Using Cognitive IOT In Vehicle System for On Actual Time Monitoring of CO_2 Emission with Temperature and Alcohol Detector

Mukesh Radhesham Pardhi[1], Prof. Swapnil Choudhary[2], Dr. Somdatta Karanjekar[3],
Dr. Bharat Chede[4], Prof. Suhas Wankhede[5]
Master of Technology in CAD/CAM
Department of Mechanical Engineering
Wainganga College of Engineering and Management
Rastrasant Tukdoji Maharaj Nagpur University

Abstract: One of the pressing environmental challenges we face today is the phenomenon of global warming, primarily driven by the release of greenhouse gases. Among these gases, carbon dioxide stands out as a significant contributor, with its emissions leading to a warming effect on the Earth's surface. Protecting our environment requires us to address and manage these changes effectively, presenting a considerable challenge. For long-term control of carbon dioxide emissions at their source, there is a growing recognition of the need for preventive and control technologies. This paper aims to employ IoT technology, utilizing Raspberry Pi's CO2 sensitivity, to monitor emissions from various sources such as public transportation, industries, and forest fires. Continuous monitoring of carbon dioxide levels within a city will help identify areas with the highest pollution levels. Additionally, this initiative seeks to implement an intelligent system for early detection of forest fires, also known as wildfires. These uncontrolled fires in natural areas pose significant threats to both ecosystems and human resources. It's noteworthy that wildfires emit more CO2 gas than initially assumed, impacting state climate targets. Integrating these efforts with IoT enhances security and enables various services, including the deployment of a Simple Notification Service (SNS) to alert mobile users about high CO2 levels in specific areas. Furthermore, this model aims to extend its capabilities to include the detection of temperature in heated vehicle components, such as engines, using temperature detectors. Moreover, alcohol detectors will be utilized to monitor alcohol consumption by vehicle drivers, enhancing safety measures on the road.

Keywords: SNS (Simple Notification Service), IoT (Internet of Things), GPS (Global Positioning System), GVG (Green Vehicle Guide), MAQUMON (Mobile Air Quality Monitoring Network).

1. Introduction

1.1 Monitoring of CO2 Emission using CIOT

The existence and well-being of all living creatures are intimately tied to the prevailing weather patterns. As the climate undergoes warming, it brings about changes that can profoundly affect vital aspects of our lives such as water resources, agriculture, Energy and transportation systems, as well as the natural environment, can also be impacted. and even our health and safety can be affected by carbon dioxide. a primary greenhouse gas, has a remarkable staying power in the surrounding, persisting for almost a century. Consequently, Terrene temperatures will continue to rise in the years ahead. A recent study on CO2 emissions from vehicles in India underscores that cars, taxis, and multi-utility vehicles (MUVs) stand out as significant contributors to these emissions. Therefore, the proposed plan primarily targets mitigating emissions from cars and taxis. Continuous monitoring of CO2 emissions allows for risk reduction. The emerging thought of the Cognitive Internet of Things (CIOT) offers a chance to develop creative applications that merge conventional digital technologies seamlessly. CIOT involves connecting these self-governing devices to interact autonomously and produce unified data. Employing advanced intelligence to analyze this amalgamated data and provide insights for human decision-making is crucial. This approach, known as CIOT (Convergence of IoT), has been implemented to oversee the release of greenhouse gases from vehicles. The suggested model enables real-time monitoring of CO2 emissions, facilitating effective control and, ultimately, contributing to the mitigation of global warming.

1.2 Alcohol Detection of Drunk Drivers

Currently, road accidents occur frequently, with a significant portion attributed to drink driving. Intoxicated drivers often make reckless decisions on the road, posing risks to themselves and other road users. This issue extends beyond demographics and geographical boundaries. However, efficiently monitoring intoxicated drivers poses a challenge for law enforcement and road safety officials. Hence, there is a necessity for an automated alcohol detection system capable of operating without constraints of space or time.

