motion-powered sensors helps in utilizing the kinetic energy produced by vehicles while passing the U-turns. The sensors capture the extra energy and later convert it into electrical power. Instead of being wasted, it can be used as an alternative energy source for indication purposes along the road.

TABLE I. SUMMARY OF THE NUMBER OF CRASHES BY SEVERITY

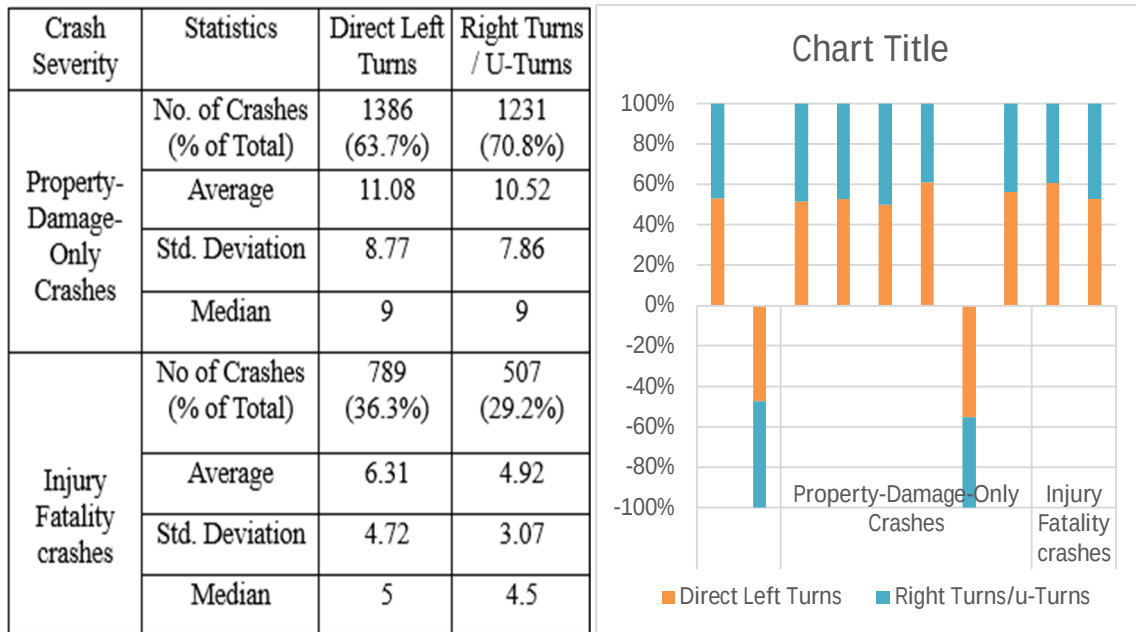
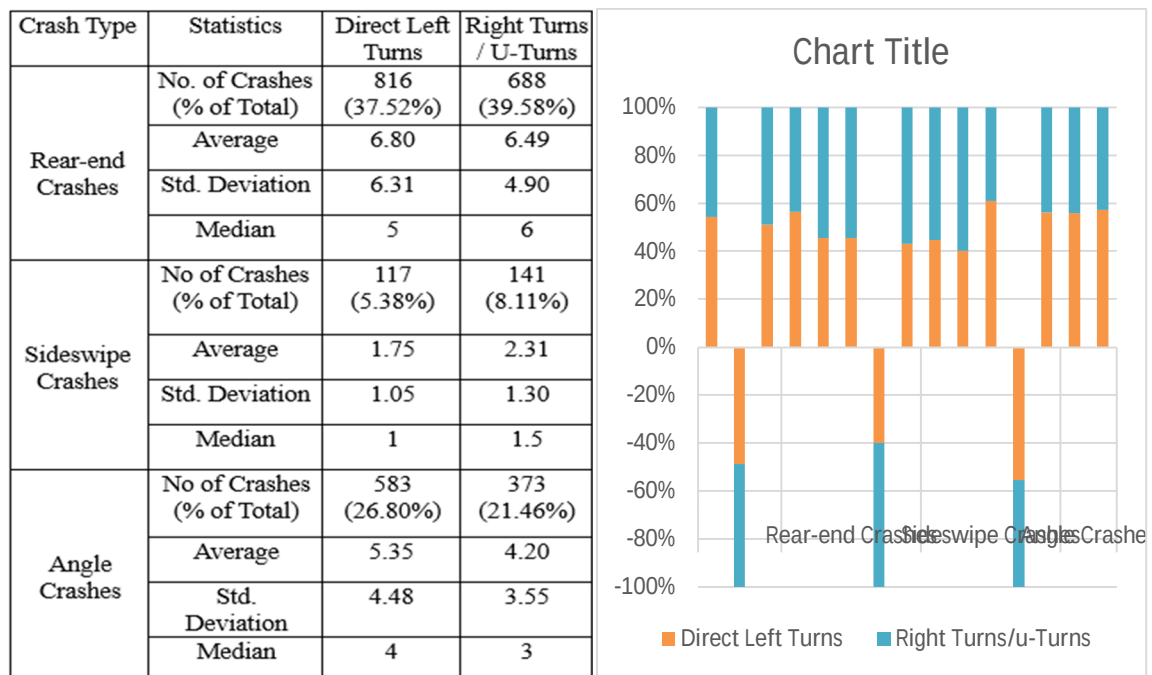


