Project Phase II Report On

AUTOMATED H-TEST

Submitted in partial fulfillment of the requirements for the award of the degree of

Bachelor of Technology

in

Computer Science and Engineering

By

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CERTIFICATE

This is to certify that the project report entitled ***"Automated H-Test"*** *is a bonafide record of the work done by* ***Jovan C. John (U2003111), Muhammed Shinaz K. P. (U2003137), Ifaz C. Perviz (U2003215), Joseph Tomy (U2003110)****, submitted to the Rajagiri School of Engineering & Technology (RSET) (Autonomous) in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology (B. Tech.) in Computer Science and Engineering during the academic year 2023-2024.*

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Abstract

In many developing nations, combating corruption within organizations, particularly at government levels such as Regional Transport Offices (RTOs), poses significant challenges. Observable instances of corruption, where RTO officers turn a blind eye, underscore the pervasive nature of the issue. A major impediment in corruption prevention efforts is the involvement of intermediaries and agents. The essence of our project lies in the capacity to identify discrepancies during the driving H-Test and relay real-time messages through Arduino. Our technological solution aims to address corruption by introducing an Internet-of-Things (IoT) platform employing fundamental ultrasonic sensors,laser diode,LDR, an Arduino UNO board, a breadboard, and a PC. The primary objective is to not only detect errors during the driving H-Test and track instances of line cutting, thereby reducing the incentive for bribery within the context of driving schools and RTO officers. The technical foundation of our project involves the implementation of ultrasonic sensors interfaced with an Arduino UNO R3 board. These sensors are strategically positioned to monitor and analyze driving test maneuvers. Upon detecting irregularities, the system transmit immediate notifications. Additionally, the system incorporates a mechanism for monitoring line-cutting incidents, providing a comprehensive approach to corruption reduction within the driving test environment. By utilizing the Arduino UNO R3 board , our solution ensures the collection and dissemination of real-time, objective data related to the H-Test. This data is made accessible to governmental and road transport authorities, enabling them to have unprecedented insights into the driving test process. The proposed system not only contributes to a technologically advanced testing framework but also prioritizes public safety by effectively evaluating a driver's skills, ultimately minimizing the prevalence of untrained drivers on the roads.

Contents

List of Abbreviations

RTO: Regional Transport Officer

IoT: Internet of Things

AI: Artificial Intelligence

GSM: Global System for Mobile Communications

NLP: Natural Language Processing

VR: Virtual Reality

IR: Infrared

HR-NET: Human Resource Network

GPS: Global Positioning System

WSN: Wireless Sensor Network

LabVIEW: Laboratory Virtual Instrumentation Engineering Workbench

RFID: Radio-Frequency Identification

LED: Light-Emitting Diode

DC: Direct Current

API: Application Programming Interface

HTML: HyperText Markup Language

CSS: Cascading Style Sheets

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Chapter 1

Introduction

This Chapter provides a comprehensive introduction to the Automated H-Test project, setting the stage for an in-depth exploration of its objectives, challenges, and societal implications. Beginning with a background discussion, it outlines the project's mission to revolutionize traditional driving tests through the integration of cutting-edge technology, such as ultrasonic sensors, LDR, laser diodes, and Arduino systems. The chapter underscores the shortcomings of current evaluation methods, emphasizing the need for a more objective and real-time assessment approach to enhance road safety. It then defines the scope and motivation of the project, highlighting its ambitious goals to develop a robust sensor integration system, establish a user-friendly web platform, and enhance assessment precision, among others. Moreover, the chapter acknowledges the challenges ahead, including technical complexities and assumptions regarding driver compliance and testing environments. Lastly, it emphasizes the societal and industrial relevance of the project, positioning it as a pioneering initiative at the forefront of reshaping driving assessments and advancing road safety standards. Through this introduction, Chapter 1 lays the groundwork for the subsequent discussions on technical intricacies, implementation strategies, and project outcomes.

1.1 Background

In the realm of driving examinations, our project 'Automated H-Test' addresses the shortcomings of traditional tests by introducing a real-time assessment system powered by ultrasonic sensors, LDR, laser diode and Arduino technology. Traditional evaluations often lack objectivity and immediate feedback, hindering candidates' understanding of their performance.

Our project aims to revolutionize driving tests by providing precise measurements and instant feedback through strategically placed LDR, laser diode and ultrasonic sensors on an H-shaped track. This not only enhances objectivity but also aligns with the broader trend of incorporating smart solutions into conventional practices.

In an era of technological advancements, our project contributes to the ongoing dialogue surrounding road safety and modernizing assessment methodologies. The subsequent sections of this report will explore the technical intricacies, objectives, and potential societal impact, highlighting how 'Automated H-Test' stands at the intersection of traditional driving tests and contemporary technology, ultimately aiming to elevate the standards of road safety assessments.

1.2 Problem Definition

The current 'H' test procedure for issuing driving licenses carries drawbacks such as subjective ratings, mistakes by people, and lack of real-time support which may pose threats to road safety. Addressing the mentioned shortcomings is hugely important in order to recognize that there emerged an imperious need for a more precise, objective and technologically advanced solution being applied which would lead us into increasing reliability of this licensing process.

1.3 Scope and Motivation

The 'Automated H-Test' project's scope is comprehensive, utilizing LDR, laser diode, ultrasonic sensors and Arduino technology to assess driver skills in precision and adherence to traffic guidelines. It extends beyond traditional tests, providing a scalable solution adaptable to various testing environments. The project also explores data analytics integration for insights into performance trends, fostering collaboration with driving schools and regulatory bodies.

1.4 Objectives

1. Develop a Robust Sensor Integration System: Ensure an effective and dependable connection of the LDR, laser diode and ultrasonic sensors to Arduino technology,

which allows for precise data capturing as well as real time monitoring throughout the driving simulation test.

2. Establish a User-Friendly Web Platform: Develop an easy to understand web interface for candidates as well as administrators and they would be able to register, book appointments or slots , check their results with ease.

3. Enhance Assessment Precision: Use sensor data to accurately assess candidates based on specific criteria such as path accuracy, speed control and compliance with road traffic rules.

4. Implement Real-Time Feedback Mechanism: Incorporate a real-time feedback feature that allows candidates instant insights into their performance so they can correct themselves soon afterwards and gain better understanding of how well they drive.

5. Explore Data Analytics for Performance Trends: Investigate possibilities for incorporating data analytics into reviewing historical performance information, finding trends and patterns that can be used in continued improvement of methods around driving education as well assessment processes.

6. Ensure Scalability and Adaptability: Make the system scalable and adaptive so it can be used in different testing settings, as well facilitate collaboration with driving schools and regulatory bodies to achieve a more widespread effect.

1.5 Challenges

The project faces hurdles in creating a precise sensor integration system, including addressing environmental factors affecting accuracy and managing real-time data streams. Achieving a balance between sensitivity and specificity in assessment criteria is another challenge, requiring careful fine-tuning for diverse driving scenarios. These complexities demand innovative solutions to ensure the system's reliability and accuracy during driving tests.

1.6 Assumptions

1. Driver Compliance: The project assumes candidates' cooperation and adherence to test guidelines, as effective evaluation depends on their active participation and adherence to prescribed driving patterns.

2. Stable Testing Environment: The assumption of a stable testing environment includes consistent track conditions and minimal external disturbances during driving tests to ensure accurate sensor readings and reliable assessments.

3. Internet Connectivity: The project assumes that users have reliable internet connectivity for seamless interaction with the web platform, encompassing registration, slot booking, and result management.

4. Functional Sensor System: The system assumes the proper functioning of LDR, laser diode, ultrasonic sensors and Arduino technology, with consistent power supply and minimal technical malfunctions during the driving tests.

1.7 Societal / Industrial Relevance

The 'Automated H-Test' project holds significant relevance for society by addressing the critical need for enhanced road safety through immediate and objective feedback during driving tests. In the automotive industry, the system's integration potential with existing platforms positions it as a valuable tool for driving schools, regulatory bodies, and industry stakeholders, contributing to the adoption of innovative solutions for safer and more efficient transportation systems. This project stands at the forefront of initiatives aimed at reshaping driving assessments, aligning with the industry's commitment to advancing road safety standards.

1.8 Organization of the Report

The report begins with an introduction that provides context, outlines the problem and the scope and motivation for the project. It also underscores the assumptions and challenges undertaken and the significance of the Automated H-Test. The second chapter then delves into a comprehensive review of existing literature and research in the field, providing a foundation for understanding the project's context within existing knowledge. The third chapter then details the implementation prerequisites in hardware and software. Following this, the fourth chapter details the system design illustrating the architecture and modules involved in the project, as well as the project execution plan using Gantt chart and work schedules. Finally, the concluding chapter summarizes the key findings and outcomes of the project. The references and appendices are then provided to offer a comprehensive resource base for the report.

Chapter 2

Literature Survey

2.1 Smart driving test track

2.1.1 Introduction

The "Smart Driving Test Track" system[1] is innovatively designed to revolutionize the process of issuing driving licenses, with a primary focus on elevating the standards of the existing mechanism to bolster road safety. Recognizing road safety as a national concern, the system addresses its wide-ranging impacts on the economy, public health, and overall societal well-being. The core objective of the system is to mitigate road accidents caused by inadequately trained license holders. By transitioning from manual processes, the proposed system effectively eliminates inherent limitations, paving the way for a more robust and reliable evaluation of driving skills. This automation ensures that only proficient and well-trained drivers are granted licenses, thereby contributing to enhanced road safety. A key feature of the system lies in its commitment to transparency and expeditiousness, promising a streamlined license issuing process. The integration of a control unit, utilizing Arduino technology, orchestrates the system's functionalities. A sensor unit, equipped with ultrasonic and sharp IR sensors, diligently detects and assesses driver mistakes in real-time. To facilitate seamless communication and reporting, a GSM module is incorporated, enabling the transmission of test results to the Regional Transport Officer (RTO) through concise and rapid short text messages. In essence, the "Smart Driving Test Track" system emerges as a comprehensive solution, leveraging cutting-edge technology to address critical road safety concerns and contribute to the overall welfare of society.

2.1.2 Methodology

The "Smart Driving Test Track" system represents a sophisticated integration of hardware and software components, aimed at automating the driving license issuance process and concurrently enhancing road safety. At its core, the system incorporates a control unit, utilizing the Arduino microcontroller, and a sensor unit equipped with both ultrasonic and sharp IR sensors. The strategic placement of ultrasonic sensors along the sides of the track and sharp IR sensors in the track's middle enables continuous monitoring of vehicle movements, allowing for the real-time detection of any errors made by the driver.

The collected data from these sensors is channeled to the analog pins of the Arduino microcontroller, which operates as an 8-bit processing unit. This microcontroller serves as the brain of the system, analyzing the input from the sensors to evaluate the driver's performance during the test. If the test taker successfully completes all three tracks without errors and within the specified time frame, a message is promptly transmitted to the Regional Transport Officer (RTO) through a GSM module, signifying a positive outcome.

Conversely, should mistakes occur or if the test is not concluded within the stipulated time, an automated message is dispatched to the RTO, indicating an unsuccessful test. The inclusion of a 12V power supply ensures a stable and sufficient DC voltage supply to the onboard components, ensuring the system's reliable and continuous operation. In summary, the "Smart Driving Test Track" system represents an integrated and technologically advanced solution, utilizing sensors, microcontroller, and communication modules to automate the driving test process and contribute to improved road safety standards.

2.1.3 Conclusion

The "Smart Driving Test Track" system is strategically designed to revolutionize the issuance of driving licenses, with a primary objective of enhancing road safety and addressing the shortcomings of the manual process. By seamlessly integrating hardware components such as ultrasonic and sharp IR sensors, an Arduino control unit, and a GSM module for communication, the system establishes a robust framework for assessing driver competence. The sensors, strategically placed along the track, continually monitor vehicle movements and promptly identify any mistakes made by the driver. These detected errors are efficiently communicated to the Regional Transport Officer (RTO) through concise short text messages, streamlining the reporting process.

A key feature of the system is its capacity to automate the license issuance process, alleviating the need for on-field monitoring by the RTO. This not only enhances efficiency but also mitigates human errors, eliminates potential favoritism, and minimizes the risk of corruption. The system's overarching goal is to introduce transparency, accuracy, and corruption-free practices into the license issuing procedure. By ensuring that only well-trained drivers receive licenses, the "Smart Driving Test Track" system contributes significantly to road safety, aligning with broader societal interests and paving the way for a more secure and reliable driving environment. In essence, the system represents a technological leap towards a transparent, accurate, and corruption-resistant approach to license issuance, with a paramount focus on fostering road safety.

2.2 Development of Test RIG for Automated Driving Test Track and Issuing License Using LabVIEW

2.2.1 Introduction

The process of obtaining a driving license in India has been marred by reports of flaws and corruption, resulting in a substantial number of license holders acquiring their permits without undergoing the mandatory licensing exam and lacking the requisite qualifications to drive safely. To address these concerns and mitigate corruption in the licensing process, there is a pressing need to develop an automated system. Such a system would play a pivotal role in eliminating the possibility of tampering with driving test results, ensuring a fair and standardized evaluation process. By leveraging technology to automate key aspects of the licensing procedure, it becomes possible to introduce transparency, accuracy, and integrity into the system, ultimately curbing corrupt practices and fostering a safer driving environment for all road users. This technological intervention holds the potential to rectify the existing flaws in the licensing process, promoting accountability and meritocracy in obtaining driving licenses.

