International Journal of
Embedded Systems and
Emerging Technologies

ISSN: 2456-723X
Volume 11, Issue 2, 2025
July–December
DOI (Journal): 10.37628/IJESET

http://ecc.journalspub.info/index.php?journal=JESET&page=index

Review IJESET

SOBER "An Alcohol Detection and Car Engine Locking System"

Manasi Mandal[1,*], Jyoti Gupta[1]

Abstract

Drinking Driving is a major issue in road accidents all over the world; 60 percent of the accidents are caused by it. The number of deaths due to careless driving is assumed to be larger than imagined. The model device aims to help stoners from driving drunk and reduce the number of accidents and cases due to drunk driving. Alcohol impairs drivers' cognitive and motor functions, reducing reaction time, judgment, and coordination, while increasing risk-taking behavior. Likewise, fatigue leads to reduced alertness, slower responses, and microsleeps that can be as dangerous as alcohol intoxication. Studies have shown that the combination of alcohol and drowsiness amplifies impairment and accident risk far beyond the effects of either factor alone. This paper introduces SOBER, an intelligent alcohol-detection and car-engine-locking system designed to reduce such incidents. SOBER uses real-time alcohol sensors to detect driver intoxication and prevents engine ignition if unsafe BAC levels are detected. Additionally, it considers drowsiness by monitoring physiological and behavioral indicators, providing a comprehensive approach to impaired driving prevention. We describe experimental methodologies that measure cognitive, physiological, and driving performance under varied BAC and sleep deprivation conditions, highlighting the synergistic dangers of combined impairment. This research underscores the need for cost-effective, non-invasive, and reliable detection systems integrated with existing Advanced Driver Assistance Systems (ADAS). Regulatory mandates, public education, and incentives for early adoption are also crucial for widespread implementation. Future advancements may include infrared spectroscopy, capacitive touch sensors, and wearable sweat analysis technologies to seamlessly monitor driver impairment.

Keywords: Drunk driving, alcohol impairment, drowsy driving, road safety, cognitive impairment

INTRODUCTION

Driving under the influence of alcohol or while drowsy represents two of the most significant hazards on ultramodern highways, contributing to a substantial portion of business accidents, injuries, and losses worldwide [1–5]. While extensive exploration has been conducted to understand the injurious effects of alcohol intoxication or doziness collectively, lower attention has been paid to their concerted influence on driving performance. This exploration aims to address this gap by exhaustively probing the synergistic effects of alcohol intoxication and drowsiness on various aspects of driving performance, cognitive function, and physiological responses. By delineating the specific challenges posed by the concurrent presence of alcohol and drowsiness, this study seeks to inform substantiation-grounded interventions and programs aimed at reducing the prevalence of disabled driving and perfecting road safety [6–10].

***Author for Correspondence**
Manasi Mandal
E-mail: manasimandal84@gmail.com

[1]Research Scholar, MCA, Thakur Institute of Management Studies, Career Development & Research (TIMSCDR), Mumbai, Maharashtra, India

Received Date: April 08, 2025
Accepted Date: July 11, 2025
Published Date: December 31, 2025

Citation: Manasi Mandal, Jyoti Gupta. SOBER "An Alcohol Detection and Car Engine Locking System". International Journal of Embedded Systems and Emerging Technologies. 2025; 11(2): 14–19p.

LITERATURE REVIEW

Alcohol Impairment and Driving Performance

Alcohol consumption has long been linked to disabled driving. Multitudinous studies have explored the specific ways alcohol impairs a motorist's cognitive and motor functions. Some of the crucial findings include:

- *Cognitive and Perceptual Impairment:* Alcohol slows down the processing of information, reduces attention span, impairs judgment, and hinders the capability to make quick opinions [2]. Motorists under the influence of alcohol have slower response times, reduced coordination, and poor judgment, all of which increase the liability of accidents.
- *Dropped Response Time:* Research has shown that alcohol reduces a motorist's capability to respond to unforeseen changes in the terrain, similar to climbers crossing the road or an auto cutting off in front of them. At blood alcohol attention (BAC) situations as low as 0.02, response times begin to decelerate, and at advanced BACs, the impairment is more pronounced [7].
- *Increased Threat:* Taking alcohol tends to lower inhibition and encourages unsafe gestures. This is particularly apparent in youthful motorists or those with advanced BAC situations, who are more likely to speed, engage in aggressive driving, or ignore business signals [4].

