International Journal of Reconfigurable and Embedded Systems (IJRES)
Vol. 13, No. 2, July 2024, pp. 278~285
ISSN: 2089-4864, DOI: 10.11591/ijres.v13.i2.pp278-285

Design and implementation of an alcohol detection driver system

Oluwaseyi Omotayo Alabi[1], Oyetunde Adeoye Adeaga[2], Sunday Adeola Ajagbe[3,4], Esther Oluwayemisi Adekunle[5], Matthew Olusegun Adigun[3]
[1]Department of Mechanical Engineering, Lead City University, Ibadan, Nigeria
[2]Department of Mechanical and Mechatronics Engineering, First Technical University, Ibadan, Nigeria
[3]Department of Computer Science, University of Zululand, Kwadlangezwa, South Africa
[4]Department of Computer Engineering, First Technical University, Ibadan, Nigeria
[5]Federal Polytechnic Ile-Oluji, Ile-Oluji, Nigeria

Article Info

Article history:

Received May 12, 2023
Revised Sep 1, 2023
Accepted Sep 17, 2023

Keywords:

Alcohol
Breathalyzers
MQ-3 sensor
Output voltage
Technology

ABSTRACT

A technology called an alcohol detection driver system is used to stop drunk driving by identifying alcohol in a motorist's breath or blood. This technology correctly measures the amount of alcohol a driver has in their system using sensors and algorithms, and it stops the car from starting if the amount is more than the legal limit. The number of fatal accidents and traffic fatalities caused by drinking could be greatly decreased thanks to this technology. The main focus of this project is to carry out the experiment in lowering the number of alcohol-related incidents on the road. Alcohol detection devices come in a variety of forms right now, including ignition interlocks, passive alcohol sensors, and in-car breathalyzers. Although these systems have reduced the number of drunk driving accidents, there remain questions about their efficiency, dependability, and cost. According to the sensor's specs, the output voltage of the MQ-3 sensor reduces by 69% during the sensor's recovery period of 30 seconds at 69% of baseline resistance. To assess the long-term viability and efficiency of these systems in lowering alcohol-related accidents and enhancing traffic safety, more research is required.

This is an open access article under the CC BY-SA license.

Corresponding Author:

Sunday Adeola Ajagbe
Department of Computer Engineering, First Technical University
Ibadan, Nigeria
Email: saajagbe@pgschool.lautech.edu.ng

1. INTRODUCTION

Drinking and driving continues to be a leading cause of road accidents and fatalities worldwide, alcohol detection for drivers has been a subject of study for many years. With the aim of lowering the prevalence of drunk driving and raising road safety, numerous techniques have been developed and are employed to detect alcohol levels in drivers [1]. The national highway traffic safety administration (NHTSA) reports that 28% of all traffic-related deaths in the US occurred as a result of drunk driving in 2019. This corresponds to one fatality caused by alcohol every 52 minutes on average [1]. Similarly, according to the European Commission, about 10,000 fatalities in the European Union occur each year as a result of alcohol-related accidents. Alcohol-related traffic accidents are a major public health issue, and studies have shown that even small amounts of alcohol can make it difficult to drive safely and raise the likelihood of an accident. The world health organization (WHO) estimates that 25% of all traffic fatalities globally are caused by alcohol-related incidents [2]. Alcohol-related accidents not only result in a high death toll but also huge economic losses such as medical expenditures, lost productivity, and property damage [2].

The mistakes of drivers, and human factors affected by fatigue, alcohol, recklessness or carelessness are the main factors associated with the most accidents. In order to combat the problem of drunk driving, many nations have established legal blood alcohol concentration (BAC) limits. The legal limit is typically 0.08% BAC or less, though there are some regional variations. In addition, several nations now have regulations requiring drivers who are suspected of driving under the influence to submit to an alcohol test. The most popular alcohol detection tool for drivers is the breathalyzer. These tools measure a person's breath alcohol content, which is a good indicator of how much alcohol is in their blood. Breathalyzers are a popular option for law enforcement agencies because they are portable and generally simple to use [3], [4]. Another technique for detecting alcohol is blood testing, which entails taking a suspect's blood and determining the level of alcohol in it. Although this method is more precise than breath testing, it also requires more intrusive procedures and specialized tools. Other biological materials, such as saliva and sweat, have also been investigated by researchers as potential tools for detecting alcohol in drivers. These procedures might be less invasive than blood tests and simpler to use in the field.