2.2.2 Methodology

The process of acquiring a driving license in India has been plagued by widespread reports of flaws and corruption, leading to a substantial number of license holders obtaining their permits without undergoing the mandatory licensing examination, thereby lacking the necessary qualifications for safe driving. To address these systemic issues and minimize corruption in the license acquisition process, there is a critical need to implement an automated system. This system would play a pivotal role in eradicating the potential for tampering with driving test results, thereby ensuring a fair and standardized evaluation process for all applicants. By introducing automation, the licensing system can be restructured to foster transparency, reduce human intervention, and mitigate corrupt practices, ultimately contributing to a more reliable and trustworthy method of issuing driving licenses in India.

2.2.3 Conclusion

The creation of a test rig for an automated driving test track using LabVIEW represents a significant leap forward in the effort to enhance the efficiency and transparency of the driving test process. With a primary goal of eliminating human intervention and transitioning to a paperless system, LabVIEW's hierarchical nature proves instrumental. It enables the development of high-level Virtual Instruments (VIs) that can serve as subVIs in various applications, amplifying the system's power and versatility.

This comprehensive system[2] incorporates several key features designed to streamline the licensing procedure. An e-application page facilitates the submission of candidate information, subsequently verified for accuracy. Once the test is completed, the system generates a detailed test result sheet for each candidate. This report encompasses essential details such as the test date and time, the test status (pass or fail), and personal information submitted during the e-application process.

In adherence to the standard licensing protocol, the driving license acquisition involves both a theory test and a practical test on an "H" track. Initially, a learner's license is issued, with a permanent license granted after a specified period of successful driving practice. By leveraging LabVIEW's capabilities, this automated driving test track not only expedites the testing process but also ensures accuracy and transparency, marking a transformative shift towards a more efficient and technology-driven approach to issuing driving licenses.

2.3 Driving License Test Automation Using VB

2.3.1 Introduction

The process of obtaining a driving license in India has long been criticized for its distortion and bureaucratic complexities, resulting in inconsistent issuance of licenses. A study conducted by the International Finance Corporation (IFC) brought alarming revelations, indicating that nearly 60 percent of license holders bypassed the mandatory driving license test, and a substantial 54 percent of them lacked proper training to operate a vehicle safely. The study further underscored the presence of corruption in the license issuance process, with intermediaries demanding bribes between officials and citizens. This corruption not only leads to inflated payments for licenses but also compromises the quality of driving tests and contributes to the presence of unskilled drivers on the road.

To address these pressing issues, there is an urgent need for the implementation of an efficient, transparent, and cost-effective driver testing system. The current system comprises both theoretical and practical examinations, with the theoretical test serving as a prerequisite for the practical examination. By advocating for a comprehensive overhaul and embracing modern technologies and transparent protocols, India has the potential to establish a more reliable and accountable driver testing system. Such reforms would not only enhance the integrity of the licensing process but also contribute significantly to the overall safety and competence of drivers on the nation's roads.

2.3.2 Methodology

The driver testing system[3] is a comprehensive assessment that encompasses both theoretical and practical examinations, with successful completion of the theoretical test serving as a prerequisite for the practical evaluation. As part of the examination process, the test taker provides essential personal data, including their name, date of birth, email, mobile number, address, and gender.

The practical test is conducted on a modified track equipped with advanced technology. This includes the implementation of IR sensor pairs and pressure switches strategically positioned to detect specific actions such as trouncing on sensor-mounted yardsticks or the crossing of line intersections between sensors. Two key IR sensors are deployed at the "START" and "STOP" positions of the track, while a speed sensor is incorporated into the vehicle wheel to facilitate the enabling or disabling of the zero rpm measurement system.

These sensors are seamlessly interfaced with a microcontroller-based central control unit. This central control unit plays a pivotal role in enabling or disabling the on-vehicle control unit for monitoring vehicle motion based on the inputs from the various sensors. Specifically, the on-vehicle control unit for zero rpm measurement is designed to activate its measurement function exclusively when the test vehicle is inside the sensor-embedded track, deactivating it when the vehicle exits the designated track area. This intricate system ensures precise and context-sensitive measurement, contributing to a thorough and technologically advanced evaluation of the test taker's driving capabilities.

2.3.3 Conclusion

The establishment of an effective, transparent, and cost-efficient driver testing system is imperative to tackle the prevalent issue of inconsistent driving license issuance in India. The existing framework involves a comprehensive evaluation process comprising both theoretical and practical examinations, with the theoretical test serving as a prerequisite for the practical assessment.

One notable advancement in the system involves the incorporation of IR sensor pairs and pressure switches on a modified track, facilitating the accurate detection of sensor trouncing and line intersections. This innovative approach ensures precise monitoring of the vehicle's motion during the test, enhancing the overall assessment process. The microcontroller-based central control unit seamlessly interfaces with these sensors, enabling or disabling the on-vehicle control unit based on the sensor inputs. Crucially, this mechanism ensures that the zero rpm measurement system is active only when the test vehicle is within the designated track, adding a layer of context-sensitivity to the evaluation process.

By leveraging these technological enhancements, the system aspires to deliver a fair and standardized assessment of driving skills, with the overarching goal of reducing the prevalence of untrained and unskilled drivers on the road. Through these advancements, the driver testing system aims to contribute significantly to the improvement of road safety and the overall competence of licensed drivers in India.

2.4 Automation of driving license test using wireless sensor network

2.4.1 Introduction

A driving license is an official document certifying that the holder is suitably qualified to drive a motor vehicle .One person is dying in road accident in every 30 seconds because of ineligible drivers with illegal license .So it is very important to disassociate the driving ability test from the licensing authority

2.4.2 Methodology

The proposed methodology[4] for the automated driving license test is a sophisticated approach that combines a wireless sensor network (WSN) with a Bayesian logic classification algorithm to achieve precise assessments of driving abilities. The system integrates feature extraction algorithms and employs multi-sensor fusion-based detection to gather and analyze comprehensive data from the test vehicle. This collected data is transmitted to a remote server, where it undergoes thorough scrutiny and is compared with reference data from the Global Positioning System (GPS) to facilitate result analysis.

Key to the methodology is the application of the Bayesian classification algorithm, complemented by data mining techniques, to process the received data and determine the test results accurately. The inclusion of ZIGBEE as a communication gateway enhances connectivity between sensors and the remote server, ensuring seamless data transfer.

The methodology goes beyond mere analysis, incorporating mapping and comparison of current test data with historical data for a more nuanced result interpretation. Additionally, the paper explores alternative methodologies, such as the pixel-matching method, rule-based method, discriminant function-based method, prototypes-based method, and training-based method, particularly in the context of gesture recognition and mapping systems using RGB-D cameras.

Expanding its versatility, the methodology extends to a smart TV interaction system, introducing face and hand gesture recognition techniques. Here, the implementation involves sophisticated algorithms like Adaboost and support vector machine (SVM). This holistic approach signifies the adaptability and potential of the proposed methodology not only in the context of driving license tests but also in diverse applications, advancing the capabilities of smart and interactive systems.

2.4.3 Conclusion

The proposed automated driving license test, integrating a wireless sensor network (WSN) and a Bayesian logic classification algorithm, offers significant advantages over the traditional manual test. One of its key merits lies in its commitment to ensuring accuracy in evaluating driving abilities while simultaneously disassociating the test from direct oversight by the licensing authority. The system's overarching goal is to curb the issuance of illegal licenses, thereby addressing a major contributor to road accidents. The incorporation of wireless sensor networks enables seamless data collection and transmission from the test vehicle to a remote server, where thorough processing and result analysis take place. Notably, the WSN operates on an event-based data collection mechanism, where sensors detect and promptly report specific driving events to designated data sinks. This real-time monitoring ensures a comprehensive assessment of critical driving behaviors. Additionally, the proposed system employs a multi-sensor fusion-based detection approach, involving the comparison of test data from the Global Positioning System (GPS) with reference data for meticulous result analysis. By improving the efficiency and precision of the driving license test process, this innovative system aims to not only reduce the issuance of illegal licenses but also contribute significantly to the broader objective of minimizing road accidents associated with unqualified drivers.

2.5 Automated License Management System Using RFID

2.5.1 Introduction

The research paper[5] details a comprehensive system designed for monitoring candidates during a license test, incorporating a combination of advanced technologies. Key components of this system include a load cell, micro-controller, ultrasonic sensor, and fingerprint sensor, each serving a specific purpose in evaluating candidate performance.

During the license test, candidates are required to navigate a closed loop path without any external support on the land surface. To ensure compliance with this requirement, metal strips are strategically placed at specific positions along the path. These metal strips play a crucial role in detecting whether the vehicle is moving correctly within the specified parameters.

The load cell is employed to detect instances where candidates fail to keep their feet appropriately positioned within the vehicle while following the designated path. The micro-controller then processes the differential output from the load cell, providing a mechanism for real-time assessment of candidate performance.

Additionally, the system utilizes an ultrasonic sensor to detect hand signals made by the candidates during the test. This feature adds an extra layer of evaluation, capturing non-verbal communication that may be essential for safe driving practices.

Furthermore, a fingerprint sensor is integrated into the system to record the number of attempts made by a candidate during the license test. This data can be valuable in assessing persistence and the learning curve of individuals seeking to obtain their license.

The metal strips, combined with the data gathered from the load cell, ultrasonic sensor, and fingerprint sensor, contribute to the generation of a comprehensive test report. This report categorizes candidates as either "pass" or "fail" based on their ability to successfully complete the specified test requirements. In essence, the system not only ensures the adherence to driving path guidelines but also provides a multifaceted evaluation of candidates' performance, contributing to a more robust and fair assessment process.

2.5.2 Methodology

The research paper adopts a comprehensive methodology that employs various components and techniques to create an effective system for monitoring candidates during a license test. One integral component is the use of a load cell, which is instrumental in detecting pressure changes on the surface. Specifically, it serves to identify candidates who fail to maintain their feet appropriately positioned within the vehicle while navigating the prescribed path.

The output from the load cell undergoes processing through a micro-controller. This micro-controller plays a pivotal role in analyzing and interpreting the data generated by the load cell. By doing so, it facilitates real-time assessment and provides valuable insights into the candidates' performance during the license test.

In addition to the load cell and micro-controller, the methodology incorporates an ultrasonic sensor. This sensor is strategically utilized for the detection of hand signals made by candidates. By monitoring these non-verbal cues, the system gains a deeper understanding of the candidates' actions and reactions throughout the license test, contributing to a more comprehensive evaluation.

Furthermore, a fingerprint sensor is integrated into the system to capture data regarding the number of attempts made by each candidate during the license test. This additional information becomes a valuable metric for evaluating the persistence and learning curve of individuals seeking to obtain their license.

To ensure the adherence to the designated route, metal strips are strategically placed along the specified path. These metal strips serve as a crucial element in the system, detecting and verifying whether the vehicle moves correctly according to the prescribed guidelines.

In summary, the research paper establishes a robust methodology by combining the functionalities of the load cell, micro-controller, ultrasonic sensor, fingerprint sensor, and strategically positioned metal strips. This integrated approach forms the foundation of a comprehensive system designed to monitor and evaluate candidates during a license test, providing a nuanced and multifaceted assessment of their driving abilities.

2.5.3 Conclusion

In conclusion, the research paper underscores the advantages and efficacy of the proposed driving license test automation system. Built upon RF Module wireless acquisition and VB-based technology, the system is designed with the primary goal of minimizing human intervention, thereby enhancing transparency and mitigating corruption in the driving skill test process.

The automation of the test process is a key feature of the system, ensuring that candidates are evaluated against predetermined conditions necessary for obtaining a driving license. These conditions encompass aspects such as successfully covering the complete path, avoiding any contact with or impact on the edges, and maintaining a non-zero speed throughout the test. The implementation of these criteria through automation not only streamlines the evaluation process but also sets clear and standardized benchmarks for candidate performance.

A noteworthy outcome of the automated system is the generation of pass or fail reports based on the objective assessment of the candidate's performance during the test. This objective evaluation eliminates subjective biases and provides a fair and standardized measure of an individual's driving skills. The use of technology in generating these reports adds a layer of precision to the assessment, contributing to the overall reliability of the evaluation process.

In summary, the proposed system presents a more efficient and reliable approach to conducting driving license tests. By leveraging RF Module wireless acquisition and VB-based technology, the system not only ensures adherence to established criteria but also enhances the fairness and accuracy of the evaluation process. Ultimately, the implementation of this automated system represents a significant step forward in modernizing and improving the efficiency of driving license testing, benefiting both the candidates and the overall integrity of the licensing system.

2.6 Summary and Gaps Identified

In the presented research, the driving license acquisition process in India is scrutinized for flaws and corruption, highlighting the urgent need for an automated system to address these systemic issues. The proposed solution, based on RF Module wireless acquisition and VB-based technology, aims to revolutionize the licensing process by eliminating human intervention, increasing transparency, and reducing corrupt practices. The automated system, equipped with a comprehensive set of technologies including load cells, micro-controllers, ultrasonic sensors, fingerprint sensors, and strategically placed metal strips, not only ensures candidates meet necessary conditions for a license but also generates objective pass or fail reports, enhancing the fairness and accuracy of the evaluation process.

The subsequent sections of the paper delve into specific methodologies and advancements in driving license test automation, demonstrating a concerted effort to streamline and modernize the testing procedures in India. From the use of LabVIEW for a hierarchical test rig to employing advanced technologies such as IR sensors and Bayesian logic classification algorithms in driving tests, each methodology underscores the commitment to transparency, accuracy, and efficiency in evaluating driving skills. The integration of wireless sensor networks, face and hand gesture recognition, and RFID technology in various sections of the research further illustrates the multi-faceted approach aimed at transforming the driving license acquisition process, making it more reliable, accountable, and technologically driven.