This prototype system incorporates several hardware components into its design. This system integrates several components, including an LCD, an MQ-3 alcohol sensor, a Direct current motor, a bell, and 2-LEDs, all controlled by a microcontroller. The circuit board facilitates communication between these modules, including the MQ-3 alcohol sensor, GSM, LCD, and DC motor. The LCD acts as the interface, displaying relevant information, while the DC motor demonstrates the system's capability to immobilize the engine upon detecting alcohol.

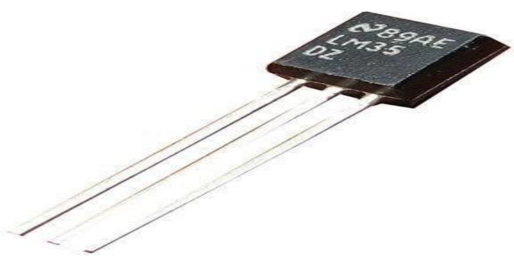
1.3 CO_2 Sensor

A carbon dioxide sensor, also referred to as a CO2 Sensor, is a device crafted to detect the presence of carbon dioxide gas. These sensors primarily operate on two principles: Infrared Gas Sensors (NDIR) and Chemical Gas Sensors. One significant advantage of these sensors is their exceptionally low energy consumption. Moreover, they can be scaled down to fit into micro-electronic systems, rendering them versatile and adaptable for diverse applications. In this instance, we are employing an MQ-135 sensor for monitoring CO2 gas.

1.4 Alcohol Sensor

The alcohol sensor evaluate the presence of alcohol vapor in the air and produces an analog voltage output. It operates effectively in temperatures ranging from -10°C to 50°C and consumes less than 150 mA of power at 5V. Its sensitivity extends from 0.04 mg/L to 4 mg/L, making it suitable for integration into breathalyzer devices.

1.5 Temperature Sensor



A Temperature Sensor is an electronic instrument crafted to gauge the heat of its environment and transform this information into electronic signals for purposes like recording, tracking, or alerting about temperature fluctuations. There exist different kinds of temperature sensors. Certain ones, referred to as contact temperature sensors, necessitate direct contact with the object under observation to precisely measure its temperature. Conversely, non-contact temperature sensors can gauge an object's temperature indirectly, without requiring physical contact.

2. Literature Survey

In IoT landscape, ordinary objects in our surroundings are progressively being interconnected in various ways. Initially, this concept emerged primarily in the domain of supply business logistics management. However, its definition has since expanded to encompass a wide array of petition spanning health protection, gentilities, and transportation. At its essence, IoT strives to empower devices to autonomously sense and process information, minimizing the need for human intervention. This entails Acquiring from the surrounding and Associating with the physical world (catalyst/Instruction/control). Leveraging established Internet quality, IoT furnishes services for data exchange, analysis, applications, and communication. The proliferation of Open Wireless Technologies like Bluetooth, RFID, Wi-Fi, and (TDS) Telephonic Data Services, along with embedded sensor and actuator nodes, has expedited the progression of IoT.

The Cognitive Internet of Things (CIoT) is still in its early stages. A cognitive management substructure has been proposed to enhance IoT's capabilities in supporting the sustainable development of smart cities. In this context, cognition refers to the autonomous achieving of related information for specific applications. CIoT involves integrating cognitive and symbiotic appliance with IoT to enhance interpretation and accomplish intelligence.

"IOT Based Smart System for controlling CO_2 Emission". The primary aim of this study is to deploy IoT technology for monitoring CO2 emissions from various sources such as public transportation, industrial activities, and forest fires. This involves utilizing Raspberry Pi devices equipped with CO2 sensors to continuously measure the amount of carbon dioxide emitted in a city. Additionally, efforts are made to identify the areas with the highest pollution levels.

These data are then integrated into the IoT infrastructure, which enhances security and enables the utilization of various services. For instance, a Simple Notification Service (SNS) can

International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 05 | May - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

be implemented to send alerts to mobile phones if a particular area exhibits elevated CO2 levels.