One of the most significant elements that has an impact on traffic safety is driver behavior. As a result, current research has focused on systems for tracking and identifying driver behavior. Others monitor the driver's status by combining the driver's behavior, vehicle's condition, and environment [5], [6]. Some systems monitor the driver's behavior in isolation. Nearly all driver behavior monitoring systems only pick up on one abnormal behavior (Carmona), whereas only a small minority pick up on multiple abnormal behaviors [5]. However, there is presently no reliable monitoring system that can reliably identify all unusual driving behaviors. It is not advised for a drunk individual to operate a vehicle [7]. Drunk driving affects one's temperament and impairs one's ability to anticipate oncoming traffic and hazards. 10,000 more people die in accidents each year across Europe. Road accidents in China are only caused by drunk drivers in 34.1% of cases. Legally, BAC between 0.01% and 0.08% are acceptable. However, exceeding the top limit of 0.08% may result in serious accidents [2].

In recent years, there has been increasing interest in using technology to detect alcohol impairment in drivers. This includes the use of sensors and cameras to detect physical signs of impairment, as well as the use of machine learning algorithms to analyze driving patterns and detect deviations from normal driving behavior. Many researchers have focus on similar work in past decades, the "Driver alcohol detection system based on virtual instrumentation" proposal by Gasparesc [3]. Ahmad *et al.* [8] proposed an alcohol detection and alerting system for vehicles that can detect the presence of alcohol in the driver's breath and warn them if they are over the legal limit. The system's hardware and software components are described by the authors, who then use simulation and real-world testing to assess the system's performance. A system that can detect alcohol in a driver's breath and prohibit the car from starting if the driver is above the legal limit is described in "Drunk driving detection based on classification of multivariate time series" [9], [10]. The system's hardware and software components are described by the authors, who then use simulation and real-world testing to assess the system's performance.

In 2017, a compelling study was published on the detection of drunk drivers through alcohol sensors integrated into car engine locking systems. This innovative technology aims to prevent intoxicated individuals from operating a vehicle and potentially endangering themselves and others on the road [11], [12]. The authors go over the many interlock system types and their features, as well as the crucial elements that must be taken into account for a successful deployment, such as stakeholder participation, policy, and legal considerations. Ansari *et al.* [13] proposed "In-vehicle wireless driver breath alcohol detection system using a microheater integrated gas sensor based on Sn-doped CuO nanostructures". This paper examines current developments in breath-based and sweat-based alcohol biosensors for in-vehicle detection. The authors talk about the drawbacks and shortcomings of these technologies and point out areas for further research and commercialization. In their study of the literature on the implementation of ignition interlock programs for criminals, [14] identified both facilitators and impediments. The authors outline the critical aspects of program success, including program design, stakeholder involvement, and public awareness campaigns, and offer suggestions for removing implementation roadblocks. The creation of a system for detecting alcohol. The authors of performance comparison of deep convolutional neural network (CNN) models for detecting driver's distraction [15], [16] employ machine learning techniques using a dataset of breath alcohol content readings to train and test the system. They then assess the system's performance using a range of metrics. The design and development of a portable alcohol detection device for drivers of motor vehicles that can be quickly integrated into the dashboard of the vehicle are presented by [17], [18].

The authors describe the hardware and software components of the system and evaluate its performance using simulation and real-world testing. A summary of the developments and difficulties in technology for detecting drunk driving, including those used in car alcohol detection systems. The authors examine the various detection technologies that are now available, highlighting their advantages and disadvantages as well as difficulties in their adoption and application. Provide a review of the adoption and use of alcohol ignition interlock regulations in the US, which mandate that drivers convicted of driver utility installer (DUI) install alcohol-detecting equipment in their cars [19], [20]. The authors evaluate the effectiveness of these laws in reducing DUI recidivism and discuss challenges to their implementation and enforcement. There are some studies about vehicle accident and alcohol detection system [3], [21], [22], they assess the precision and accuracy of a breathalyzer intended for use in automobiles. The performance of the system is assessed through a series of experiments by the authors, who also compare it to other commercially available systems. The goal of this study is to identify intoxicated driving and arouse both the driver and the passengers with alert signals.