2.7 Conclusion

In conclusion, the literature survey highlights the transformative potential of automated driving license testing systems, including the "Smart Driving Test Track," LabVIEW-based Test RIG, VB Automation, and WSN-driven methodologies. These innovative approaches, integrating advanced technologies such as ultrasonic sensors, Arduino control units, LabVIEW, and wireless sensor networks, signal a paradigm shift towards efficient, transparent, and accountable licensing processes. By addressing challenges in manual testing, ensuring real-time monitoring, and introducing communication modules for streamlined reporting, these systems aim to significantly contribute to road safety. Their commitment to accuracy and automation reflects a promising future for driving license assessments, aligning with broader societal goals of promoting skilled and responsible drivers and fostering safer roads.

Chapter 3

Requirements

3.1 Hardware and Software Requirements

1 Hardware

- I5 Processor Computer
- HC SR-04 Ultrasonic Sensors- 5no.s
- LDR Diode - 6no.s
- Laser - 6no.s
- Arduino UNO R3- 3no.s
- Breadboard- 5no.s

2 Software

- ReactJS 18 (Front-End)
- nodeJS (Back-End)
- Visual Studio Code
- Database-MongoDB
- Arduino IDE

Chapter 4

System Architecture

In this chapter, we look into a comprehensive overview that includes its architecture, design, module division, and a visual representation of the planned timeline through a Gantt Chart. The System Overview section provides a bird's-eye view, outlining the core components and their interactions. Following this, the Architectural Design section delves into the structure and organization of the system, elucidating the principles guiding its construction.

The Module Division segment breaks down the system into distinct modules, elucidating their specific functions and interconnections. To provide a tangible sense of project progression, the chapter concludes with a Work Schedule presented in the form of a Gantt Chart. This chart serves as a roadmap, detailing the planned timeline for the various project activities, ensuring a clear understanding of the anticipated milestones and their interdependencies.

4.1 System Overview

The "Automated H-Test" system is a comprehensive and technologically advanced solution designed to revolutionize the process of issuing driving licenses. The system comprises interconnected components that collectively aim to elevate the standards of the existing mechanism, with a primary focus on enhancing road safety. At its core, the system integrates a control unit utilizing Arduino technology and a sensor unit equipped with ultrasonic and ldr. The strategic placement of sensors along the track enables continuous monitoring of vehicle movements, allowing for real-time detection of driver mistakes. An Arduino transmit test results promptly to the Regional Transport Officer (RTO). This system ensures a more robust and reliable evaluation of driving skills by eliminating inherent limitations associated with manual processes. The commitment to transparency, expeditiousness, and accuracy positions the ”Automated H-Test” system as a transformative tool in the issuance of driving licenses, contributing significantly to overall road safety.

4.2 Architectural Design

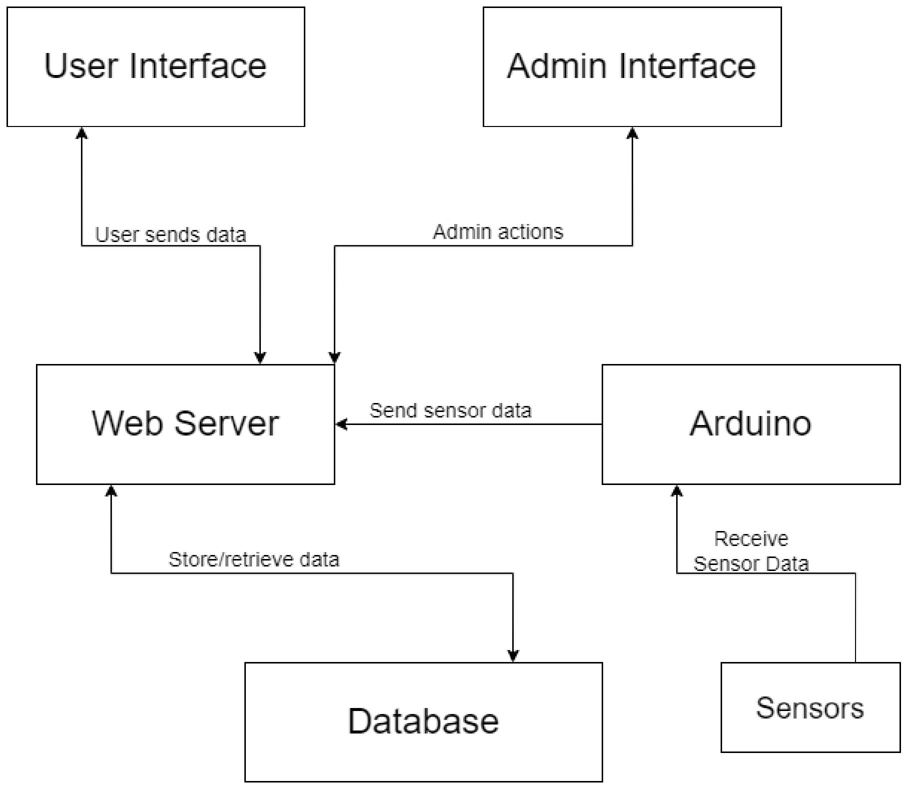

Figure 4.1: Architecture Diagram

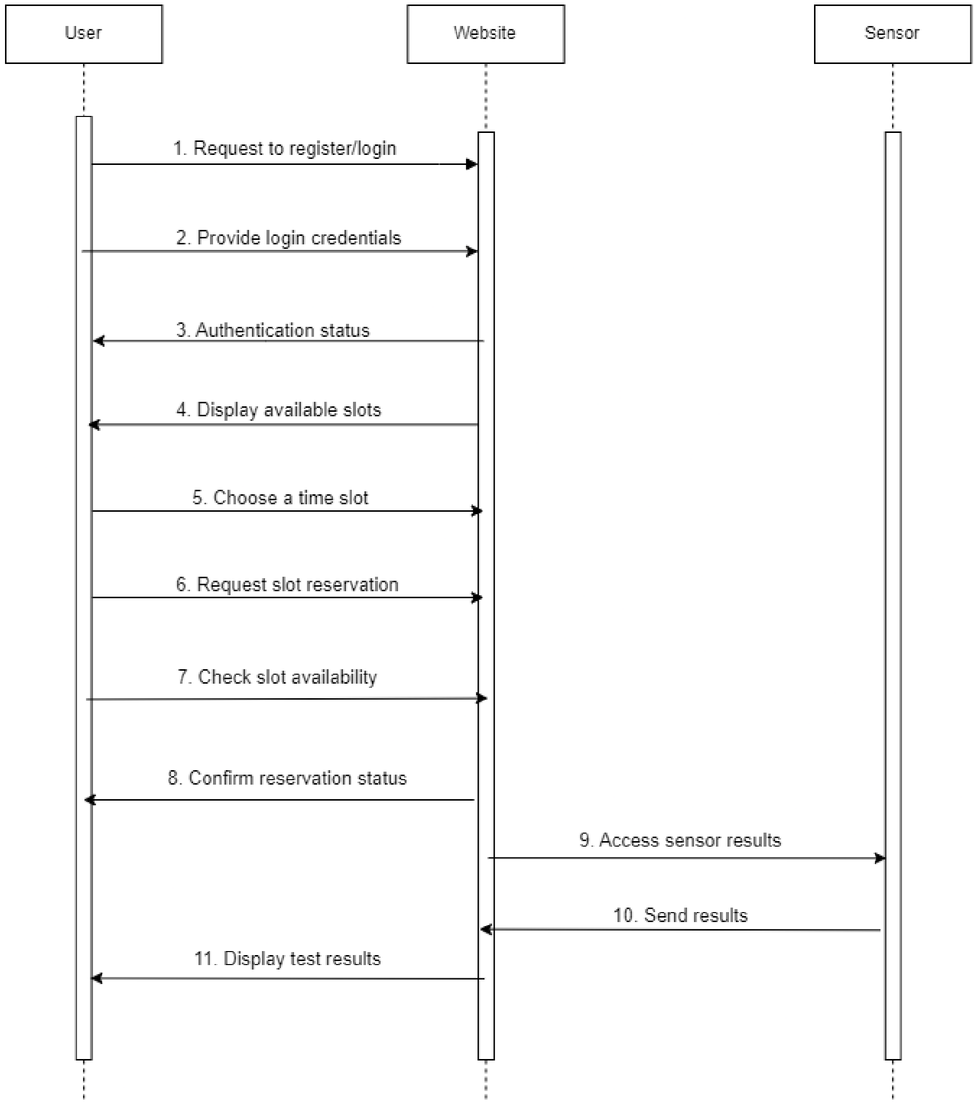

Figure 4.2: User Sequence Diagram

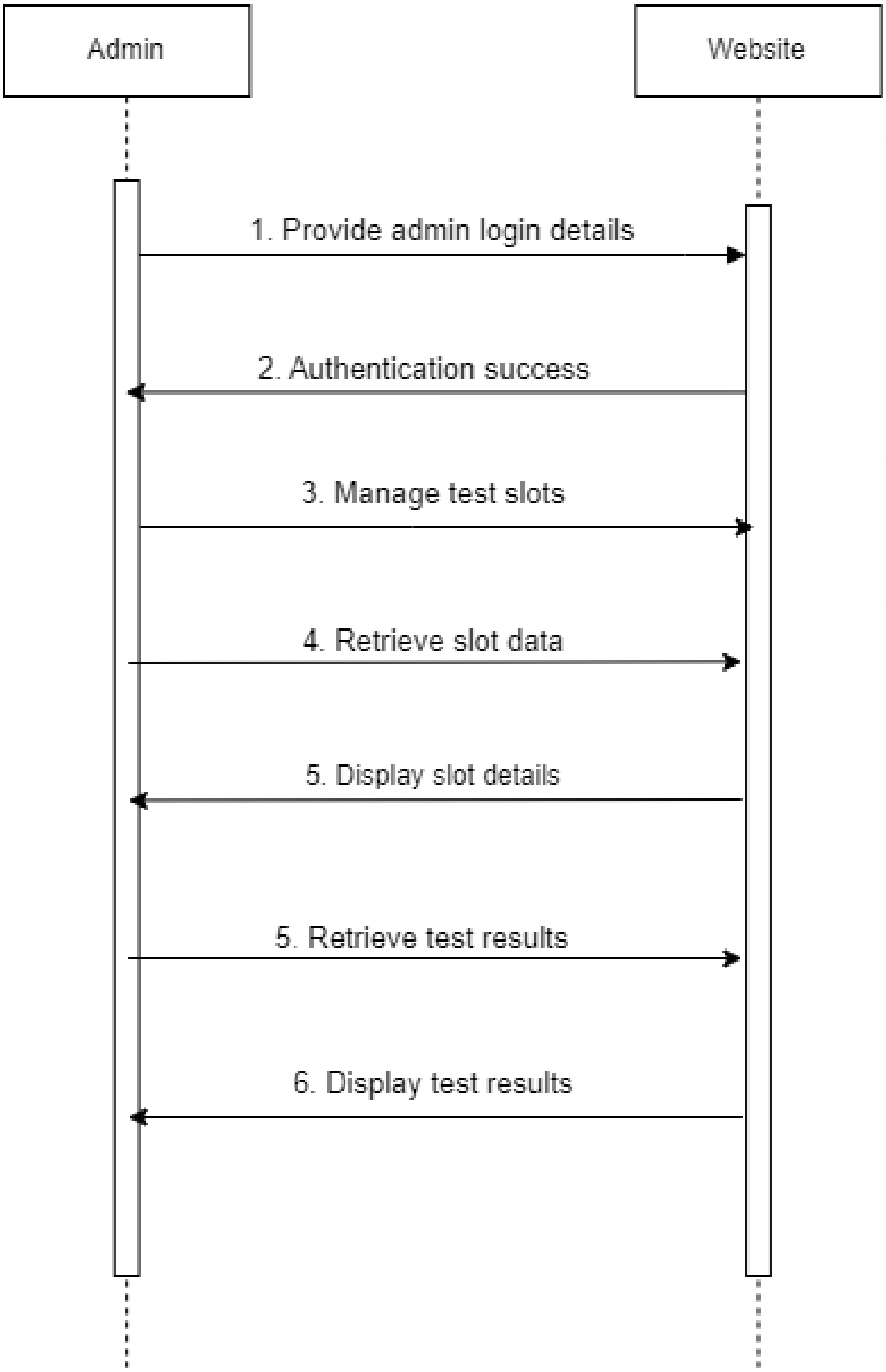

Figure 4.3: Admin Sequence Diagram

4.3 Module Division

4.3.1 Sensor Integration Module

The Sensor Integration Module is a critical component responsible for seamlessly incorporating data from ldr and ultrasonic sensors. It manages the real-time detection and assessment of driver mistakes during the driving test, ensuring accurate and reliable readings using ldr and Ultrasonic sensors. This module forms the foundation for the evaluation process by continuously monitoring the vehicle's movements.

4.3.2 Control Unit Module

The Control Unit Module serves as the brain of the system, utilizing Arduino technology to analyze input from sensors and make real-time decisions during the driving test. It orchestrates the functionalities of the system, ensuring efficient processing of sensor data and facilitating prompt communication with the Regional Transport Officer (RTO).

4.3.3 Power Supply Module

The Power Supply Module is responsible for ensuring a stable and sufficient DC voltage supply to the onboard components, including sensors and the Arduino microcontroller. It guarantees the reliable and continuous operation of the system during driving tests.

4.4 Work Schedule - Gantt Chart

To sum up, this chapter thoroughly examined the important facets of our project, starting with a thorough System Overview that offered understanding of the overall design and operation. The section on Architectural Design examined the system's architecture and clarified the fundamental design ideas that influenced its creation. By breaking the system down into smaller, more manageable parts, Module Division clarified the functions and relationships between them.

The Gantt Chart ensures transparency and a clear execution roadmap by graphically outlining our tasks and deadlines. The foundation established thus far prepares the reader for a thorough examination of each component in the next sections.

