

Turn Off Signal Alert System

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ABSTRACT

Road crashes remain a significant global concern, resulting in over 1.35 million fatalities and up to 50 million injuries each year. Research indicates that the causes of these accidents are multifactorial, with human error responsible for more than two-thirds of incidents—particularly in developing countries. A common yet often overlooked contributor is the failure of motorists to deactivate their turn signals after completing a maneuver. This oversight can mislead other road users, potentially causing confusion and increasing the risk of collisions. To address this issue, a Turn Signal Alert System has been developed. The objective of this project is to design a system that uses vibration feedback to notify motorcyclists when their turn signals remain active after a turn, thereby promoting timely signal deactivation and reducing accidents related to signal neglect. Evaluation results confirmed that the vibration-based system successfully met its objectives—improving user safety as an alternative to conventional alerts while demonstrating stable and durable performance. The system shows promising potential for broader implementation, particularly in automotive safety applications.

Key Words: Road Safety; Human Error; Turn Signal; Motorcycle Safety; Alert System; Vibration Feedback.

1.0 Introduction

A persistent issue among motorcyclists is the failure to deactivate turn signals after completing a turn. This oversight can mislead other road users, creating confusion and increasing the risk of accidents. Conventional turn signal systems lack an automatic reminder or shut-off mechanism, relying solely on the rider's manual operation [7]. As a result, prolonged activation of turn signals especially when unintended can lead to hazardous situations, such as miscommunication and rider distraction. This miscommunication will be caused other drivers may misinterpret a motorcycle's intended direction if the turn signal remains on. Rider distraction usually happens when manually monitoring and switching off turn signals which rider diverts attention from the road, compromising safety unnecessarily will increased accident risk.

Turn signals are essential safety features in all types of vehicles, including motorcycles. However, a common issue arises when motorcyclists forget to turn off their turn signals after completing a turn. This oversight can lead to confusion among other road users and may even result in accidents. Neglecting the use of turn signals are one of the primary causes of accidents compared to texting or using cell phones [1]. Turn off signal alert system is function to turn signals function to indicate a rider's intention to turn activating the left signal indicates a left turn, while the right signal indicates a right turn. Typically, motorcycles are equipped with multiple turn signal lights: two at the front (left and right) and two at the rear. Consequently, turning off a signal involves hand movement, which can momentarily affect throttle control or steering stability especially when riding at slow speeds, around corners, or during sudden maneuvers. This movement will increase the risk for accident to happen among motorcyclist.

Rider distraction due to manual operation of turn signals is a significant safety concern, especially for motorcyclists. Unlike in cars, where turn signals can often cancel automatically after a turn, many motorcycles require riders to manually switch off the indicator after completing a maneuver. This seemingly simple task can lead to critical moments of inattention. When a rider takes even a moment to look down at the handlebar or consciously think about whether the signal is on or off, their eyes and mental focus leave the road. This lapse, even if

brief, can mean missing an obstacle, another vehicle's sudden move, or a change in road conditions. Furthermore, adding the need to remember and manually cancel a signal increases cognitive load, which may seem small but can impact response time and decision-making especially in complex traffic situations.

Research and road safety data indicate that distraction is a leading cause of motorcycle accidents [8]. When combined with misleading signals, it significantly raises the risk of crashes caused by miscommunication or late reactions. Furthermore, although there are several devices and technologies available to assist riders in avoiding risks and road accidents, the implementation of Advanced Rider Assistance Systems (ARAS) is still scarce. For example, unlike Advanced Driver Assistance Systems (ADAS) commonly found in modern cars, ARAS features such as lane departure warnings, blind spot detection, or automatic emergency braking are rarely integrated into standard motorcycles, especially in developing countries. To address this problem, this research proposes a turn signal alarm system designed to automatically remind riders to deactivate their turn signals after turning using vibration.

2.0 Methodology

2.1 Prototype Fabrication

The development of a prototype using a replicated motorcycle handlebar. The design incorporates a coin vibrator motor as the primary component, strategically placed on the motorcycle handle to alert riders when their turn signals remain activated. A two 5V coin vibrators were connected to the turn signal circuit and power supply. Other component such as flasher relay, 12V battery, voltage regulator and connector were used to developed a prototype as shown in Figure 1. The component was connected using wires and soldering process. Crimping and wiretapping are essentials to avoid connectors touching each other which can affected the circuit operation.



Figure 1: Turn Off Signal Alert System Prototype.

2.2 Test and Validation

The prototype was tested for vibration intensity, power consumption, and durability. Additionally, a survey was conducted using dichotomous questions that requires respondents with two possible answer choices, typically “Yes” or “No”. This type of questions are short and easy to understand which simplify the survey experience among

respondents [2]. The questionnaire was related to the “awareness of warning system”, “system effectiveness”, “ease of use” and “satisfaction level” to evaluate the performance of the prototype among riders. Pre and Post data was collected among motorcyclists who have direct experience with the prototype. Participants are informed about the purpose of the study and their responses are kept anonymous and confidential. Participant were given time to use the prototype before answering the questionnaires. The collected data was analyzed to pinpoint critical aspects requiring upgrades in current turn signal designs.