2. RESEARCH METHOD

To make sure the technology is efficient, dependable, and secure, the technique for technology development in alcohol detection for drivers entails a rigorous process of design, testing, and validation. To develop novel and useful methods for identifying alcohol impairment in drivers, a multidisciplinary approach combining engineering, science, and user-centered design is necessary. It is suggested that an appropriate method be used to monitor both traffic accidents and blood alcohol content. A whistle sound and information about the presence of alcohol are sent to thing speak through the internet by the MQ-3 sensing module. The device uses vibration sensors to identify accident victims and then notifies surrounding hospitals and sends alert messages to them [7].

2.1. Hardware implementation

The MQ03 sensor, NodeMCU, and Arduino implementation entail wiring up the hardware parts, creating code to read the sensor's output, calibrating the sensor, and testing the implementation to make sure everything is operating as it should. The development of low cost alcohol detection systems for uses like breathalyzer tests or alcohol ignition interlocks may benefit from this kind of implementation [23], [24]. This system's technology automatically recognizes drunk driving and traffic incidents. The MQ-3 sensor will emit a whistle when alcohol is present and send the measurement information to thing speak over the internet. The device uses vibration to identify accident victims. Additionally, it sends out alerts and leads users to the nearest hospitals. One crucial issue that is taken into account during the process is whether the choice of hardware components corresponds to the project's overall budget. For the processing system, there are several choices. Nevertheless, embedded systems are now more capable of successful execution due to their low cost, small size, and, most importantly, their capacity to carry out vital jobs. The market today offers a wide variety of microcontrollers. Nevertheless, NodeMCU and Arduino were carefully picked since they have all of the necessary setups for this plan, such as an analog-to-digital converter, wireless communication modules (Bluetooth and WiFi), and the necessary number of digital outputs [25]–[27].

Standard sensors like the vibrator sensor and MQ-3 sensor are required for recording vibration sensing for accident detection and alcohol sensing. The MQ-3 uses the I2C interface to communicate with the sensor module and can detect gases such as H2, alcohol, and liquefied petroleum gas (LPG); however, it is most commonly referred to as an alcohol sensor. When it comes to the alarm system, several light emitting diodes (LEDs) as well as buzzers are utilized to alert people: when an accident happens or if alcohol content is detected, it notifies with a buzzer sound, and when a system problem occurs.

2.2. Software implementation

By boosting the accuracy of detecting intoxicated drivers and protecting the lives of automobile occupants in the case of an accident, the interface is designed to be unobtrusive. User input is not necessary. For instance, it is simple to increase alcohol detection by integrating the MQ-3 alcohol sensor with the vehicle ignition system. Accident detection in an automobile is readily accomplished with a global system for mobile communication (GSM) module and a global positioning system (GPS) module. Every time a situation is produced by a car crash or collision from any viewpoint, the technology sends a message to the nearby 108 (ambulance) service center with the accident location. The prototype's interaction with the user and how each of its key capabilities fits into the main process loop are shown in the flowchart (Figure 1), and the system's basic operation is shown in Figure 2, respectively.

2.3. Implementation of the system in a vehicle

The system was designed to be installed in a car in such a way that a 12-volt battery was used to power the system via the ignition switch, much as the radio in the car is powered. The voltage regulator LM7805 was used to step down the 12-volt to the 5-volt that the Arduino required, and a copper heat sink was linked to the voltage regulator to prevent system overheating. The Arduino board received 5-volt of power, and the Vero board or printed circuit board (PCB), liquid crystal display (LCD), and MQ-3 alcohol sensor were connected to them. To detect the presence of alcohol in the drivers' breath, the MQ-3 gas sensor was installed in the steering wheel. The LCD was placed close to the dashboard so that the driver and passengers could see if alcohol was being detected. In order to activate an emergency light once alcohol is detected and alert adjacent motorists, an output signal was extracted from one of the digital pins of the Arduino and attached to the emergency switch. When alcohol was found, a buzzer was installed in the car and connected to an Arduino digital pin so that it would sound an alarm. When alcohol is found, a killer switch made of a 12-volt automotive relay is utilized to cut off power to the fuel pump. The automotive relay was connected to the 12-volt supply in the circuit or to any location where 12-volt could be tapped in the car (pin 85). The relay signal pin (pin 30) was connected to one of the digital pins of the Arduino, while pins 87 and 86 served as the output killer switches and were connected to the fuel pump and ground, respectively. This stopped the car from stopping suddenly while it was moving. The automotive relay pin diagram and connection were shown in Figures 3 and 4 accordingly.