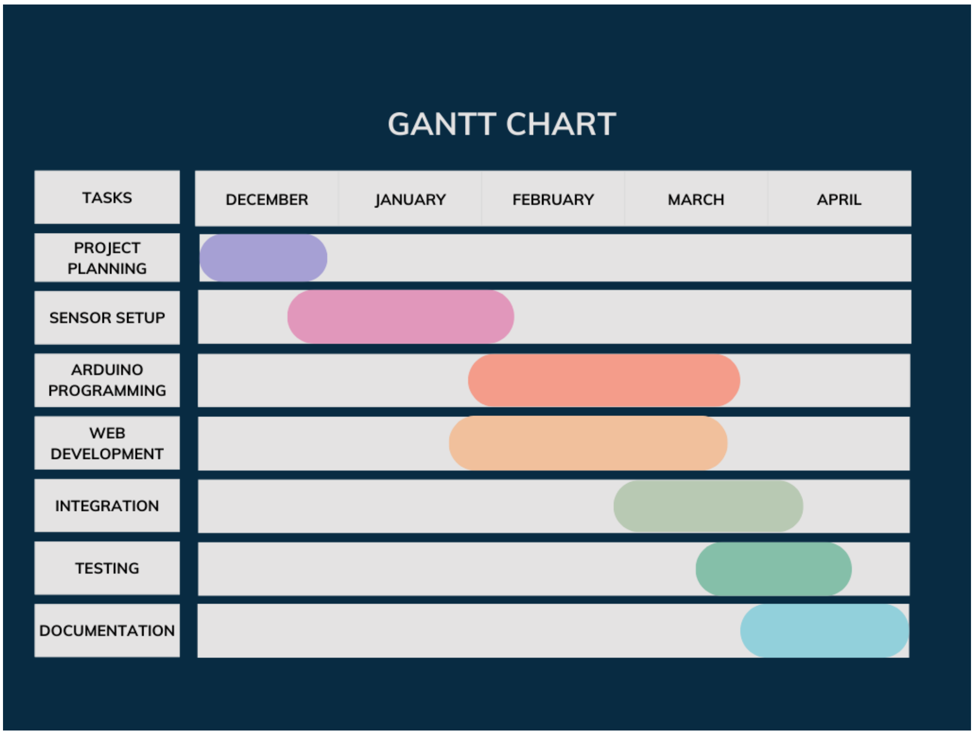

Figure 4.4: Gantt Chart

Chapter 5

System Implementation

The system implementation chapter delves into the technical intricacies of deploying the proposed solution to combat corruption within driving test environments. It provides a concise overview of the methodologies, algorithms, and technological components utilized in the development process. By detailing the step-by-step implementation of hardware and software elements, this chapter offers readers insights into the functional aspects of the solution, its capabilities, and its potential to enhance the integrity of driving test assessments. Through a succinct exploration of the system implementation process, stakeholders can grasp the essential framework necessary for successful deployment and operation.

5.1 Proposed Methodology/Algorithms

The method proposed for Automated H-Test is a track installed with sensors .The key functionalities: Identification of Components, Setup and Interfacing of Ultrasonic Sensors, Integration of Laser Diode and LDR, Programming the Arduino UNO R3 Board, Testing and Calibration, Integration with PC and IoT Platform and Feedback.

5.1.1 Identification of Components

The first step in implementing the system is to gather all the necessary components. This includes ultrasonic sensors, a laser diode, an LDR (Light Dependent Resistor), an Arduino UNO R3 board, a breadboard, and a PC.[6]

5.1.2 Setup and Interfacing of Ultrasonic Sensors

Ultrasonic sensors play a crucial role in detecting the position and movement of vehicles during the driving test. These sensors need to be strategically positioned along the test route. Interfacing the sensors with the Arduino UNO board involves connecting the sensor's trigger and echo pins to digital input/output pins on the Arduino, and providing power and ground connections.

5.1.3 Integration of Laser Diode and LDR

The laser diode and Light Dependent Resistor (LDR) play a pivotal role in the Automated H-Test project, specifically in the monitoring of line-cutting incidents during driving examinations. The laser diode functions as the emitter of a focused beam of light, essentially delineating the designated path that vehicles are required to follow during the test. Conversely, the LDR serves as the detector, strategically positioned to intercept the emitted laser beam. When a vehicle crosses the designated line, thereby obstructing the path of the laser beam, the LDR detects a reduction in light intensity, signaling a line-cutting incident.

The process of integrating these components with the Arduino microcontroller involves meticulous attention to detail. Firstly, the laser diode and LDR must be connected to the Arduino's analog input/output pins. This ensures that the Arduino can accurately receive and process data from these sensors. Additionally, appropriate power and ground connections are established to provide the necessary electrical supply for the smooth operation of the components. These connections are crucial for maintaining stability and reliability throughout the testing process. [7]

5.1.4 Programming the Arduino UNO R3 Board

Programming the Arduino UNO board entails a multifaceted process aimed at enabling it to execute a range of functions crucial to the operation of the Automated H-Test system. These functions encompass tasks such as acquiring sensor data, identifying irregularities in driving behavior, and facilitating the transmission of real-time notifications. Accomplishing this involves the creation of code within the Arduino Integrated Development Environment (IDE), utilizing the C/C++ programming language.

Within this code, sophisticated algorithms are devised to meticulously handle sensor data. These algorithms are designed not only to capture data from various sensors but also to process it intelligently. Furthermore, the code is structured to detect any deviations from the anticipated maneuvers expected during the driving test. This involves implementing logic that analyzes sensor inputs to ascertain whether the vehicle is adhering to the prescribed path and executing maneuvers correctly.

Additionally, the Arduino code is engineered to facilitate the seamless transmission of notifications to a connected PC in real-time. This aspect of the programming encompasses establishing communication protocols to relay pertinent information regarding test performance and any detected irregularities. By implementing robust code that orchestrates these functionalities, the Arduino UNO board becomes a sophisticated controller within the Automated H-Test system, enabling it to carry out its assessment tasks with precision and efficiency.

5.1.5 Testing and Calibration

Testing and calibration represent pivotal phases in the deployment of the Automated H-Test system. Upon completion of the hardware setup and Arduino programming, meticulous attention is directed towards subjecting the system to exhaustive testing and calibration procedures. These endeavors encompass a series of trial runs of the driving test, meticulously observing and analyzing the system's performance under various conditions.

During the testing phase, the system's functionality is scrutinized comprehensively to validate its efficacy in accurately assessing driving capabilities. This involves simulating real-world driving scenarios and evaluating the system's ability to capture and interpret sensor data reliably. Moreover, the system's response to different driving maneuvers and environmental factors is carefully assessed to ensure robust performance across diverse conditions.

Simultaneously, calibration procedures are conducted to refine the system's accuracy and reliability. Calibration efforts may entail fine-tuning sensor parameters and algorithms to optimize the detection of vehicle positions, movements, and line-cutting incidents. By meticulously adjusting system settings and parameters, calibration endeavors aim to enhance the system's precision and minimize potential inaccuracies in test results.

Overall, the testing and calibration processes serve as critical phases in the development and refinement of the Automated H-Test system. Through rigorous testing and meticulous calibration efforts, the system's performance is validated, ensuring its readiness for deployment in real-world driving examination scenarios.

5.1.6 Integration with PC and IoT Platform

The integration of the Automated H-Test system with both a personal computer (PC) and an Internet of Things (IoT) platform is a pivotal aspect of its functionality and versatility. This integration facilitates seamless communication and enhances the system's capabilities for monitoring and managing driving tests.

The Arduino UNO board serves as the central hub for data acquisition and communication. It communicates with the PC utilizing serial communication protocols, establishing a reliable connection for data exchange. Through this communication channel, the PC receives real-time data streams from the Arduino, allowing it to analyze and process the information effectively.

Upon receiving data from the Arduino, the PC undertakes various tasks, including data analysis, result generation, and real-time notifications. By leveraging its computational capabilities, the PC can swiftly process incoming data streams and generate notifications regarding driving test performance, irregularities, and any detected safety violations.

Furthermore, the Automated H-Test system boasts the capability for integration with an IoT platform, further extending its functionality and accessibility. This integration enables remote monitoring and management of the driving test process, irrespective of geographical location. Through the IoT platform, authorized users can access real-time data streams, monitor test progress, and remotely manage system parameters.

By integrating with both a PC and an IoT platform, the Automated H-Test system ensures seamless communication, enhances data accessibility, and enables efficient monitoring and management of driving tests. This comprehensive integration underscores the system's versatility and adaptability, making it well-suited for a wide range of applications and environments.

5.1.7 Feedback

For feedback, we compare the pattern retrieved using ultrasonic sensor with the desired pattern and also any line cutting has occurred during the test. The result of the test will be visible for the user and admin through the website.