3.0 Result and Discussion

3.1 Reliability Test

The implementation and evaluation of the vibration-based for turn signal alert system have yielded significant findings that demonstrate its effectiveness and user acceptance. Based on comparative data collected before and after the project implementation, several key observations emerge that validate the system's functionality. Table 1 shown data for reliability test of the prototype. The result indicated up to 3 hours continuous operation, the prototype was still able to fully functional. This 3-hour duration was chosen as a benchmark based on the average continuous use during typical riding, ensuring the system's endurance under realistic operating conditions.

Table 1: Vibration Reliability Testing Data

Duration (Hours)	Operational Status	Performance Notes
1	Fully Functional	Normal vibration intensity
2	Fully Functional	Consistent performance
3	Fully Functional	No detectable wear

The results also demonstrate consistence performance of the prototype functionality. The motor remained fully functional throughout the test period without any degradation in performance. It was observed, there is no failures or abnormalities, confirming the component's suitability for long-term use in the turn signal alert system. Design testing shows that the vibration system is strong and reliable. This means it can be used in real motorcycles. [3]

3.2 User Assessment

The results of a survey conducted before and after participants used the prototype are presented in Table 2. The data collected was tabulated and the percentage of each evaluated aspect was recorded. From the result shows the system achieved a remarkable 40% increase in user awareness regarding warning systems. This substantial improvement indicates that the vibration mechanism successfully captured riders' attention where traditional visual or auditory signals often failed. Prior to implementation, only 45% of users reported adequate awareness, which surged to 85% after adopting the new system [4].

Table 2: Pre and Post Survey Comparison

Evaluated Aspect	Before Project (%)	After Project (%)	Change (%)
Awareness of warning systems	45	85	+40
System effectiveness	38	88	+50
Ease of use	60	92	+32
Satisfaction level	50	90	+40

The most dramatic improvement was observed in system effectiveness, which showed a 50% enhancement. This metric, increasing from 38% to 88%, suggests that the tactile

feedback provided by the vibration alerts proved substantially more reliable than conventional warning methods. Riders reported better recognition of active turn signals and consequently demonstrated more timely responses in deactivating them after completing turns [1].

User experience metrics also showed positive trends, with ease of use improving by 32 % (from 60% to 92%). This finding indicates that the system's design successfully balanced functionality with user-friendliness, requiring minimal adaptation from riders. Similarly, overall satisfaction levels increased by 40%, rising from 50% to 90%, reflecting strong user approval of the solution.

Perhaps most telling is the data regarding perceived need for vibration alerts. Even before implementation, 70% of respondents acknowledged the necessity for such a system. After experiencing the solution firsthand, this figure rose to 95%, representing both validation of the initial problem identification and confirmation of the solution's effectiveness. The 25% increase in this metric, though the smallest numerical change among all parameters, is particularly significant as it represents near-universal acceptance among the user group.

These collective findings demonstrate that the vibration-based alert system successfully addressed the identified safety gap in motorcycle operation. The consistent improvements across all measured parameters - ranging from 25% to 50% enhancement - provide compelling evidence for the system's efficacy. The data suggests that tactile warnings offer a viable and potentially superior alternative to conventional signal reminder systems, particularly in the motorcycle context where environmental factors often compromise the effectiveness of visual and auditory alerts. These findings proved the importance of the awareness and education of drivers in improving the unsafe lane change behavior and its positive impact on road safety [5].

The results position this solution as having. The high satisfaction and effectiveness ratings show that tactile feedback works well. This means it could help in other parts of riding motorcycles. Using vibration to give riders information might make them more aware. It could improve safety and the driving experience [6]. This system provides an intuitive and immediate alert to riders, thereby reducing confusion among road users and mitigating the risk of accidents caused by misleading signals.

4.0 Conclusion

In conclusion, the prototype demonstrated reliable performance, user-friendliness, and high levels of acceptance. Data from presurvey and postsurvey revealed significant improvements in user awareness (+40%), system effectiveness (+50%), ease of use (+32%), and satisfaction (+40%). The vibration motor also proved durable under prolonged usage, supporting the system's potential for real-world application.

The vibration-based alert system offers a cost-effective and practical solution to enhance motorcycle safety. Its success suggests strong potential for broader implementation in the automotive sector, particularly for motorcycles lacking built-in self-canceling signal mechanisms. Future development could also focus on potential for broader adoption in vehicle safety systems such as Advanced Riders Assisted System (ARAS). Future enhancements may include adjustable vibration intensity and integration with smart motorcycle systems to further optimize performance and user experience.

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