The system is primarily deployed in major cities to monitor and control carbon dioxide concentrations resulting from vehicle emissions and urbanization.

Prof. Basavaraj R. Birajdar, Prof. Mallikarjun B. Awat; 2017 [3] did research on "Vehicle Accident Prevention System Embedded with Alcohol Detector".

The primary objective of this model is to create a system capable of detecting the alcohol content in the air expelled by a driver and subsequently shutting off the vehicle automatically if the alcohol percentage surpasses the permissible limit. This project employs a microcontroller from the 8051 family, specifically the 89S52 variant, along with an alcohol sensor for this purpose. "Alcohol Detection of Drunk Drivers with Automatic Car Engine Locking System". The research introduced a promising approach to address the rising incidence of road accidents stemming from alcohol-impaired driving on Nigerian roads. The project involved building a prototype system for alcohol detection and engine immobilization. It utilized an Arduino Uno microcontroller connected to components such as an alcohol sensor (specifically an MQ-3 sensor). The system continuously monitored the driver's blood alcohol content using the MQ-3 alcohol sensor. If the alcohol content exceeded a certain threshold, the system would immobilize the engine, showcasing the potential for a safety mechanism in vehicles. (BAC) for signs of impairment. If alcohol is detected in the driver's breath, the ignition system will be disabled, preventing the vehicle from starting.

3. Methodology

3.1 Layers of Working

The proposed design fits into the CIoT framework, acting as a transparent conduit connecting physical objects and the social realm to create the intelligent system. Within our system, which monitors CO2 levels in vehicle emissions, the cognitive process unfolds across four primary layers:

Sensing control layer: The layer directly interacts with the physical nature, employing the MG811 to detect Carbon dioxide gas. If the CO2 levels exceed predetermined thresholds, actions are triggered. signals are generated and relayed upper layer.

Data semantic knowledge layer: Here, data from the control layer undergoes efficient analysis and is stored in a database. This process enriches the data with semantic relevance, which is then integrated into the knowledge base.

Decision-making layer: Utilizing insights extracted from the underlying semantic stratum, this tier makes informed decisions. In our system, such decisions may involve dispatching alerts to vehicle owners and the central control board, guided by the abstracted data.

Service evaluation layer: This tier integrates with social media platforms and the automotive sector. where feedback and evaluation results contribute to the cognitive process. Our approach leans towards an Internet-eccentric architecture, where internet services take precedence, and object-contributed data supports the framework's functionality