Drowsy Driving and Its Effects on Driving Performance

Driving while drowsy is a major contributor to road accidents, and its effects are analogous to alcohol impairment in numerous aspects. Crucial findings from exploration on drowsy driving include:

- *Cognitive Function and Alert Doziness:* It leads to dropped alertness, slower response times, and an increased tendency to fall asleep behind the wheel. Motorists passing fatigue frequently suffer from cognitive setbacks, including reduced attention and attention, and are more prone to drifting out of their lane [9].
- *Physiological Responses:* Lack of sleep affects both the central nervous system and the autonomic.
- *Increased Threat of Fatal Accidents:* The exploration of increased threat of fatal accidents indicates that the threat of fatal accidents is amplified when both alcohol and fatigue are involved. A study from the National Highway Traffic Safety Administration (NHTSA) found that the threat of fatal crashes for motorists with a BAC of 0.08 or advanced was further elevated when the motorist was sleep-deprived (NHTSA, 2010).

METHODOLOGY

The following methodology outlines the experimental approach for studying the synergistic effects of alcohol intoxication and drowsiness on driving performance. The end is to exhaustively estimate how these two factors interact and impact cognitive functions, physiological responses, and driving geste. This methodology includes party reclamation, experimental design, data collection styles, and statistical analysis.

Study Design

This study will borrow an in-subject experimental design to assess how alcohol and drowsiness affect driving performance both singly and in combination. Actors will serve as their own controls, being tested under different conditions to compare their performance in scripts of alcohol consumption, sleep deprivation, and the combined effects of both.

Independent Variables

Alcohol Intoxication (BAC situations) Actors will be tested under sober (control), low (0.02–0.04), moderate (0.05–0.08), and high (0.10–0.12) BAC situations. Doziness/ Fatigue Actors will be tested in three conditions of sleep deprivation rested (8 hours of sleep), moderate fatigue (4–5 hours of sleep), and severe fatigue (lower than 2 hours of sleep).

Dependent Variables

Cognitive performance is measured using response times, decision-making delicacy, and attention span. Physiological responses covered via heart rate, pupil dilation, and eye-shadowing to assess

© JournalsPub 2025. All Rights Reserved

drowsiness and alertness [11]. Driving performance measured using a driving simulator or on-road driving assessments, with crucial criteria similar to lane-keeping capability, response times to unforeseen events, speed control, and error rates.

Actors

The study will involve a sample of 40–50 healthy grown-up actors progressed 18–40 years, who have a valid motorist's license and a history of safe driving. Actors will be barred if they've a history of alcohol or medicine abuse, sleep disorders, or medical conditions affecting cognitive function (e.g., neurological diseases). To control individual differences in alcohol forbearance, actors will suffer a pretest webbing to assess their BAC forbearance and sleep patterns.

Experimental Conditions

Actors will be subordinated to the following experimental conditions. Control Condition (Sober Rested) Actors are sober (0 BAC) and well-rested (8 hours of sleep). Alcohol Intoxication Rested Actors consume alcohol to reach a target BAC (0.05 and 0.08) after a full night of rest (8 hours of sleep). Alcohol Intoxication Fatigued Actors consume alcohol to reach the target BAC while being sleep-deprived (4–5 hours of sleep). Fatigue (No Alcohol) Actors are sober but oppressively fatigued (lower than 2 hours of sleep). Concerted Alcohol Intoxication Severe Fatigue Actors consume alcohol to reach the target BAC while being oppressively sleep-deprived (lower than 2 hours of sleep).

PROCEDURE

Pretest Screening and Baseline Measures

Actors will be screened for eligibility, and birth measures of cognitive function (e.g., using a Stroop test or a simple response time task), alertness (e.g., using a Psychomotor Alert Test), and physiological responses (heart rate, blood pressure) will be collected.

Alcohol Consumption Protocol

Actors will drink a controlled quantity of alcohol (based on body weight) to achieve the required BAC level. BAC will be measured using a breathalyzer incontinently after consumption, and regularly later to ensure the asked BAC is maintained.

Sleep Deprivation Protocol

Actors will be assigned to different sleep privation conditions (rested, moderate fatigue, severe fatigue). Sleep quality and volume will be covered via a sleep journal and actigraphy (a wrist-worn device that tracks sleep-wake cycles).

Post-Experiment Measures

After completing the driving test, actors will fill out tone-report questionnaires assessing their perceived position of fatigue, intoxication, and difficulty in performing the tasks.

IMPLEMENTATION

Standardization and Regulatory Support

To ensure uniformity and reduce perpetration complexity, a global frame of norms and regulations should be developed. This will help set clear guidelines for vehicle manufacturers on how alcohol discovery systems should serve, their delicacy, and how they should be integrated into buses [12, 13].