5.2 User Interface Design

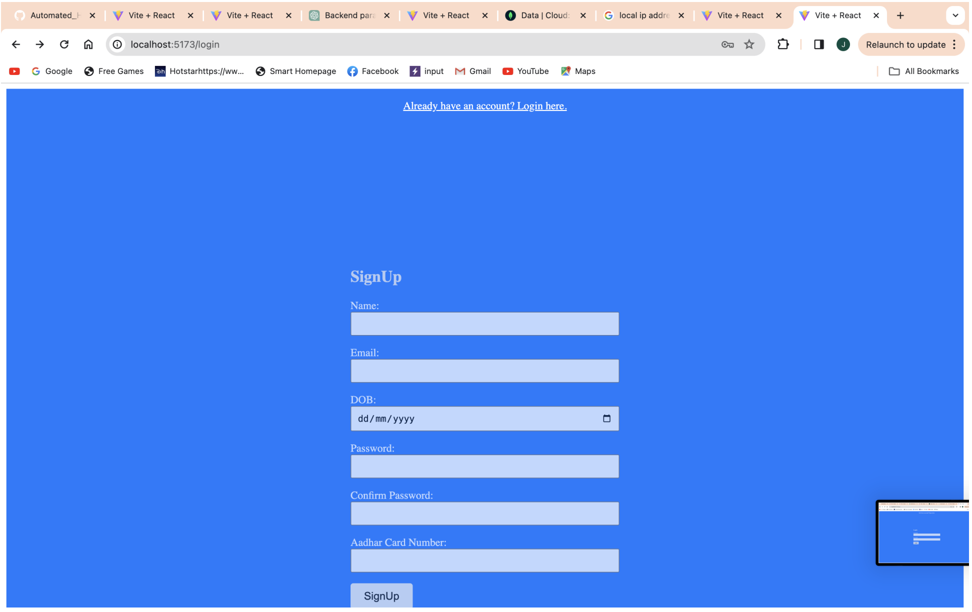

Figure 5.1: SIGNUP

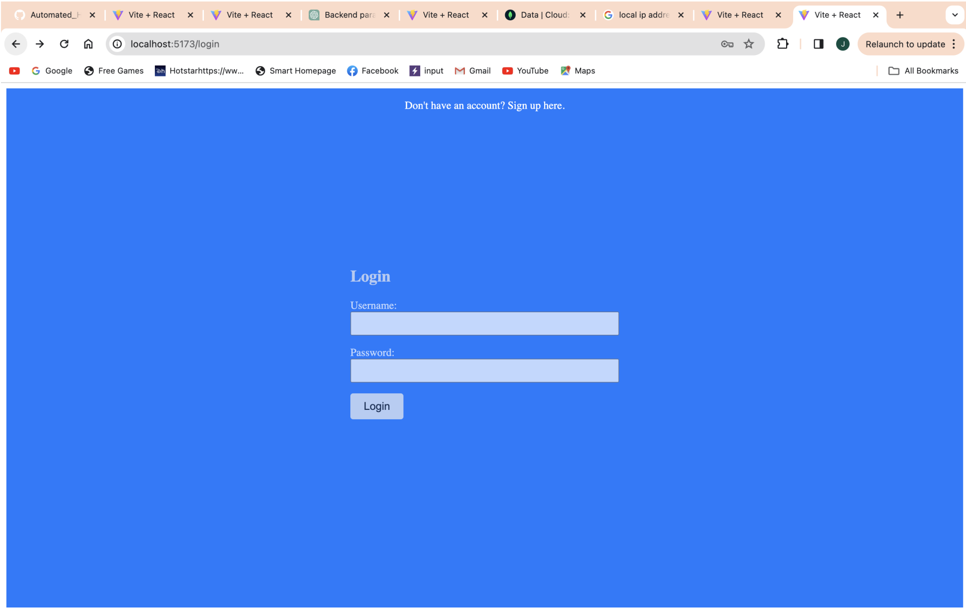

Figure 5.2: LOGIN

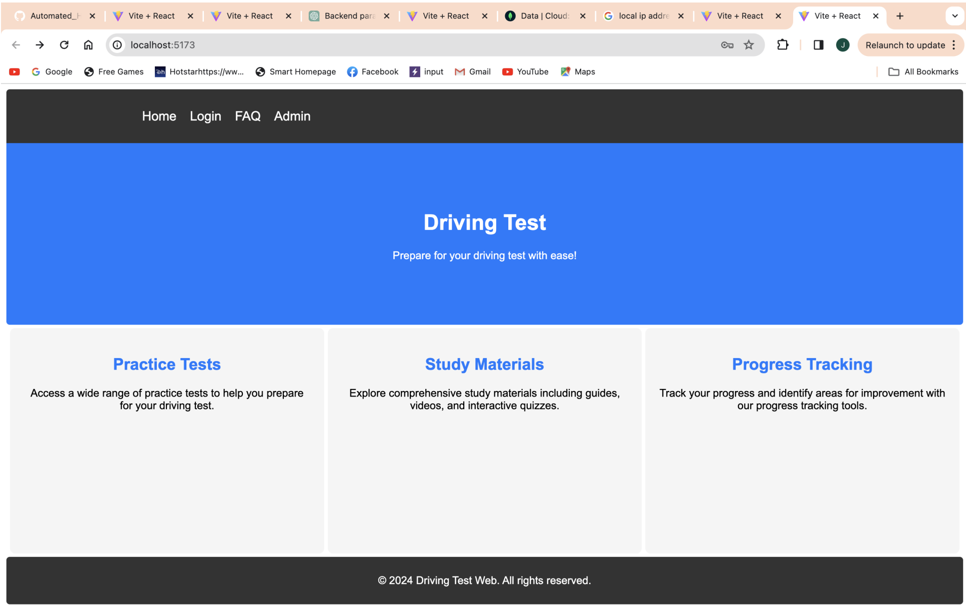

Figure 5.3: HOME PAGE

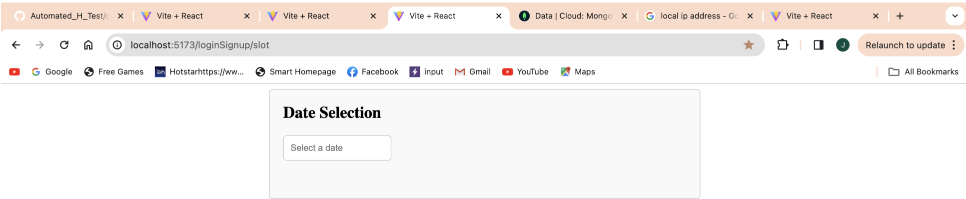

Figure 5.4: DATE SELECTION

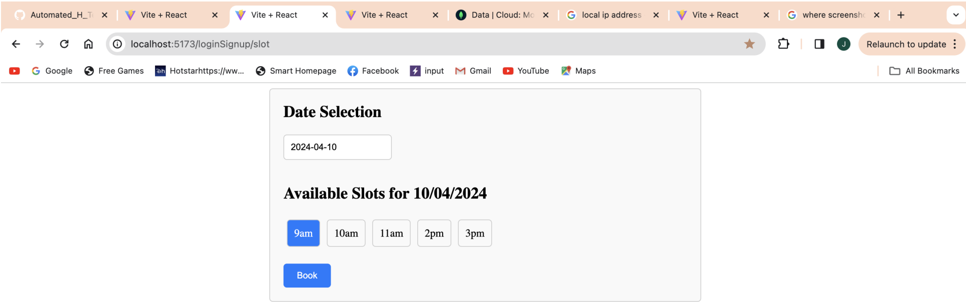

Figure 5.5: SLOT BOOKING

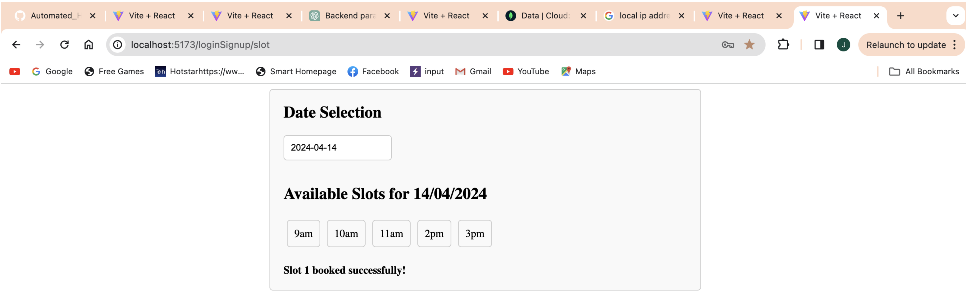

Figure 5.6: BOOKED

5.3 Database Design

Noting its lightweight design, ease of installment, and react js and node js compatibility is why MongoDB is selected.Like other NoSQL databases, MongoDB doesn't require predefined schemas. It stores any type of data. This gives users the flexibility to create any number of fields in a document, making it easier to scale MongoDB databases compared to relational databases.

- **UserSignup:** This table stores user signup information. Each user is identified uniquely by their email (signupemail). Other details such as name, password, and date of birth are also stored.

- **UserStatus:** This table maintains user status information. It tracks the test result and stores it (pass or fail).

- **Slot:** This table stores the slot selected by the user for the test.

5.4 Conclusion

The system implementation chapter encapsulates the convergence of innovative technologies and strategic methodologies aimed at addressing corruption within driving test environments. Through meticulous planning, integration of hardware components, and development of sophisticated algorithms, the proposed solution demonstrates its potential to enhance the accuracy, objectivity, and transparency of driving test assessments. By leveraging real-time data processing, line-cutting detection algorithms, and automated notification systems, the implemented solution not only detects irregularities but also fosters a culture of accountability and integrity within regulatory bodies. Moving forward, continuous refinement and optimization of the system will be essential to ensure its efficacy in combating corruption and promoting road safety. As we reflect on the journey of implementation, it becomes evident that technological advancements hold the key to transforming traditional practices and safeguarding the integrity of driving test procedures for generations to come.

Chapter 6

Results and Discussions

The automated H-Test track was assembled and tested. Different scenarios were tested. The results and analysis are shown here. This chapter details the results and analysis that we got from the proposed work.

6.1 Overview

Highlighted the system's effectiveness in detecting the pattern break or line cutting and communicating to the admin.Additionally, further analysis identifies trends and areas for improvement, providing valuable insights into the system's performance and potential enhancements.

6.2 Testing

6.2.1 Scenario 1: Test-Pass

The test passing testing phase validates the system's proficiency in accurately identifying the successful completion of the driving test by detecting no pattern break or line cutting.

6.2.2 Scenario 2: Test-Failed

The test failure testing phase validates the system's proficiency in accurately identifying the failure in completion of the driving test by detecting possible pattern break or line cutting.

6.3 Arduino Results

6.3.1 Pattern break

The Arduino records the car's movement along the track as a pattern using ultrasonic sensors. This pattern is then compared with the correct pattern to determine whether the test is passed or failed.

6.3.2 Line Cutting

The laser diode and LDR placed at the edges of the track detect whether the car is cutting the border line.If so it results in test failure.

6.4 Conclusion

To sum up, we have detailed the testing phases and the results. We used different scenarios to check the test passing case and test failure case. Looking closer, we found ways to make it even better. The main point is our results show how promising this system is for improving driving skill.