1. The Central Board module on the payment gateway and cloud server.
2. Module with PI and CO2 sensor.

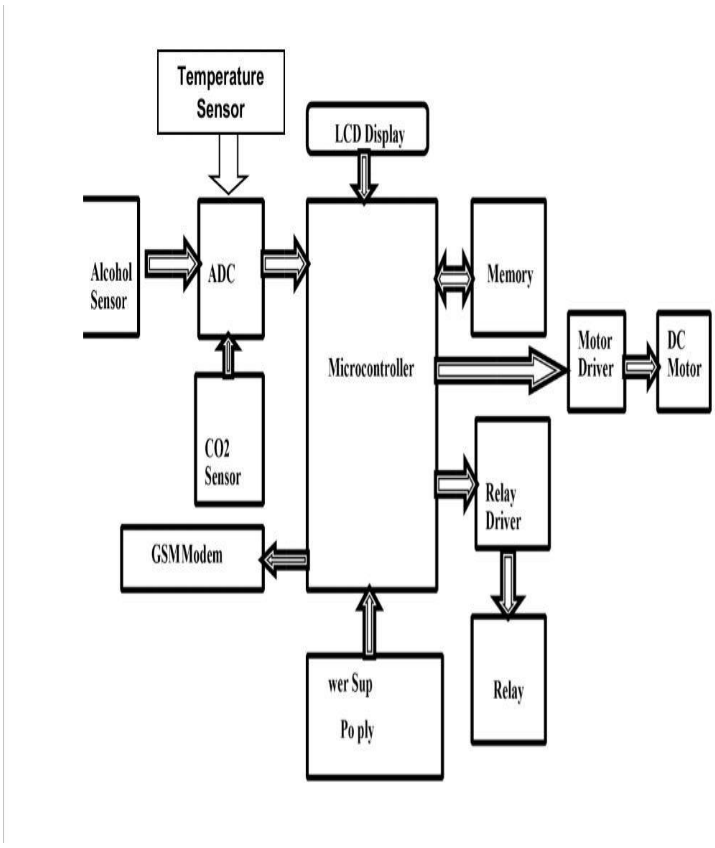


Figure 3.1: The setup block diagram

3.2 Working Methodology

All the three sensors CO2 sensor, Alcohol Sensor, and Temperature Sensor interfaced with micro-controller.

CO2 sensors senses the amount of CO2 coming from the exhaust of the vehicle.

The Alcohol sensor senses amount of alcohol and alerts the driver of the vehicle accordingly.

Temperature sensor senses the temperature of Engine and display it on LCD.

The master mind or processor used is micro-controller. Here sensor could be connected with the help of wires.
The program coding is loaded in micro-controller to read the sensor values. Some configuration should be established to enable interface, relay etc. The data would be obtained from micro-controller to analyses the value for each sensor.
If the value exceeds the limit value, then the alert notification will be sent to owner of the vehicle.

3.3 System flow chart for CO_2 Sensor

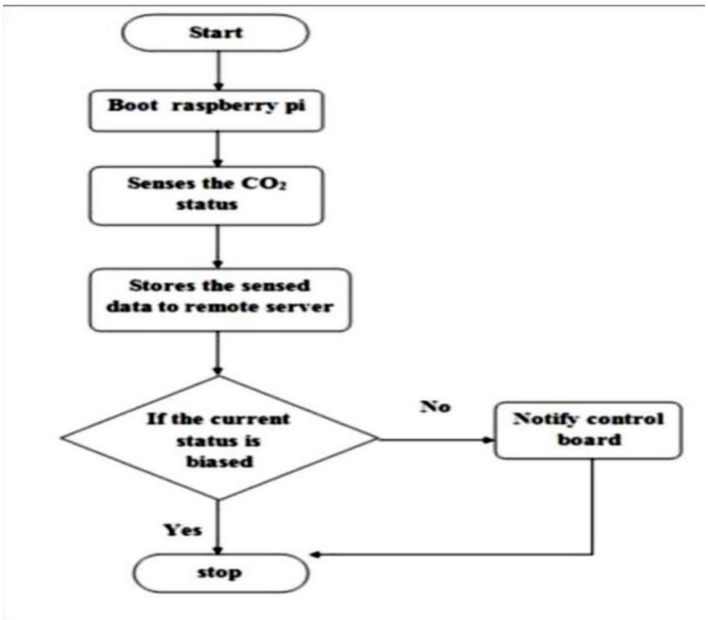
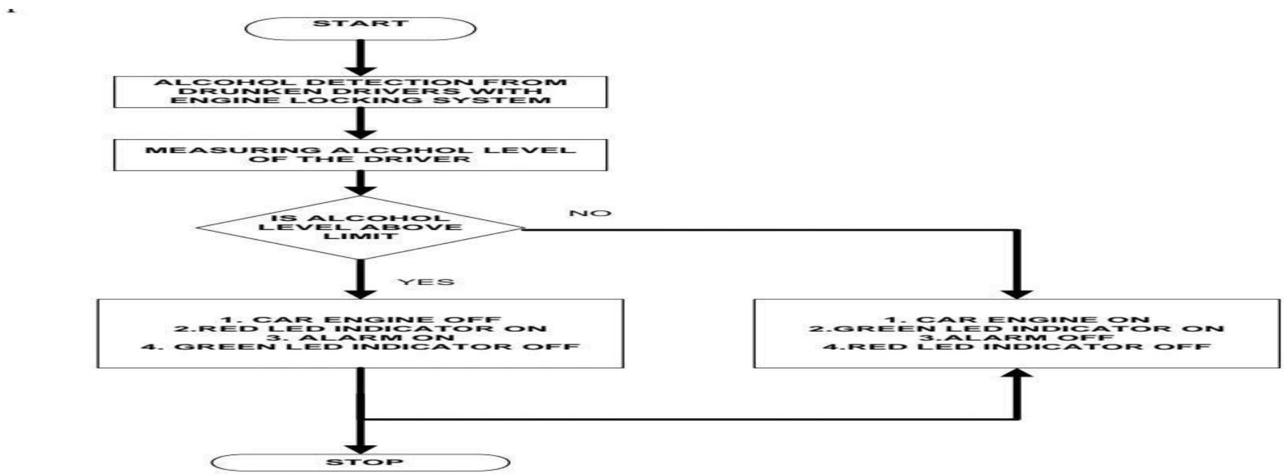