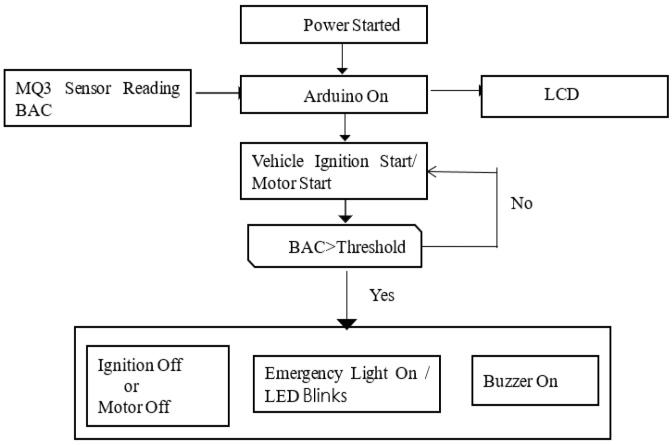

Figure 1. Flowchart diagram

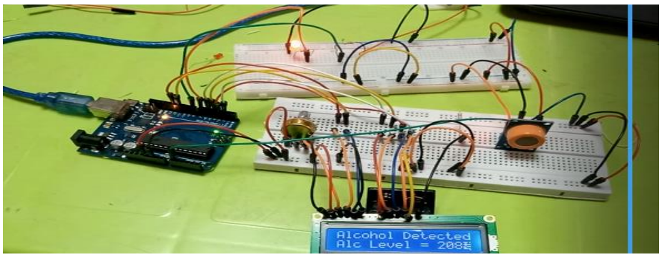

Figure 2. Led display alcohol

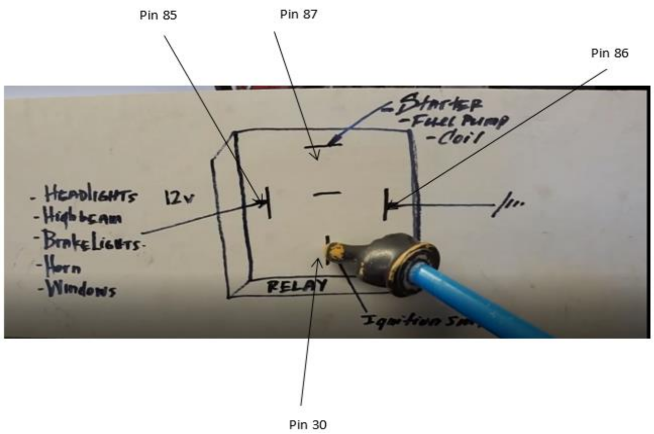

Figure 3. Automotive relay diagram

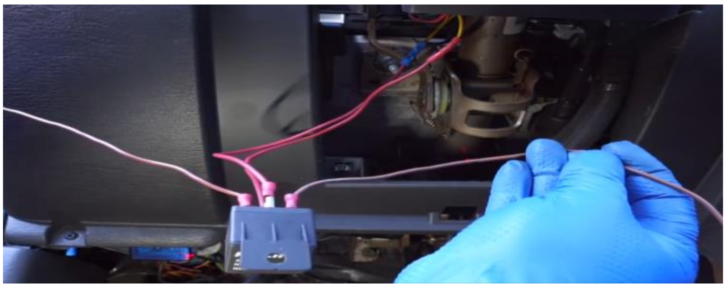

Figure 4. Automotive relay connection

3. RESULTS AND DISCUSSION
3.1. Alcohol sensor testing

Periodic estimation of the alcohol detector is necessary; this involves a laborious process and precious outfit relating detector readings with BAC values attained from a breath analyzer, is a better result for a low cost detector. The breathalyzer, also appertained to as a breath analyzer, is an electronic measuring tool designed to calculate BAC using a sample of the stoner's breath. They're accessible and movable, the stoner is guided through each phase of the breath alcohol test by buzzer sounds, textbook dispatches displayed on the screen, and LED status pointers. Also, breathalyzer tests are non-invasive, quick, precise, and easy, and they yield findings right down. These tools are thus constantly employed marketable breathalyzer hanwey AT8060 as shown in Figure 5 is employed in this study to assess the MQ-3 detector alcohol content [3].