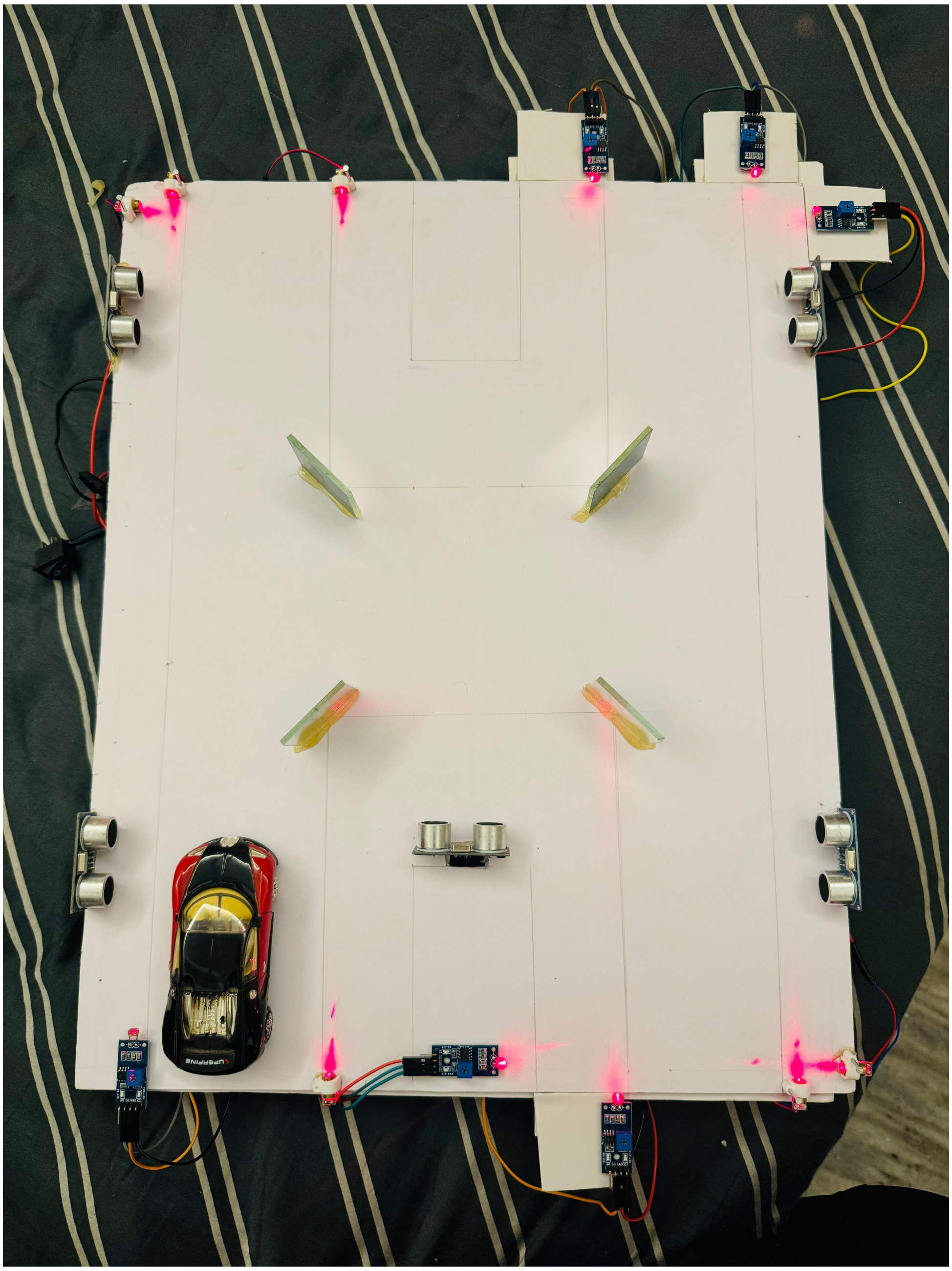

Figure 6.1: Automated track

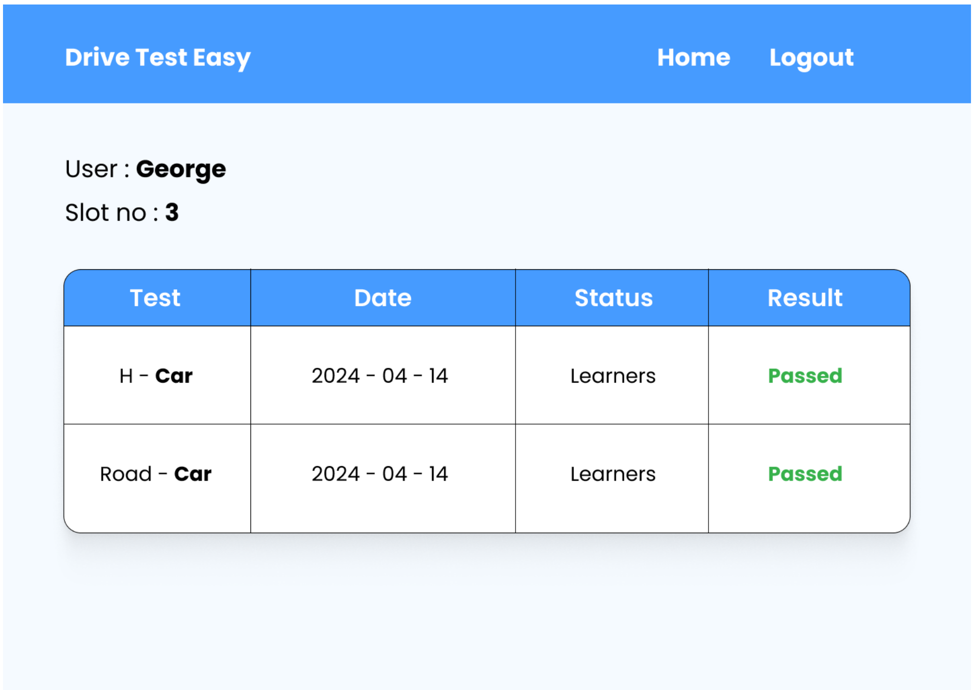

Figure 6.2: Test passing case

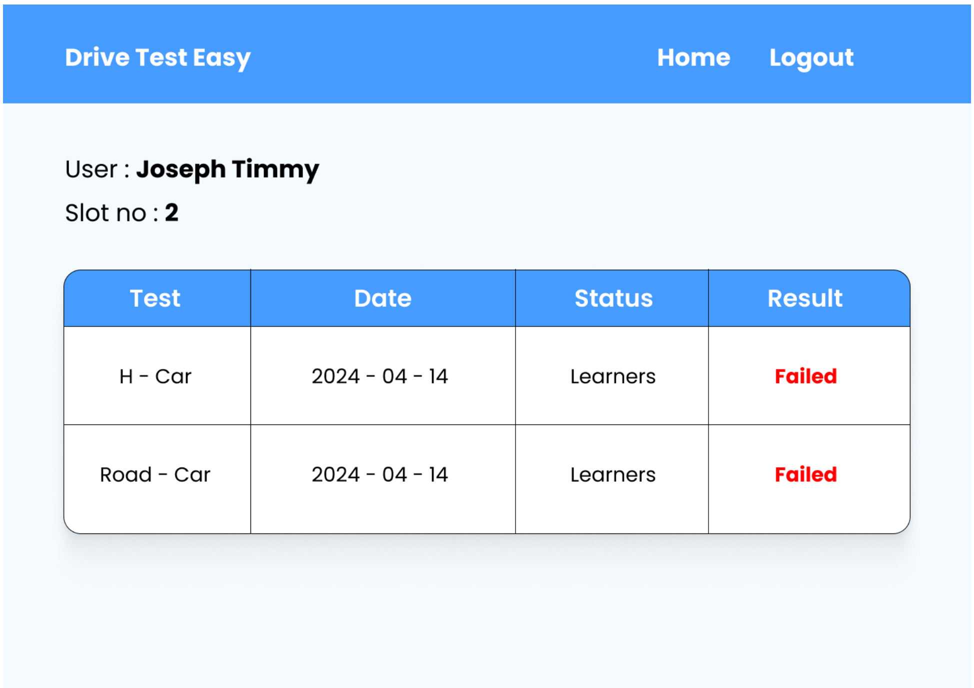

Figure 6.3: Test failure case

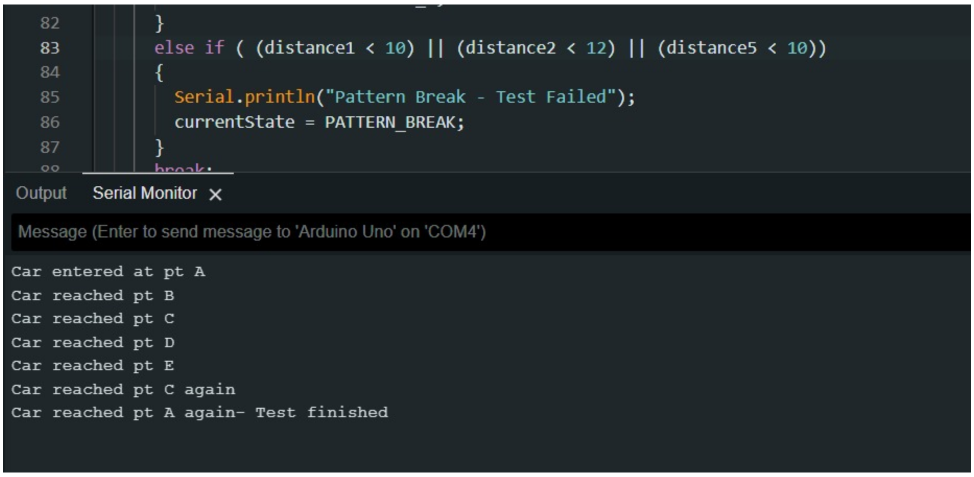

Figure 6.4: Arduino pattern readings

Chapter 7

Conclusions and Future Scope

The "Automated H-Test" project concludes with the successful implementation of an innovative system aimed at enhancing the evaluation process for driving tests. The integration of LDR, laser diode and ultrasonic sensors on a strategically designed H-shaped track, coupled with Arduino technology, provides real-time monitoring of drivers' maneuvers. The web-based registration and slot booking system streamlines the process for aspiring drivers, while the admin interface empowers Regional Transport Officers (RTO) with efficient slot management and immediate access to test results.

Looking ahead, there are exciting possibilities for extending the project's capabilities. Integration of advanced computer vision algorithms could further enhance the system's accuracy in assessing driving skills. Incorporating machine learning for predictive analysis based on historical data could provide insights into potential areas of improvement for drivers. The introduction of smart wearable devices for drivers could enable real-time feedback and performance monitoring during the test. Additionally, exploring the integration of emerging technologies, such as artificial intelligence and Internet of Things (IoT), could open avenues for creating a more comprehensive and intelligent driving evaluation system. The project's success lays a solid foundation for future advancements that could contribute to the ongoing evolution of driving test methodologies and road safety measures.

References

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[6] A. Rai, M. Rai, N. Jogi, B. Rai, S. Rai, and D. Rasaily, "Low cost laser light security system in smart home," pp. 1–4, 2019.

[7] H. K. M B, A. G. Kaushik, and Prajeesha, "Smart home surveillance system using ldr technology," pp. 415–421, 2021.

Appendix A: Presentation

AUTOMATED H-TEST

Final Presentation

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Muhammed Shinaz K P (U2003137)
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Joseph Tomy (U2003110)

RSET

May 9, 2024
Guided by: Dr. Tripti C

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AUTOMATED H-TEST

Problem Definition

- The current 'H' test process for driver's licensing faces several challenges, particularly in the accuracy and safety of line-cutting assessments.
- Common issues include subjective evaluations, human errors, and limited real-time feedback.
- These challenges can result in inconsistencies in testing, and in some cases, may compromise road safety.
- The need for a more precise, objective, and technologically advanced solution is evident.

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Purpose and Need

- Corruption Prevention: The system's main goal is to prevent corruption during driving tests by reducing bribery and middleman influence. It ensures fairness and transparency by detecting errors and line-cutting during the test.
- Improved Driver Training: The system enhances driver training by identifying and correcting driving errors and violations, promoting the qualification of skilled drivers for licenses.
- Road Safety Enhancement: The system aims to enhance road safety by reducing the number of untrained or inadequately skilled drivers on the road. This can help decrease the likelihood of accidents and traffic violations.

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Project Objective

- To understand the significance of line cutting in 'H' tests and its implications for road safety.
- To explore the role of sensor technology in enhancing the accuracy and precision of line cutting.
- To discuss the benefits of using sensors, including improved safety and real-time feedback.
- To examine the challenges and considerations associated with sensor technology in driving tests.
- To provide insights into future trends, such as autonomous testing vehicles.

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1. Smart Driving Test Track

- Automated license issuance enhances road safety by minimizing illegal licenses and ensuring that only well-trained drivers receive licenses. This system boosts transparency and expedites the licensing process, reducing the occurrence of accidents.
- The smart driving test track eliminates the need for on-site monitoring by the Regional Transport Officer (RTO), mitigating human errors like observation bias, favoritism, and corruption.
- The goal of the smart driving test track is to automate the traditional license issuance system, addressing limitations of the manual process and reducing accidents caused by untrained drivers.

1. Smart Driving Test Track

Advantages:

- Using sensors streamlines the license issuance, reducing accidents from untrained drivers.
- Eliminating on-field monitoring cuts errors and corruption, while a smart test track boosts transparency and fraud prevention.

Disadvantages:

- Automation may introduce technical failures, affecting assessment accuracy.
- The smart driving test track requires substantial investment and may struggle to adapt to diverse driving conditions, potentially limiting its real-world effectiveness.

2. Driving License Test Automation Using VB

- The paper introduces a technology-driven approach for driving license testing, offering enhanced efficiency and transparency compared to manual procedures.
- The proposed system incorporates an 8051 controller-based module and a VB-based virtual instrument to automate the manual testing process.
- The system detects the test vehicle's motion on the track and assesses specific conditions, including covering the complete path, avoiding edges, and maintaining a non-zero speed.
- If all conditions are met, a pass result is displayed; otherwise, a fail report is generated, ensuring a streamlined and automated testing process.

2. Driving License Test Automation Using VB

Advantages:

- The automated system reduces human involvement, minimizing opportunities for manipulation and negotiation in driving license testing.
- Improved accuracy in assessing driving skills, as the system uses a controller module and virtual instrument to automate the test process.

Disadvantages:

- The available sources offer limited insight into potential drawbacks or limitations of the proposed system, prompting the need for further research.
- Additional research or analysis is necessary to fully uncover any potential disadvantages or challenges associated with the system's implementation.

3. Development of Test RIG for Automated Driving Test Track and Issuing License Using LabVIEW

- The paper outlines an "H" track evaluation for assessing a candidate's vehicle control skills.
- Successful completion without hitting poles or crossing intersections deems the ground test a pass.
- Current procedures rely on human monitoring, posing potential risks of result tampering.
- The paper's smart e-application employs block diagrams with array functions, structures, loops, and local variables, enabling hierarchical use of Virtual Instruments (VIs).

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AUTOMATED H-TEST
Literature Survey

3. Development of Test RIG for Automated Driving Test Track and Issuing License Using LabVIEW

Advantages:

- The paper introduces a ground test for evaluating vehicle control abilities.
- LabVIEW block diagrams enable hierarchical use and reusability of Virtual Instruments (VIs), supported by a logic level converter and a data acquisition system (DAQ) card for accurate data collection.

Disadvantages:

- The ground test relies on human monitoring, introducing the potential for errors and tampering with results.
- The paper doesn't validate the ground test's accuracy, lacks information on LabVIEW block diagram limitations, and provides no specifics on the logic level converter and data acquisition system (DAQ) card's performance.

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4. Automation of driving license test using wireless sensor network

- The paper focuses on using Arduino and IoT technology to automate the driving license process, enhancing result accessibility.
- Various sensors, including ultrasonic, IR, crash sensor, RFID, and an LCD display, contribute to the automation process.
- The use of RFID technology enables efficient tracking and quick scanning, allowing for easy identification of objects, even when surrounded by others.

4. Automation of driving license test using wireless sensor network

Advantages:

- The automated system aims to raise the standard of license issuance, ensuring qualifications and knowledge among recipients.
- Through testing mental awareness while driving, the automated system contributes to enhanced road safety.
- Using test track sensors, the system quickly detects errors, provides valuable feedback for improvement, and ensures efficient test result access, reducing manual processing time.

Disadvantages:

- The automated system, involving the Arduino UNO board and sensors, may bring additional costs and require regular maintenance.
- Relying on the Arduino UNO board and sensors, the system may encounter technical issues, impacting the accuracy of test

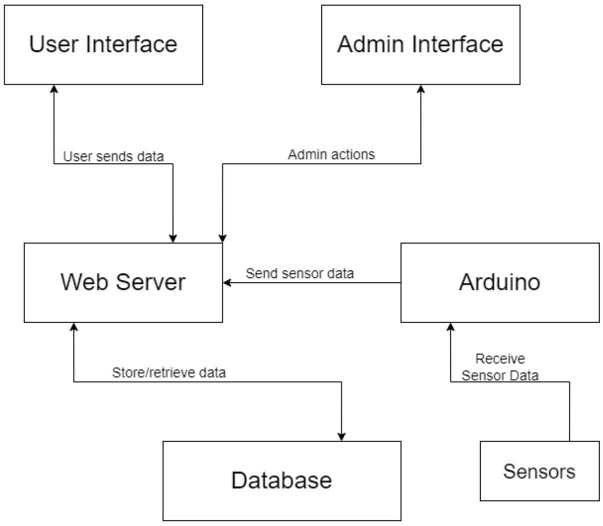
Existing Method

- In order to get Light Motor Vehicle (LMV) permanent driving license, the candidate should drive the vehicle on the H' track and also need to take up a road test.
- The drive on the H track by the candidate is also referred to as a ground test. The ground test is performed to evaluate the candidates ability in controlling the vehicle.
- In the present ground test procedure, the H track is implemented on the field using metal poles.The implementation of H track on the field requires 12 metal poles.
- A candidate is said to have a pass for the ground test, if the candidate completes the H track without hitting the metal poles and also without crossing the line ofintersection between metal poles.
- Monitoring of the current ground test requires human intervention. Hence it is possible to tamper the result.

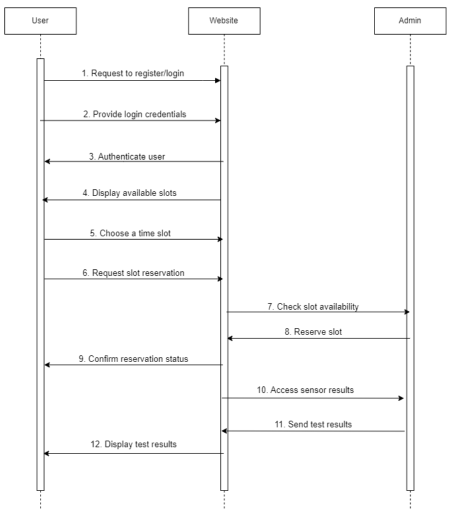
Proposed Method

- Integration of Ultrasonic Sensors:
  - Implement ultrasonic sensors along the H-Test driving track to detect line-cutting and driving errors.
- Real-time Web Interaction:
  - Develop a web-based platform that offers real-time interaction with the sensors.
  - Users can monitor and receive feedback on driving test performance.