TABLE II. SUMMARY OF THE NUMBER OF CRASHES BY CRASH TYPE



II. HELPFUL HINTS

This system integrates a cross-circuit indicator equipped with LEDs, a battery, and power motion sensors. The methodology will cover the design, implementation, and testing phases of the system.

A. Hardware Compounds

i. LED (Light Emitting Diode)

LEDs are solid-state electronics that glow as electricity flows through them. These gadgets are thought to be special because of their high energy efficiency, lengthy service life, and availability in

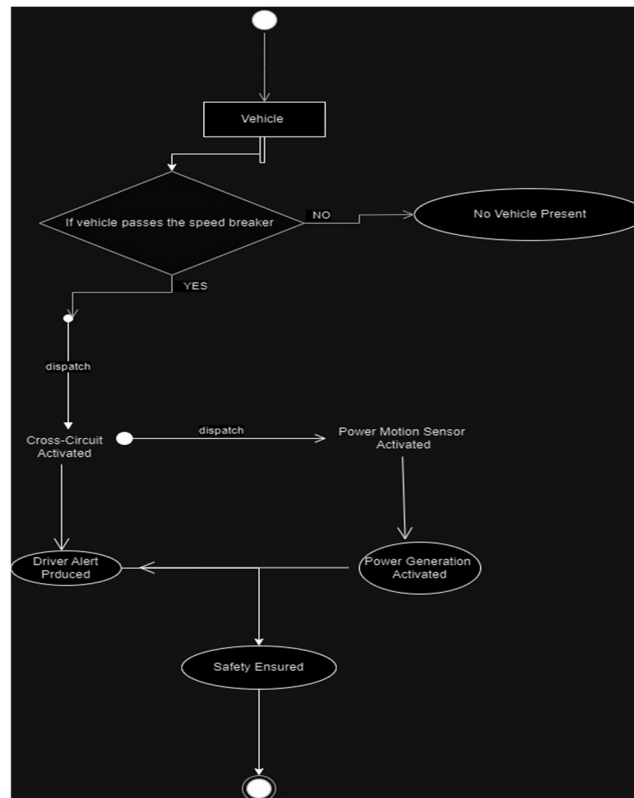


Figure 1. Activity Diagram

several colours. The LEDs' longevity and low power consumption have completely changed the lighting sector. They could be set up as general lighting, tiny indication lamps, or displays.