Figure 5. Breathalyzer hanwey AT8060 [3]

The temperature and moisture affect an alcohol detector's delicacy. Also, the detector should be preheated for over 24 hours before operation, according to the manufacturer. The demanded time for the detector to reach the birth resistance is generally referred to as the "burn-in process" for gas detectors. By furnishing constant measures, it improves detector stability. A preheating procedure is also done before each test if the detector isn't incontinently employed (the marketable breathalyzer has an important shorter preheating period of 10 s). The data sets ("data-set-detector") attained from multiple tests using the MQ-3 alcohol detectors at room temperature (23 °C), a direct retrogression line ("BAC-data-fit-detector"), and the results are shown in Figure 6. Each dimension was carried out three times, and the average value attained was taken into consideration. Prior to the test, two levies were instructed to gormandize for many hours.

The breathalyzer revealed that each person's original BAC value was zero. The first drink was also drunk by the subjects. The potables included colorful serving sizes of 5-alcohol beer, 12-alcohol wine, and 30-alcohol liqueur. The breathalyzer was used to check the BAC at 15 after the drink was completed. The cases handed out exhalations lasting roughly 40 seconds so that the MQ-3 detector could determine the applicable affair voltage. The difference between the maximum attenuation voltage and steady-state value was also measured and essential gas detector parameter has recovery time of 30 s. The quantum of time demanded for a detector to return to its birth resistance in clean air following an alcohol exposure is known as the alcohol recovery time [3]. The MQ-3 detector boasts a fast recovery time of 30 s after exposure to alcohol, while its resistance drops to 69 during this period. This performance aligns with the detector's specifications and the affair voltage must first reach its starting value before the coming test, however, which takes further time.

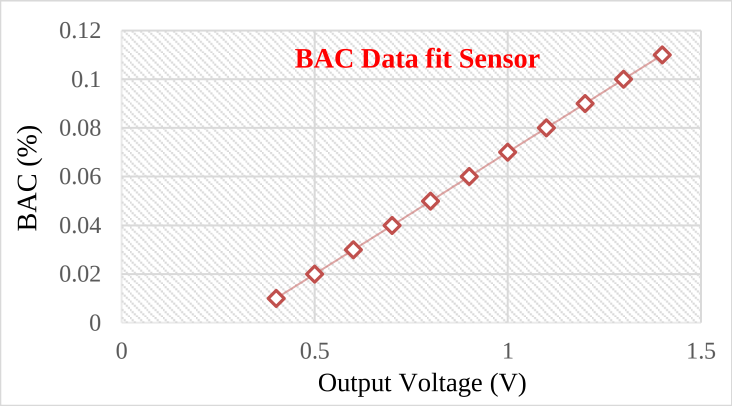

Figure 6. BAC data fit sensor and output voltage

3.2. Experimental results

Devices called breathalyzers analyze a person's breath to determine their BAC level. Normally, these gadgets are calibrated to give a precise BAC reading of +/- 0.01% BAC or less. However, various variables, such as the subject's breathing patterns, the device's calibration, and the presence of substances that can tamper with the alcohol measurement, might alter the accuracy of breathalyzer readings. Table 1 lists the relative BAC measurement errors based on breathalyzer and alcohol sensor readings. The highest possible inaccuracy is about 35%. Although this is a significant value, it is comparable to a cheap breathalyzer. The low accuracy can be improved by lowering the BAC threshold.