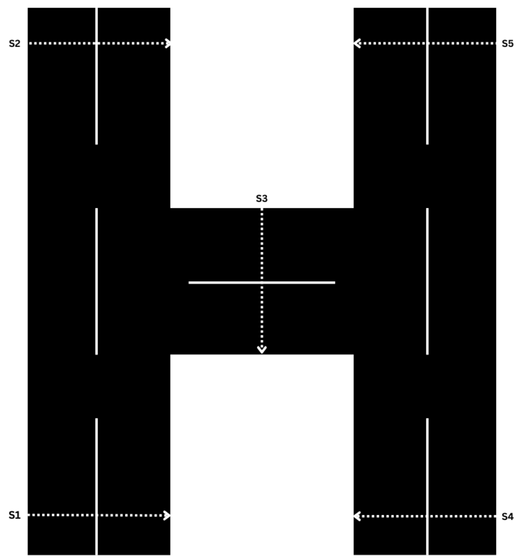
Architecture Diagram



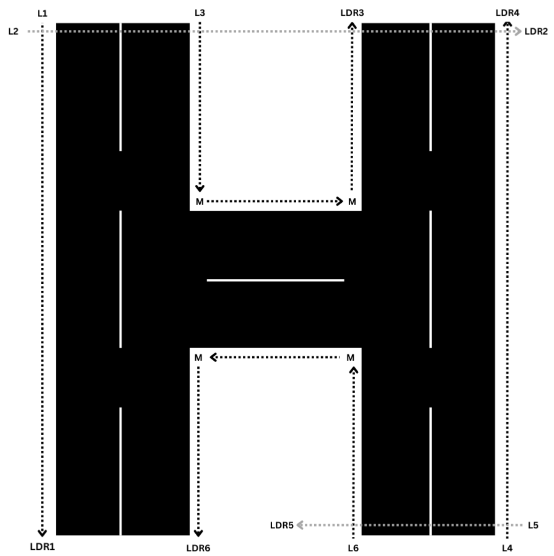
Sequence Diagram



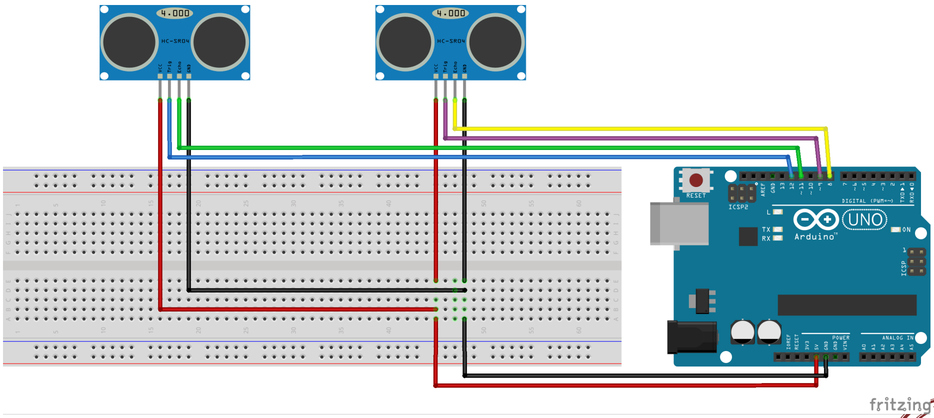
Sensor Placement



Laser and LDR Placement



Circuit Diagram



Modules

- Sensor module
- User Module
- Admin module

Sensor Module

Ultrasonic sensor : Devices that use sound waves with frequencies above the range of human hearing to measure distances and detect objects

What sensors do

Distance Measurement, Object Detection, Proximity Sensing

Some advantages

Non-Contact Operation, Versatility, Wide Range of Detection, Works in Various Environments, Low Power Consumption, Simple Integration, Cost-Effective

User Module

The user interface (UI) in this project is a crucial component as it serves as the point of interaction between the user and the system. Here are some key aspects the design of the user interface:

- Registration Page
- Slot Booking Page
- User Dashboard

Admin Module

Designing the admin interface for an automated H test website involves creating a user interface that allows administrators to manage and oversee the system efficiently.Here are key features and components that could be part of an admin interface:

- Test Configuration:
  - Set up and configure automated H tests.
  - Define parameters, test intervals, and other settings.
- Results Management:
  - View and analyze test results.
  - Filter and search results based on various criteria.
- Alerts and Notifications:
  - Receive and manage alerts related to any issues.
  - Configure notification preferences.
- Audit Trail:
  - Keep a log of administrative actions for auditing purposes.
  - Track changes made by administrators for accountability.

Assumptions

- The project assumes that the implementation of an Internet-of-Things (IoT) platform with ultrasonic sensors and Arduino technology, combined with real-time data transmission, will effectively deter corruption, ensure fairness in driving tests, and improve road safety in the context of developing nations.

Work Breakdown and Responsibilities

- Front-end Development, Integration with Web Server, User Authentication (Ifaz,Joseph)
- Back-end Development, Database Design and Management, Admin Interface (Shinaz,Jovan,Joseph)
- Arduino Programming, Hardware Integration, Real-time Sensor Data (Jovan,Shinaz,Ifaz)

Requirements

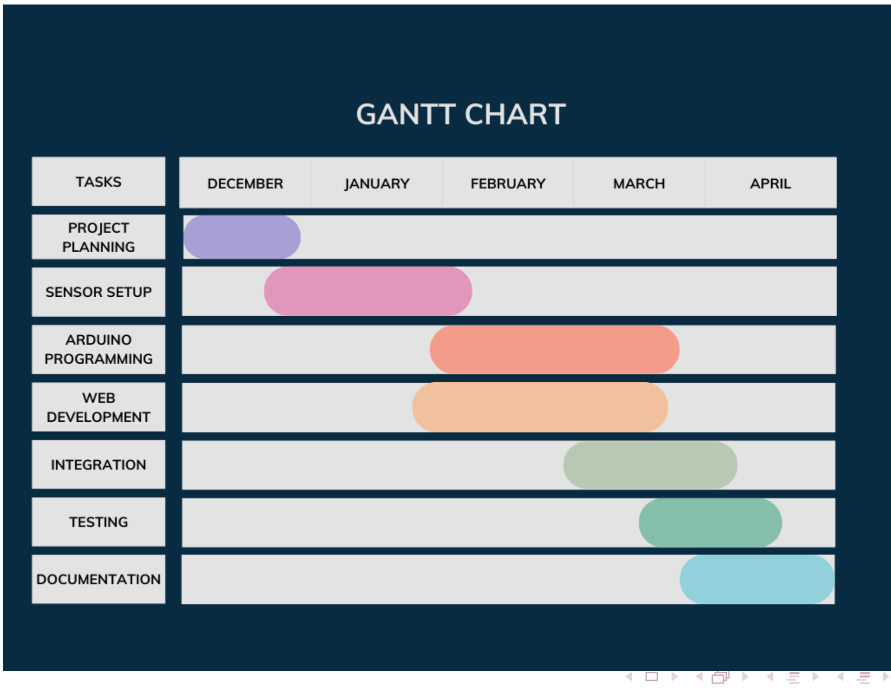
Software Requirements

- Arduino Software (IDE)
- HTML, JavaScript

Hardware Requirements

- Ultrasonic Sensors
- Arduino board
- Breadboard

Gantt Chart



Budget

- Ultrasonic sensors(5 no.s)- 4000
- Laser (6 no.s)- 60
- LDR(6 no.s)-60
- Arduino(3 no.s)- 1200
- Breadboard(3 no.s)- 600
- Jumper wires- 100
- Foam board- 400
- Mirror

Risks and Challenges

- Technical Challenges: Ensuring the reliability and maintenance of IoT devices and data security.
- Cost and Accessibility: The affordability of the project and ensuring access to technology in all regions.
- Infrastructure and Connectivity: Availability of stable infrastructure and internet connectivity.

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Work done(30% Evaluation)

- UI of the Website
- Working of the sensors
- Read and print the pattern which line it is cut

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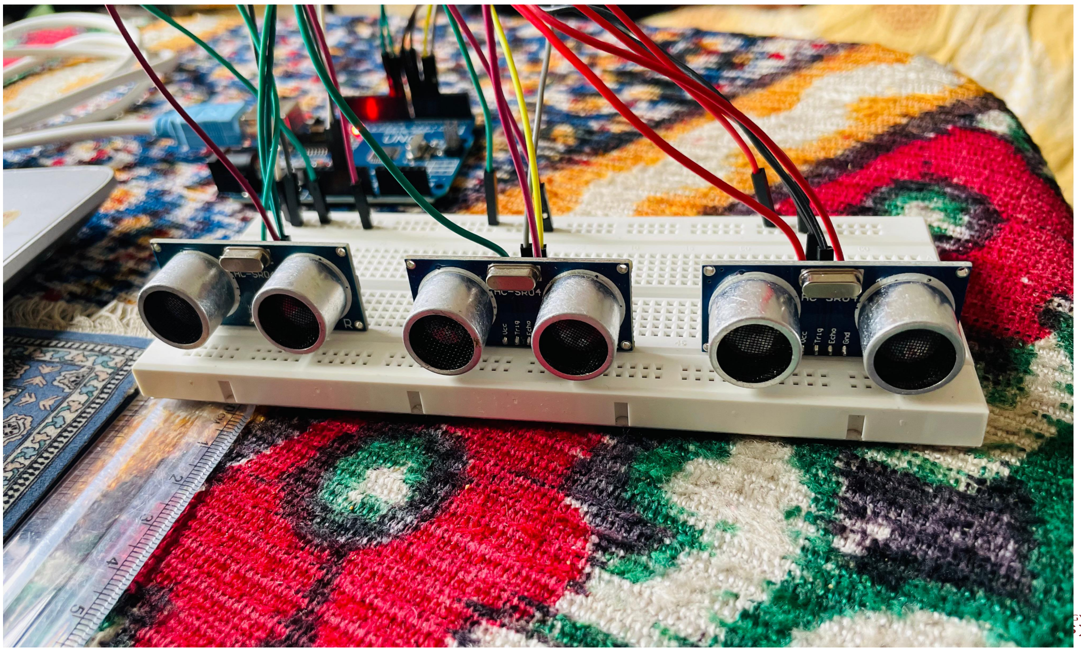
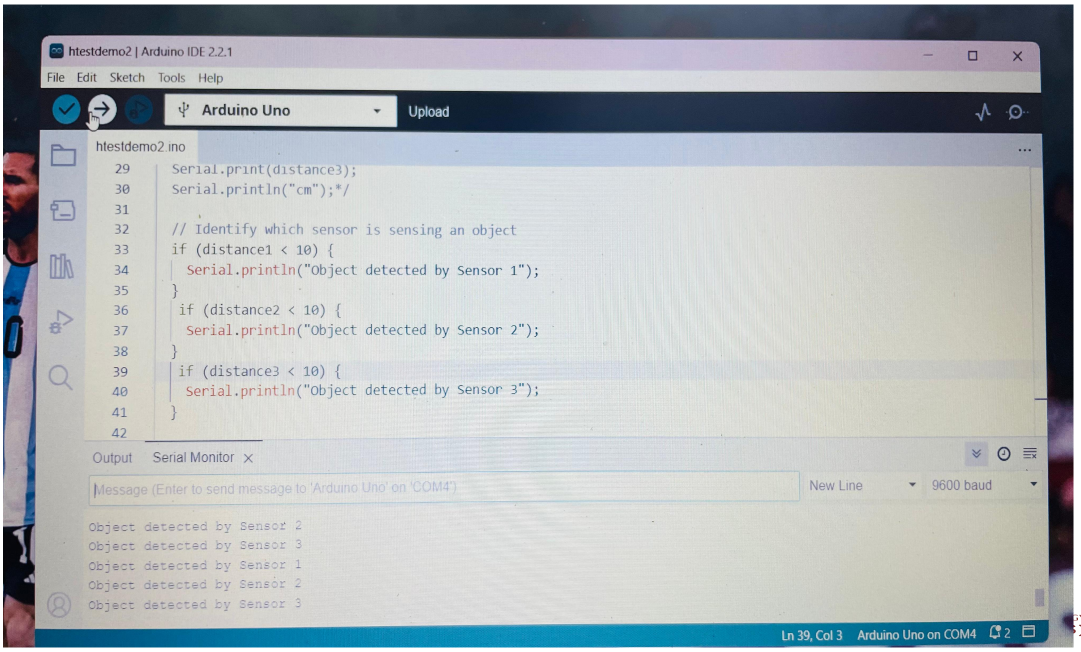
Work done(30% Evaluation)



Work done(30% Evaluation)



Work done(60% Evaluation)

- Planted sensors to a H Track
- Pattern detection.
- Website connected to Database.

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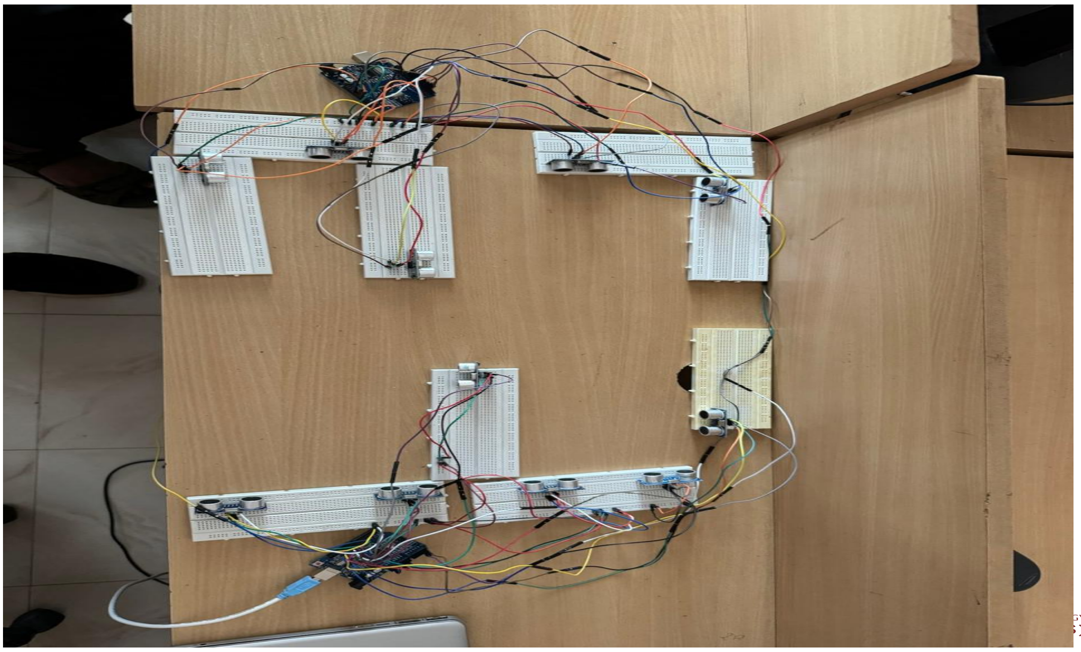
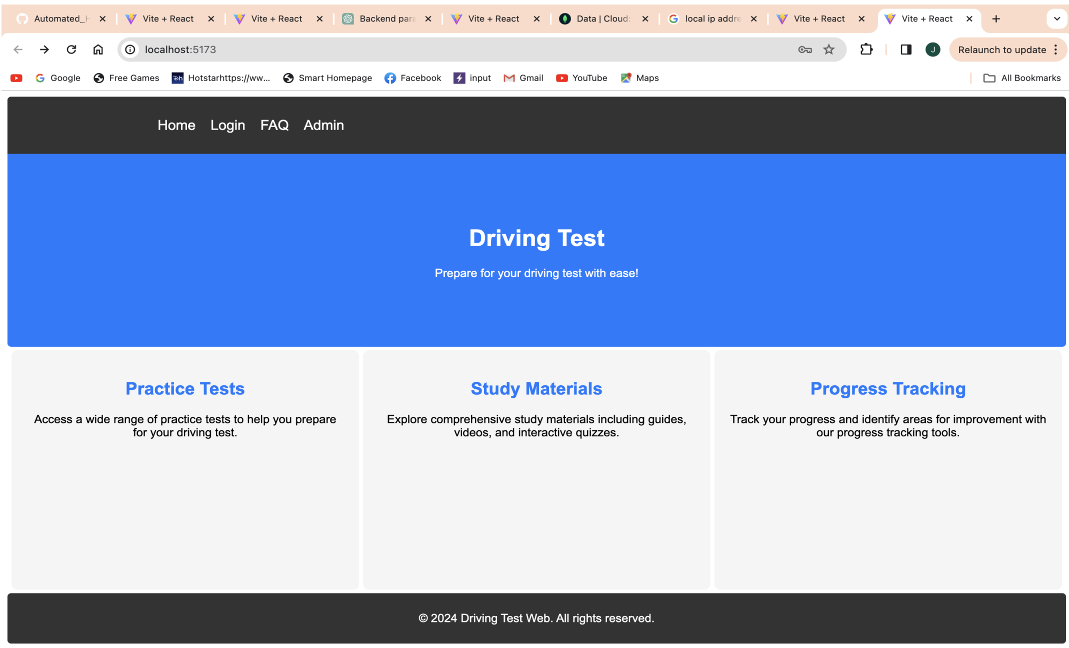
Work done(60% Evaluation)