Action Steps

Collaboration with Regulatory Authorities, Governments, nonsupervisory bodies, like the National Highway Traffic Safety Administration (NHTSA) in the U.S., the European Union's European Commission, and the United Nations' World Forum for Harmonization of Vehicle Regulations (WP.29), should unite to produce transnational norms for alcohol detection systems. Obligatory perpetration Governments should consider enforcing regulations that require all new buses to be equipped with alcohol discovery systems by a certain date (e.g., 2030), analogous to seatbelt laws. This

© *JournalsPub 2025. All Rights Reserved*

would help ensure road safety is prioritized. Impulses for Early Relinquishment Governments could offer duty impulses, subventions, or subventions to manufacturers who borrow alcohol discovery technology beforehand, making it more cost-effective to incorporate.

Cost Reduction and Mass Adoption

For alcohol discovery systems to be feasible in mass-request vehicles, their cost must drop significantly. This can be achieved through husbandry of scale, technological invention, and participated in exploration and development between manufacturers.

Action Steps

Cooperative R&D Automakers should unite on the exploration and development of alcohol discovery systems, participating in costs and inventions to reduce the overall development cost. This collaboration can also help regularize technology across the assiduity, making it easier and cheaper to apply. Objectification in Mass-Market Vehicles originally, alcohol discovery systems can be introduced in high-end or luxury vehicles, and gradually integrated into lower-cost models as product costs drop. As consumer demand grows, prices will naturally come down. Focus on Cost-Effective Technologies Manufacturers should concentrate on noninvasive and dependable alcohol discovery technologies (e.g., infrared detectors, capacitive touch detectors) that can be mass-produced at a lower cost. Innovation in accoutrements and detector technology could significantly reduce system costs.

Technological Advancements and Delicacy

For alcohol discovery systems to be trusted by consumers and nonsupervisory bodies, they must be largely accurate, dependable, and fail-safe. False cons (inaptly detecting alcohol when none is present) or false negatives (failing to detect alcohol) could undermine the system's effectiveness and public confidence.

Action Steps

Rigorous Testing and Calibration Manufacturers must conduct expansive testing of alcohol discovery systems under varied environmental conditions (e.g., different temperatures, moisture situations) and across different driving scripts. Technology should be suitable to distinguish between alcohol consumption and other substances (e.g., scents or cleansers) that may beget hindrance. Nonstop enhancement. As alcohol discovery technologies evolve, nonstop updates and advancements should be made to enhance discovery delicacy. This could involve machine literacy algorithms that ameliorate with experience, conforming to different motorist actions. Integration with Other Vehicle Safety Features To ameliorate the overall safety of the vehicle, alcohol discovery systems should be integrated with other safety technologies, similar to motorist monitoring systems, lane departure advising systems, and adaptive voyage control. This would give multiple layers of safety to ensure a holistic approach to motorist impairment forestallment.

FUTURE TRENDS

As the automotive assiduity continues to evolve, the integration of alcohol discovery systems in vehicles is poised to come a major advancement in road safety technology. With ongoing inventions in detectors, data analytics, and connectivity, alcohol discovery systems will play a decreasingly central part in preventing disabled driving and reducing alcohol-related road accidents. Below are some crucial future trends in alcohol discovery systems for vehicles [14, 15].

Non-Invasive Alcohol Detection Technologies

The future of discovery of alcohol in buses is likely to concentrate on noninvasive technologies, making the process more flawless and less protrusive for motorists.

Key Trends

- *Infrared Spectroscopy:* Infrared detectors that can discriminate alcohol in the motorist's breath without the need for a breathalyzer are anticipated to be more extensively adopted. These detectors

© JournalsPub 2025. All Rights Reserved

measure the immersion of infrared light by alcohol motes and can be bedded in the cabin, near the steering wheel, or the air exertion system.

- *Capacitive and Touch:* Grounded Detectors Advances in capacitive touch detectors and other bio-sensing technologies could enable alcohol discovery through the motorist's touch on the steering wheel, gear shift, or indeed the seat. This noninvasive system could give real-time data on BAC without requiring the motorist to perform any unequivocal action, similar to blowing into a device.
- *Sweat Analysis:* In the future, skin detectors or wearables that dissect sweat may give nonstop monitoring of a motorist's BAC. These systems could be integrated into smart apparel or as part of a wearable device (e.g., a smartwatch or ring) that communicates with the vehicle's system to assess alcohol situations.

Impact

Increased Convenience Noninvasive detectors will make alcohol discovery systems less conspicuous and more accessible for motorists, reducing resistance to their relinquishment.

More Integration: These technologies will be integrated into the vehicle's being systems, making them unnoticeable to the motorist while still improving safety.