Table 1. BAC measurement results

BAC (%)	BAC breathalyzer (%)	BAC threshold (%)
0.0212	0.0201	1.39
0.0208	0.0220	5.04
0.0301	0.0250	4.00
0.0326	0.0410	35.059
0.0294	0.050	3.04
0.0702	0.0690	6.01
0.0695	0.0802	5.990

4. CONCLUSION

In conclusion, technologies to identify drunk driving, a significant contributor to crashes and fatalities on the road, have been established. These systems employ a variety of technologies, including touch-based sensors and breath analysis. According to research, alcohol detection driver systems are effective at lowering the frequency of drunk driving-related collisions and fatalities. However, several of the technologies are still in the experimental stage, and more testing and assessment are required to ascertain their viability in practical settings. The study built a prophylactic gadget to detect drunk driving and carried out an experiment. According to the sensor's specs, the output voltage of the MQ-3 sensor reduces by 69% during the sensor's recovery period of 30 s at 69% of baseline resistance. Additionally, there are still several issues that need to be resolved, including the cost of implementation, privacy concerns, and the accuracy and dependability of the systems. Despite these difficulties, alcohol detection systems have a lot to offer and could be a key factor in lowering the number of alcohol-related incidents on the road.

ACKNOWLEDGEMENTS

Author the acknowledge the support of the University of Zululand, Kwadlangezwa, South Africa on this project.

REFERENCES

[1] M. Willis *et al.*, "Driver alcohol detection system for safety (DADSS)-pilot field operational tests (PFOT) vehicle instrumentation and integration of DADSS technology," *NHTSA 26th ESV Conference*, Eindhoven, Netherlands, Jun. 2019, pp. 1–8.

[2] C. M. Farmer, "Potential lives saved by in-vehicle alcohol detection systems," *Traffic Injury Prevention*, vol. 22, no. 1, pp. 7–12, Jan. 2021, doi: 10.1080/15389588.2020.1836366.

[3] G. Gasparesc, "Driver alcohol detection system based on virtual instrumentation," *IFAC-PapersOnLine*, vol. 51, no. 6, pp. 502–507, 2018, doi: 10.1016/j.ifacol.2018.07.110.

[4] W. Bin, "A method of detecting driver's alcohol concentration," *Journal of Physics: Conference Series*, vol. 1314, no. 1, Oct. 2019, doi: 10.1088/1742-6596/1314/1/012073.

[5] H. Wakana and M. Yamada, "Portable alcohol detection system for driver monitoring," in *2019 IEEE SENSORS*, Montreal, QC, Canada: IEEE, Oct. 2019, pp. 1–4, doi: 10.1109/SENSORS43011.2019.8956885.

[6] O. Yadav and D. Alli, "Drowsiness and alcohol detection system," *Compliance Engineering*, vol. 11, no. 10, pp. 294–300, 2020.

[7] M. Anthony, R. Varia, A. Kapadia, and M. Mukherjee, "Alcohol detection system to reduce drunk driving," *International Journal of Engineering Research & Technology*, vol. 9, no. 3, pp. 360–365, Feb. 2021, doi: 10.17577/IJERTCONV9IS03077.

[8] I. Ahmad, M. F. Suhaimi, and N. A. N. Yusri, "Development of alcohol sensor detector with engine locking system for accident prevention," *applied physics of condensed matter* (APCOM 2019), Strbske Pleso, Slovak Republic, 2019, doi: 10.1063/1.5118204.

[9] T. Samson, T. Adetoyese, O. Alabi, A. Olugbenga, G. Ebong, and T. Bamisaye, "A framework for robust attack detection and classification using rap-densenet," *ParadigmPlus*, vol. 4, no. 2, pp. 1–17, Aug. 2023, doi: 10.55969/paradigmplus.v4n2a1.

[10] A. Anuragi and D. S. Sisodia, "Empirical wavelet transform based automated alcoholism detecting using EEG signal features," *Biomedical Signal Processing and Control*, vol. 57, Mar. 2020, doi: 10.1016/j.bspc.2019.101777.

[11] E. Dada, H. Hamed, A. Lateef, and O. Ajibuwa, "Alcohol detection of drunk drivers with automatic car engine locking system," *Nova Journal of Engineering and Applied Sciences*, vol. 6, no. 1, pp. 1–15, Sep. 2017, doi: 10.20286/nova-jeas-060104.

[12] P. Bhuta, K. Desai, and A. Keni, "Alcohol detection and vehicle control," *Journal of Xidian University*, vol. 14, no. 8, pp. 92–97, Aug. 2020, doi: 10.37896/jxu14.8/024.