Figure 3.3: Flow Chart of CO2 Sensor

Fig. 3.4 Flow Chart of Alcohol Sensor



The system consists of three primary stages. The initial step involves booting up the system. Following this, the system enters the measuring state, where it evaluates the quantity of CO2 gas emitted from the vehicle's exhaust. A predetermined threshold is provided as input to the microcontroller. If the CO2 gas surpasses the established safe limit, the system will alert the vehicle owner.

3.4 System Flow chart of Alcohol Sensor

Microcontroller: This microcomputer is a high-performance CMOS 8-bit processor renowned for its low-power operation. Assembled with Atmel's cutting-edge high-concentration non-volatile memory technology, it is engineered to maintain compatibility with the MCS-51 instruction set and pinout. The inclusion of on-chip Flash memory permit for reprogramming of the ROM either in-system or through conventional non-volatile memory programmers.

GSM Modem: GSM (Global System for Mobile communications) stands as an open, Digital Cellular Technology that's widely employed for transmitting both mobile voice and data services. In our application, its sole purpose is to handle message transmission and reception. The GSM wireless data module serves as a key component enabling remote wireless applications, facilitating communication between machines or users and machines, as well as remote data exchanges across diverse applications

Relay: Mechanical relays serve as the intermediary between the micro controller and high-power devices like motors. These relays,
along with the motors, are responsible for opening and closing the motor valve.

ADC: An ADC The system consistently observes the input signal and generates refreshed digital output data whenever changes in the signal fall within a specific range of rapidity. Additionally, when the input variations are minor, the conversion process can be swift.

Power Supply: The first step in any electronic circuit is establishing the system of power supply, which supplies the acquired power to operate the entire setup. The specifications of the energy supply depend on energy requirements determined by the system's rating. For our project, we require a +5volt power supply.

4. Future scope

The suggested design solely identifies CO2 gas, yet numerous hazardous gases like carbon monoxide, methane, and nitrous oxide present considerable risks to environmental well-being. Enhancing the prototype's functionality involves integrating a superior sensor, capable of enduring higher temperatures, as a replacement for the MQ-135 sensor. Moreover, the prototype's utility extends beyond vehicular applications to encompass diverse industrial sectors. By gauging the presence of harmful gases, it plays a pivotal role in curbing air pollution stemming from these emissions. This broader implementation offers a potent tool for monitoring and mitigating pollution levels across industries, thereby contributing to environmental conservation endeavors.

In case of Alcohol detection if the Alcohol sensor is installed in every car while manufacturing them it will directly increase the overall safety of humans and car and reduce the no. of accident occur due to drink and drive cases. High grade Alcohol sensors can be used to detect the Alcohol gas. Temperature sensor can be used for regular check of hot components and thus increase the efficiency.