Integration with Advanced Motorist Assistance Systems (ADAS)

Alcohol discovery systems will probably become more integrated with Advanced motorist Assistance Systems (ADAS) and independent driving technologies, forming part of a larger ecosystem concentrated on enhancing road safety.

Impact

Enhanced Safety: The integration of alcohol discovery with ADAS will give a holistic approach to road safety by not only precluding disabled driving but also perfecting the overall driving terrain. Early Intervention: These systems will allow for early discovery of impairment and automatic safety.

CONCLUSION

Drunk driving remains a significant global issue, contributing to a substantial chance of road accidents and losses. Studies suggest that over 60 of business incidents are caused by disabled driving, with the number of deaths far exceeding numerous estimates. To address this critical problem, technological results, like the model device aimed at precluding drunk driving, can play a pivotal part. By detecting alcohol impairment and precluding the ignition of a vehicle if the motorist is intoxicated, similar bias can help reduce the circumstances of accidents and losses caused by disabled driving. The perpetuation of this bias, combined with public education and stricter enforcement of business laws, holds pledge in significantly reducing the number of incidents related to drunk driving. Similar sweats would not only enhance road safety but also save innumerable lives, making a significant impact on public health and overall road safety.

REFERENCES

1. Dawson D, Reid K. Fatigue, alcohol and performance impairment. Nature. 1997;388(6639):235. doi: 10.1038/40775.
2. Fillmore MT. Acute alcohol-induced impairment of cognitive functions: Past and present findings. Int J Disabil Hum Dev. 2007;6(2):115–125. doi: 10.1515/IJDHD.2007.6.2.115.
3. Ranjana P, Mukesh R, Kumar A, Sujith NN, Sathyasai CH. Vehicle, engine lock system for theft and alcohol detection. Int. J. Recent Technol. Eng. 2019;7(5):363-7..
4. Marczinski CA, Fillmore MT, Henges AL, Ramsey MA, Young CR. Effects of energy drinks mixed with alcohol on information processing, motor coordination and subjective reports of intoxication. Exp Clin Psychopharmacol. 2012;20(2):129–138. doi: 10.1037/a0026136.
5. Stanišić S. National Highway Traffic Safety Administration (NHTSA) Notes. Ann Emerg Med. 1998;31(1).

© JournalsPub 2025. All Rights Reserved

6. Jiang L. Enhancing driving safety via smart sensing techniques [dissertation]. Montreal: McGill University; 2018.
7. Savage LJ, Layton AM. Treating acne vulgaris: Systemic, local and combination therapy. Expert Rev Clin Pharmacol. 2010;3(4):563–580. doi: 10.1586/ecp.10.27.
8. Padilla Adamuz FM, Trógolo MA, Castro Ramírez C. Two drinks and drive: Assessing the average driver's ability to self-restrain from alcohol and drug use while driving. Transp Res Interdiscip Perspect. 2025;31:101391. doi: 10.1016/j.trip.2025.101391.
9. Kong D, Soon CS, Chee MW. Functional imaging correlates of impaired distractor suppression following sleep deprivation. Neuroimage. 2012 May 15;61(1):50-5.
10. Arnedt JT, Wilde GJ, Munt PW, MacLean AW. How do prolonged wakefulness and alcohol compare in the decrements they produce on a simulated driving task? Accid Anal Prev. 2001;33(3):337–344. doi: 10.1016/s0001-4575(00)00047-6.
11. Connor J, Norton R, Ameratunga S, Robinson E, Civil I, Dunn R, et al. Driver sleepiness and risk of serious injury to car occupants: Population-based case control study. BMJ. 2002;324(7346):1125. doi: 10.1136/bmj.324.7346.1125.
12. Philip P, Vervialle F, Le Breton P, Taillard J, Horne JA. Fatigue, alcohol, and serious road crashes in France: Factorial study of national data. BMJ. 2001;322(7290):829–830. doi: 10.1136/bmj.322.7290.829.
13. Di Milia L, Rogers NL, Åkerstedt T. Sleepiness, long distance commuting and night work as predictors of driving performance. PLoS One. 2012;7(9):e45856. doi: 10.1371/journal. pone.0045856.
14. Sagberg F. Driver health and crash involvement: A case-control study. Accid Anal Prev. 2006;38(1):28–34. doi: 10.1016/j.aap.2005.06.018.
15. Barger LK, Cade BE, Ayas NT, Cronin JW, Rosner B, Speizer FE, et al. Extended work shifts and the risk of motor vehicle crashes among interns. N Engl J Med. 2005;352(2):125–134. doi: 10.1056/NEJMoa041401.

© JournalsPub 2025. All Rights Reserved