[13] H. R. Ansari, Z. Kordrostami, and A. Mirzaei, "In-vehicle wireless driver breath alcohol detection system using a microheater integrated gas sensor based on Sn-doped CuO nanostructures," *Scientific Repors*, vol. 13, no. 1, p. 7136, May 2023, doi: 10.1038/s41598-023-34313-6.

[14] Q. Li *et al.*, "Highly sensitive sensor based on ordered porous ZnO nanosheets for ethanol detecting application," *Sensors and Actuators B: Chemical*, vol. 326, Jan. 2021, doi: 10.1016/j.snb.2020.128952.

[15] K. Srinivasan *et al.*, "Performance comparison of deep CNN models for detecting driver's distraction," *Computers, Materials & Continua*, vol. 68, no. 3, pp. 4109–4124, 2021, doi: 10.32604/cmc.2021.016736.

[16] M. Shahverdy, M. Fathy, R. Berangi, and M. Sabokrou, "Driver behavior detection and classification using deep convolutional neural networks," *Expert Systems with Applications*, vol. 149, Jul. 2020, doi: 10.1016/j.eswa.2020.113240.

[17] A. K. Biswal, D. Singh, B. K. Pattanayak, D. Samanta, and M.-H. Yang, "IoT-based smart alert system for drowsy driver detection," *Wireless Communications and Mobile Computing*, vol. 2021, pp. 1–13, Mar. 2021, doi: 10.1155/2021/6627217.

[18] O. M. Abiodun, W. M. Audu, and M. David, "Alcohol detecting and notification system for controlling drink driving," *i-manager's Journal on Embedded Systems*, vol. 7, no. 1, pp. 11–17, 2018, doi: 10.26634/jes.7.1.15658.

[19] P. Kannan and S. Bachiraju, "Detection of alcohol in drivers using computer vision through analysis of ocular indicators," *International Research Journal of Engineering and Technology (IRJET)*, vol. 8, no. 7, pp. 4214–4216, Jul. 2021.

[20] R. Das, O. Chattopadhyay, P. Biswas, M. Das, S. Chatterjee, and A. Paul, "Intelligent alcohol detection system for car drivers," *SSRN Journal*, 2020, doi: 10.2139/ssrn.3526008.

[21] G. A. E. S. Kumar, J. S. Priyanka, and A. S. Deepthi, "Vehicle accident and alcohol detection system using IoT platform," *Indian Journal of Science and Technology*, vol. 15, no. 39, pp. 2004–2010, Oct. 2022, doi: 10.17485/IJST/v15i39.1018.

[22] J. Rani, G. Devi, and B. R, "Alcohol detection system in vehicles," *SSRN Journal*, pp. 1–7, 2022, doi: 10.2139/ssrn.4031961.

[23] R. Rawat, O. A. Oki, S. Sankaran, H. Florez, and S. A. Ajagbe, "Techniques for predicting dark web events focused on the delivery of illicit products and ordered crime," *International Journal of Electrical and Computer Engineering (IJECE)*, vol. 13, no. 5, pp. 5354-5365, Oct. 2023, doi: 10.11591/ijece.v13i5.pp5354-5365.

[24] T. Maragatham, P. Balasubramanie, and M. Vivekanandhan, "IoT based home automation system using raspberry Pi 4," *I IOP Conference Series: Materials Science and Engineering*, vol. 1055, no. 1, Feb. 2021, doi: 10.1088/1757-899X/1055/1/012081.

[25] O. O. Olanrele, O. A. Adeaga, O. A. Adeyemi, O. K. Ajayi, and A. O. Mowemi, "An IoT based weather station using an embedded system," *Quantum Journal of Engineering, Science and Technology*, vol. 3, no. 3, Oct. 2022.

[26] R. A. Sowah *et al.*, "Design of a secure wireless home automation system with an open home automation bus (openHAB 2) framework," *Journal of Sensors*, vol. 2020, Oct. 2020, doi: 10.1155/2020/8868602.

[27] S. A. Ajagbe and M. O. Adigun, "Deep learning techniques for detection and prediction of pandemic diseases: a systematic literature review," *Multimedia Tools and Applications*, pp. 1–35, May 2023, doi: 10.1007/s11042-023-15805-z.