5. Conclusion

The conventional system of pollution checks requires frequent reassessment every six months, yet it's often overlooked by many. In contrast, our model offers a one-time installation that lasts up to a decade. Furthermore, the introduction of instantaneous CO2 monitoring presents a substantial improvement in reducing greenhouse gas emissions compared to conventional methods. This innovation has the potential to drastically cut down on emissions, thereby helping to alleviate global warming when implemented worldwide. Our model incorporates sensors for temperature, humidity, and CO2, continuously monitoring environmental conditions at predefined intervals. The sensory information is relayed to a fortified server via a Raspberry Pi, scripted in Python and leveraging the IPv6 connectivity protocol. The remote server then stores this data in predefined database tables, enabling users to access both historical and current atmospheric conditions. Additionally, by integrating an alcohol sensor, our model can detect alcohol levels in individuals. If the threshold value is exceeded, a DC motor is automatically disabled. This feature, when installed in vehicles, has the potential to save lives by preventing accidents caused by impaired driving. We propose a method to detect alcohol in drivers' breath, aiming to mitigate the tragic consequences of drunk driving The integration of a temperature sensor also provides insights into engine temperature, helping to prevent the buildup of oil film gases and damage to engine components.

6 References

[1] "Greenhouse gas emission reduction scenarios for bc", Colin R. Campbell and Cliff Stainsby, Co-published by the Canadian Centre for Policy Alternatives — BC Office, the Sierra Club of BC, and the BC Government and Service Employees' Union.

[2] Klemm, C.; Wiese, F. Indicators for the optimization of sustainable urban energy systems based on energy system modeling. *Energy Sustain. Soc.* **2022**, *12*, 3. []

[3] Sajede, A.; Mohsen, S.; Fahime, M.; Borna, A. Factors affecting the emission of pollutants in different types of transportation. *Energy Rep.* **2022**, *8*, 2508–2529.

[4] Menendez, M.; Ambühl, L. Implementing Design and Operational Measures for Sustainable Mobility: Lessons from Zurich. *Sustainability* **2022**, *14*, 625. [CrossRef]

[5] Guo, Y.; Ma, Z.; Ren, B.; Zhao, B.; Liu, P.; Zhang, J. Effects of Humic Acid Added to Controlled-Release Fertilizer on Summer Maize Yield, Nitrogen Use Efficiency and Greenhouse Gas Emission. *Agriculture* **2022**, *12*, 448. [CrossRef]

[6] "What will global annual emissions of greenhouse gases be in 2030, and will they be consistent with avoiding global warming of more than 2°C?", Rodney Boyd, Nicholas Stern and Bob Ward, Policy paper May 2015, ESRC Centre for Climate Change Economics and Policy Grantham Research Institute on Climate Change and the Environment

[7] "Research Directions for the Internet of Things", John A. Stankovic, Life Fellow, published in March 2014, in Internet of Things IEEE journal with ISSN: 2327- 4662

[8] Guo, Y.; Ma, Z.; Ren, B.; Zhao, B.; Liu, P.;

Zhang, J. Effects of Humic Acid Added to Controlled-Release Fertilizer on Summer Maize Yield, Nitrogen Use Efficiency and Greenhouse Gas Emission. *Agriculture* **2022**, *12*, 448. [CrossRef]

[9] "Cognitive Internet of Things: A New Paradigm beyond Connection", Qihui Wu, Senior Member, IEEE, Guoru Ding, Student Member, IEEE, Yuhua Xu, Student Member, IEEE, Shuo Feng, Zhiyong Du, Jinlong Wang, Senior Member, IEEE, and Keping Long, Senior Member, IEEE, arXiv:1403.2498v1 [cs.AI] 11 Mar 2014

[10] The ―Greenhouse Effect‖ Wicked Danger - or Merely a Hoax? ", Klaus Ermecke and Heinz Thieme K. Ashton, That ―Internet of Things‖ Thing, RFiD Journal. (2009).