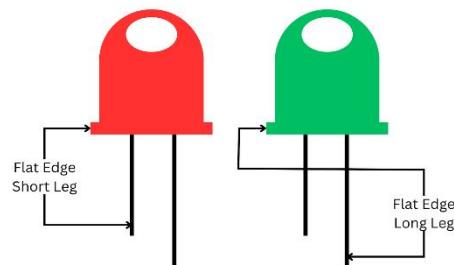


Figure 2. Light Emitting Diode (LED)

ii. Power Motion Sensors

Sensors are instruments sent to register any changes in the physical or environmental conditions and transfer them into readable signals. Sensors are used in numerous sectors ranging from automotive and industrial applications to medical and consumer devices. The most common types are temperature, pressure, motion, and proximity sensors. Modern sensors have become smaller, more precise, and cheaper, making them ideal for more compact smart devices, automating multiple processes in modern life due to convenient and accurate monitoring and control detected image. The layer takes the input from its previous layer.

iii. Battery

Battery is an electrochemical contrivance that stores and produces electric energy through the medium of chemical reactions. A battery contains one or more cells that produce electrical energy when charged and the external circuit is connected to that cell. Batteries are some of the essential power sources for millions of devices like mobile phones, laptops, electric vehicles, storage systems, and more. These include different types such as alkaline, lithium-ion, and nickel-metal hydride, each of these comes with its characteristics and applications.

iv. **Metallic Rod**

A power generation system can be installed in speed breakers to generate electricity using a metallic rod. By placing a rod across the width of the road at the speed breaker pitch, we can ensure that it turns smoothly and is safe for vehicles to drive over. As vehicles pass over the rod, it rotates and transmits this movement to a motor, which in turn generates electricity for indicators.

B. Step-by-Step Methodology

In the proposed solution a blind U-turn is considered and the indication system is designed for accident prevention when vehicles are coming from both ends of the road that is when the indication system kicks in, it consists of two LEDs; red and green which indicate the presence of a vehicle on the either of the turn and no vehicle on the road respectively. The system works on two main principles which are the Cross-Circuit indicator which provides enhanced visibility to the driver and power motion sensors which help in the conversion of the kinetic energy produced by the motion of the vehicle into electric energy which is then stored in the battery and is used for indication purposes.

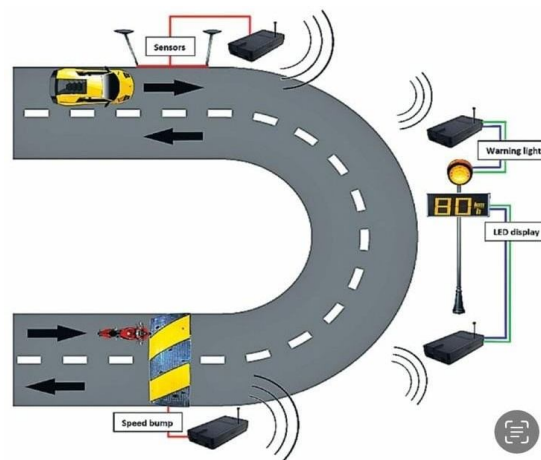


Figure 3. Methodology Design

i. **Design & Function**

- The design layout of the circuit incorporates LEDs, power motion sensors, and a rechargeable battery.
- Identify the products and products to buy for your final product sourced including high-efficiency LEDs, motion sensors with direct conversion to power sources, and the type of rechargeable battery.
- Mounting rods can be fabricated and designed accordingly with appropriate channel holders and weather-resistant materials

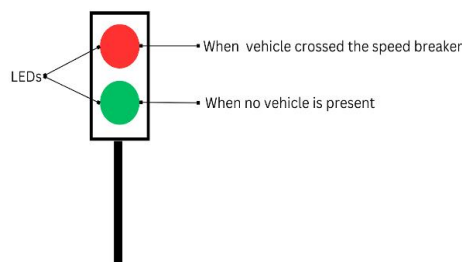


Figure 4. Indication System

ii. **Circuit Assembly**

- Mount the existing circuit components in the rods. The fetch of LEDs should be connected as indicated in the layout in supply to the power motion sensor.
- Test the circuit to determine if the vehicle motion sensor detects motion and the LEDs perfect activation.