BIOGRAPHIES OF AUTHORS

Oluwaseyi Omotayo Alabi received the B.Eng. (Hon's) degree in mechanical engineering from the Federal University of Technology, Minna, Nigeria, the M.Eng. degree in mechanical engineering (thermo-fluid) from the University of Ilorin, Nigeria. He is a Ph.D. student at the Department of Mechanical Engineering, University of Ibadan, Nigeria. His major research focus is in the aspect of applied artificial intelligent, energy system, heat transfer, HVAC, simulation and modeling, aerodynamic, computational thermal fluids. He can be contacted at email: oalabi4330@stu.ui.edu.ng.

Oyetunde Adeoye Adeaga Ph.D. is a reader and the Ag. Head of the Department of Mechanical and Mechatronics Engineering. He is also the Vice-Dean in the Faculty of Engineering and Technology at First Technical University Ibadan respectively. He obtained B.Eng. (Hons.), M.Sc. and Ph.D. in mechanical engineering from the Federal University of Technology, Akure and the University of Ibadan, Nigeria respectively. He hitherto, involved in the teaching and research profession for over two decades. His research focus in computational thermal fluids, energy and reservoir simulation; such includes flows in porous media and micro-perforated media and renewable energy and with well over 45 published articles to his credit. He has applied the cellular vortex element method to investigate single and multiphase fluid flow in subsurface porous media to both constrained or unconstrained aquifer and oil reservoirs. He has studied the potential of solar energy to industrial drying. He has also won several grant awards such as Royal Engineering Society, UK (AI4CE) and PEBL (Partnership in Enhanced Blended Learning) in robotic systems and engineering. Presently, he is working on Hydrogen gas as the source of renewable energy of future. He is a certified mechanical engineer and a member of many professional bodies both within Nigeria and outside Nigeria. He can be contacted at email: oyeadeaga@tech-u.edu.ng.

Sunday Adeola Ajagbe is a Ph.D. candidate at the Department of Computer Science, University of Zululand, South Africa and a lecturer, a First Technical University, Ibadan, Nigeria. He obtained M.Phil. and PGD in computer engineering and electronics and electrical engineering respectively at Ladoke Akintola University of Technology, (LAUTECH) Ogbomoso, Nigeria. He also obtained M.Sc. and B.Sc. in information technology and communication technology respectively at the National Open University of Nigeria (NOUN). His specialization includes applied artificial intelligence (AI), natural language processing (NLP), information and communication, data science and internet of things (IoT). He is a licensed by The Council for the Regulating of Engineering in Nigeria (COREN) as a professional engineer, a student member of the Institute of Electrical and Electronics Engineers (IEEE), and International Association of Engineers (IAENG). He has many publications to his credit in reputable academic databases. He can be contacted at email: saajagbe@pgschool.lautech.edu.ng.

Esther Oluwayemisi Adekunle is currently a master of technology student at Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Nigeria. She's experienced in hardware and network engineer at the Directorate of Management Information Systems and Information and Communication Technology of Federal Polytechnic Ile-Oluji, Ondo State. Her core research interests and proficiencies lie in data engineering, network engineering, cloud engineering, and artificial intelligence. She can be contacted at email: estadekunle@fedpolel.edu.ng.

Prof. Matthew Olusegun Adigun retired in 2020 as a senior professor at the Department of Information Technology, Cape University of Technology, Cape Town, South Africa. He obtained his doctorate degree in 1989 from Obafemi Awolowo University, Nigeria; having previously received both masters in computer science (1984) and a combined honours degree in computer science and economics (1979) from the same University (when it was known as the University of Ife, Nigeria). A very active researcher in software engineering of the wireless internet, he has published widely in the specialised areas of reusability, software product lines, and the engineering of on-demand grid computing-based applications in mobile computing, mobile internet and ad hoc mobile clouds. Recently, his interest in the wireless internet has extended to wireless mesh networking resources and node placements issues, as well as software defined networking issues which covered performance and scalability aspects arising from software defined data centers and cloud/fog/edge computing milieu. He has received both research and teaching recognitions for raising the flag of excellence in Historically Disadvantaged South African Universities as well as being awarded a 2020 SAICSIT pioneer of the year in the computing discipline. Currently, he works as a temporary senior professor at the Department of Computer Science, University of Zululand, South Africa to pursue his recent interest in AI-enabled pandemic response and preparedness. He can be contacted at email: adigunm@unizulu.ac.za.