[11] International Journal of Scientific & Engineering Research, Volume 4, Issue Ş, 2013 ISSN 2229-5518 IJSER © 2013 http://www.ijser.org Measurement of atmospheric Carbon Dioxide using multi sensor approach Akshay Anant Bhide, S.L. Nalbalwar

[12] J. Buckley, ed., The Internet of Things: From RFID to the Next-Generation Pervasive Networked Systems,
Auerbach Publications, New York, 2006

[13] "Internet of Things (IOT): A Vision, Architectural Elements, and Future Directions", Jayavardhana Gubbi,a Rajkumar Buyya,b* Slaven Marusic,a Marimuthu Palaniswamia a Department of Electrical and Electronic Engineering, The University of Melbourne, Vic - 3010, Australia b Department of Computing and Information Systems, The University of Melbourne, Vic - 3010, Australia, www.elsevier.com/locate/fgcs 29(2013)1645-1660

[14] Klemm, C.; Wiese, F. Indicators for the optimization of sustainable urban energy systems based on energy system modeling.
Energy Sustain. Soc. **2022**, *12*, 3. [CrossRef]

[15] Sajede, A.; Mohsen, S.; Fahime, M.; Borna, A. Factors affecting the emission of pollutants in different types of transportation.
Energy Rep. **2022**, *8*, 2508–2529.

[16] Menendez, M.; Ambühl, L. Implementing Design and Operational Measures for Sustainable Mobility: Lessons from Zurich.
Sustainability **2022**, *14*, 625. [CrossRef]

[17] H. Sundmaeker, P. Guillemin, P. Friess, S. Woelfflé, Vision and challenges for realizing the Internet of

Things, Cluster of European Research Projects on the Internet of Things - CERP IOT, 2010.

[18] P. Vlacheas, R. Giaffreda, V. Stavroulaki, et al,Enabling smart cities through a cognitive management framework for the internet of things, ‖ IEEE Communications Magazine, vol. 51, no. 6, pp. 102-111, June 2013

[19] Transport and climate change: a review Lee Chapman
* www.elsevier.com/locate/jtrangeoJournal of Transport Geography 15 (2007) 354–367

[20] http://www.epa.gov/climatechange/ghgemissions/sour ces.html

[21] http://co2meters.com/Documentation/Datasheets/DS 30-01%20-%20K30.pdf, Revision 1.3 – May 2015

[22] "A study on NDIR-based CO2 sensor to apply remote air quality monitoring system", Jongwon Kwon ; Gwanghoon Ahn ; Gyusik Kim ; Jo Chun Kim Published in: ICCAS-SICE, 2009 Page(s):1683 - 1687, Print ISBN:978-4-907764-34-0 INSPEC
Accession Number: 10982401

[23] Mądziel, M.; Jaworski, A.; Kuszewski, H.; Woś, P.; Campisi, T.; Lew, K. The Development of CO_2 Instantaneous Emission Model of Full Hybrid Vehicle with the Use of Machine Learning Techniques. *Energies* **2021**, *15*, 142. [CrossRef]

[24] Xie, H.; Zhang, Y.; He, Y.; You, K.; Fan, B.; Yu, D.; Lei, B.; Zhang, W. Parallel attention-based LSTM for building a prediction model of vehicle emissions using PEMS and OBD. *Measurement* **2021**, *185*, 110074. [CrossRef]

[25] Shahnavaz, F.; Akhavian, R. Automated Estimation of Construction Equipment Emission Using Inertial Sensors and Machine Learning Models. *Sustainability* **2022**, *14*, 2750. [CrossRef]

[26] Xayasouk, T.; Lee, H.; Lee, G. Air Pollution Prediction Using Long Short-Term Memory (LSTM) and Deep Autoencoder (DAE) Models. *Sustainability* **2020**, *12*, 2570. [CrossRef]

[27] Wang, X.; Yan, C.; Liu, W.; Liu, X. Research on Carbon Emissions Prediction Model of Thermal Power Plant Based on SSA-LSTM Algorithm with Boiler Feed Water Influencing Factors. *Sustainability* **2022**, *14*, 15988. [CrossRef]

[28] Dave, E.; Leonardo, A.; Jeanive, M.; Hanafiah, N. Forecasting Indonesia exports using a hybrid model ARIMA-LSTM.
Procedia Comput. Sci. **2021**, *179*, 480–487.