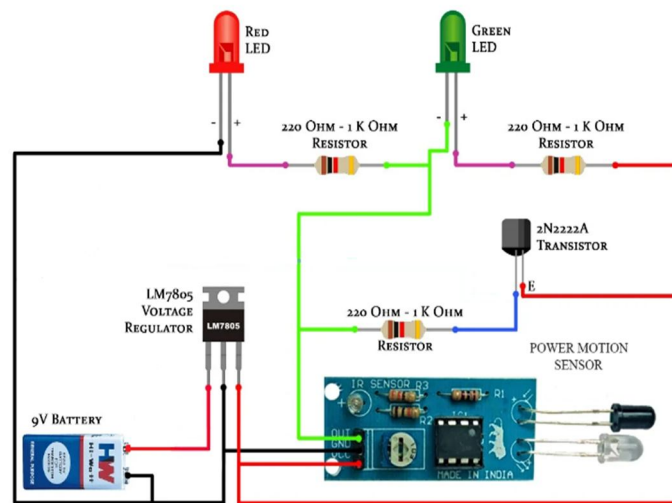


Figure 5. Circuit Assembly of System

iii. Energy Conversion and Storage

- The power motion sensors will be calibrated to convert power fetch from the passing vehicles.
- Monitor the conversion rate according to the power motion sensor output and consider whether the rechargeable battery is charged.
- As the battery reaches its full charge, a charging and monitoring system will be put up to bear efficiency between charges and eventually overuse.

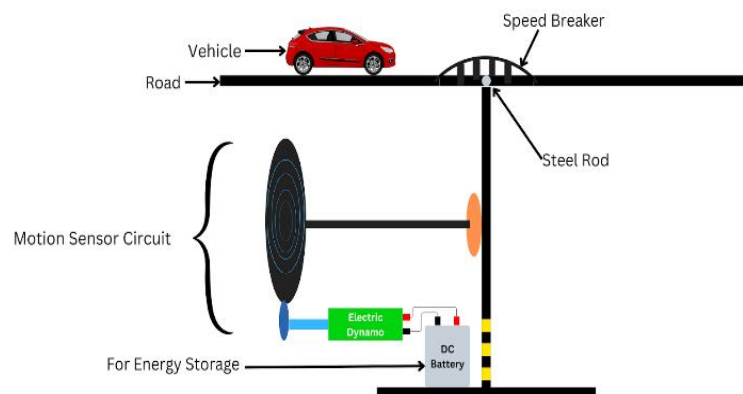


Figure 6. Energy Conservation and Storage Mechanism

iv. System Usage and Testing

- Integrate the whole system in terms of the circuit assembly, energy conversion pattern, and battery storage before carrying out a test to ascertain the system's performance capability under different conditions.
- After testing the system, modifications should be made concerning the system parameter being enhanced for reliability, accuracy, and energy conversion efficiency among others.

v. User Interface and Signage

- Designing a user-friendly interface that is used in the monitoring of the system performance in terms of the charge level.
- Install traffic signs directing the drivers on where to find the cross-circuit indicator and the importance of doing so.
- After the complete installation, UAT should be carried out against the drivers and other stakeholders to gather feedback and acclimation to the optimum design to enhance maximum usability.

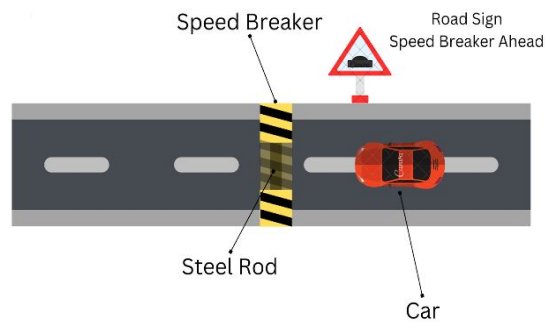


Figure 7. Top View of the Proposed Solution

III. CONCLUSION

In conclusion, the designed cross-circuit indicator system is a promising solution to reduce accidents associated with blind U-turns by offering timely alerts to drivers. It will not only solve the cost estimation and budget issue but will also help the drivers to be able to identify the parameters that are important in the prevention of accidents like enhanced visibility with an adaptive alert system. The proposed solution will help in decrement of accidents caused due to blind U-turns as well as blind spots effectively by 70%.

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