Work done(60% Evaluation)

Final Output



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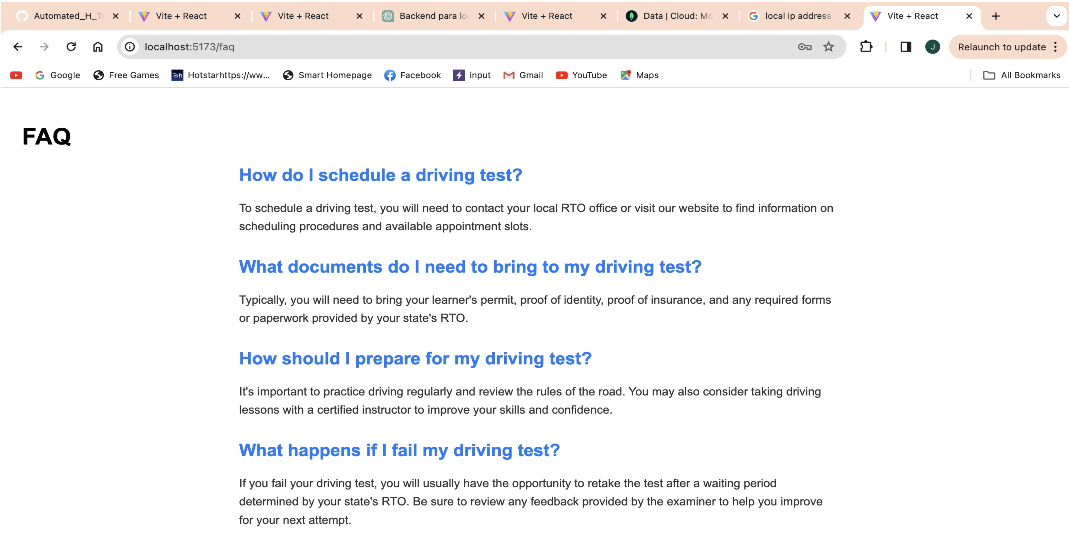

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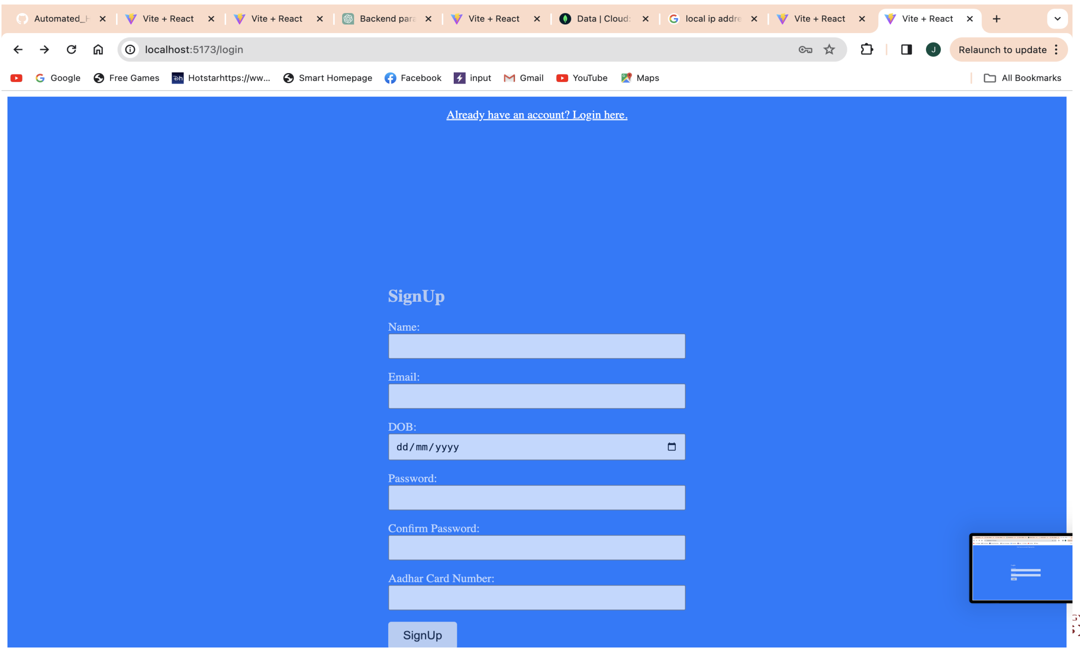

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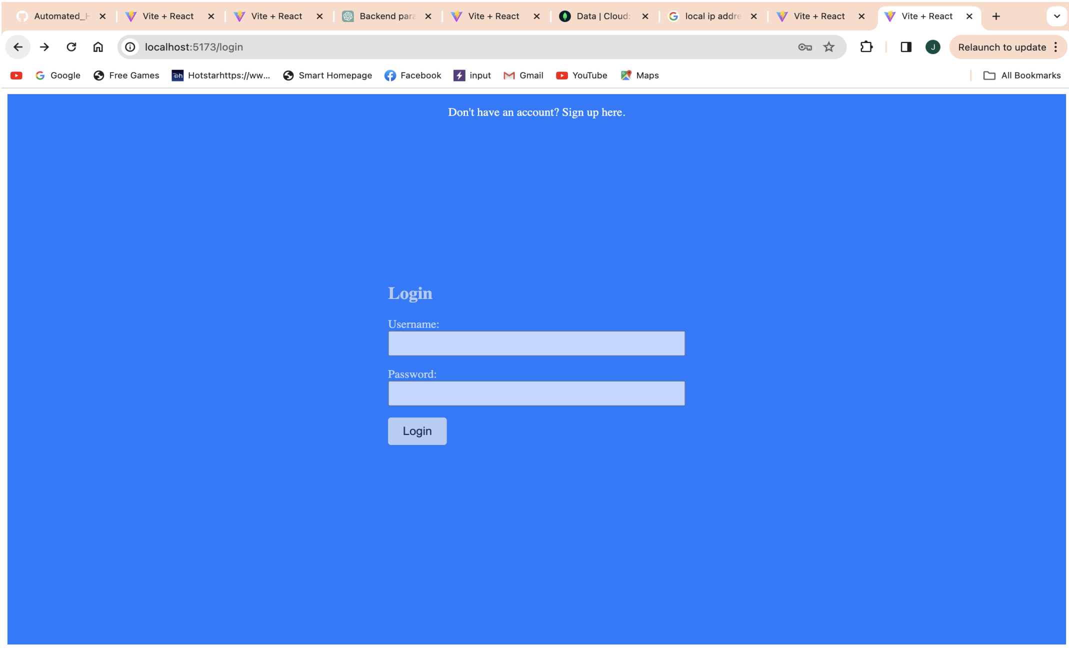

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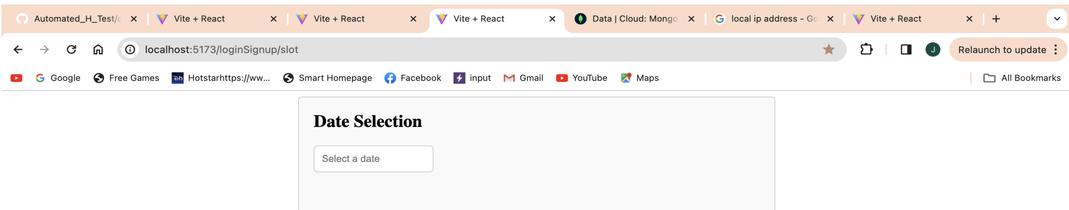

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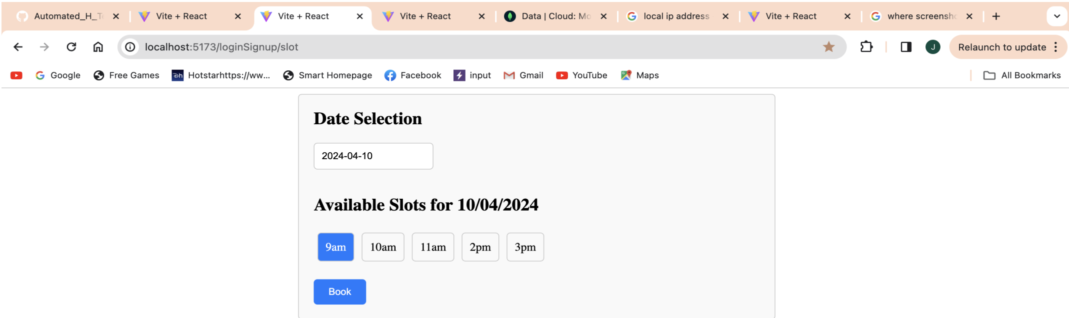
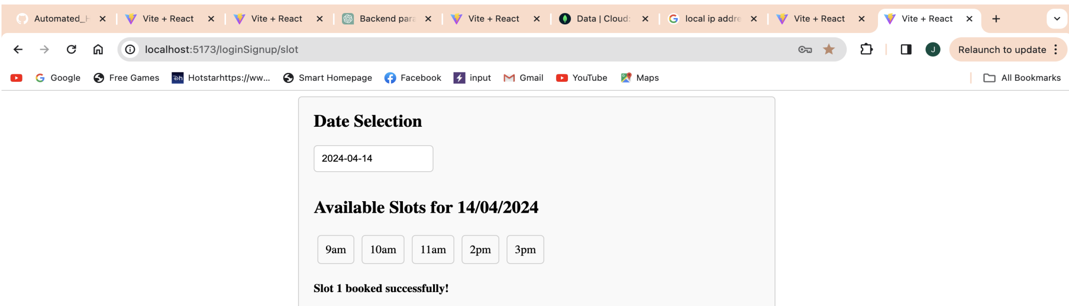


AUTOMATED H-TEST
Final Output

Final Output



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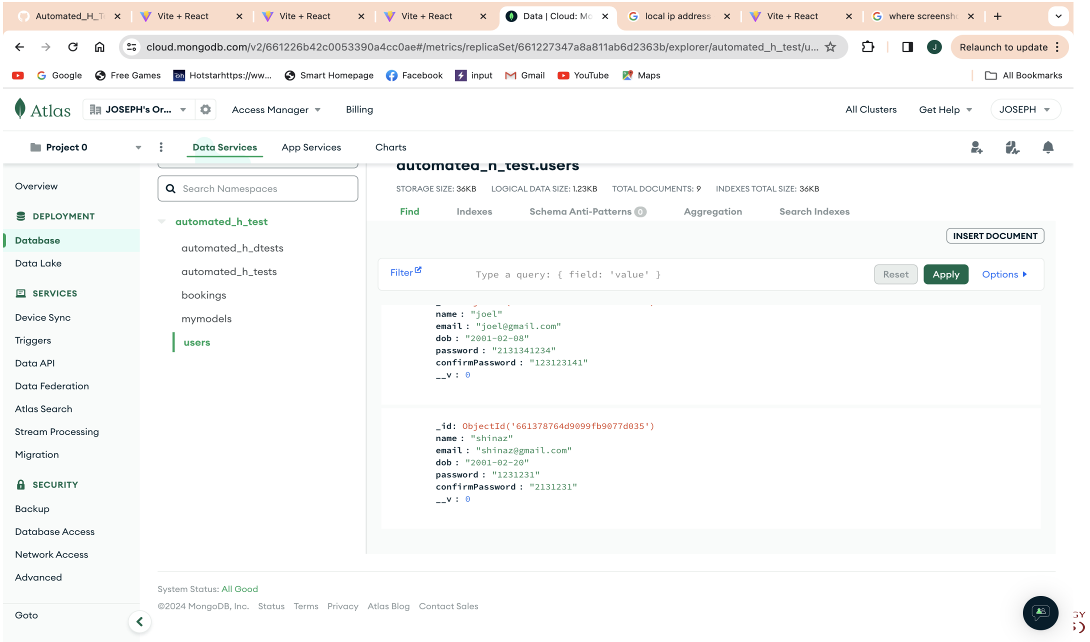
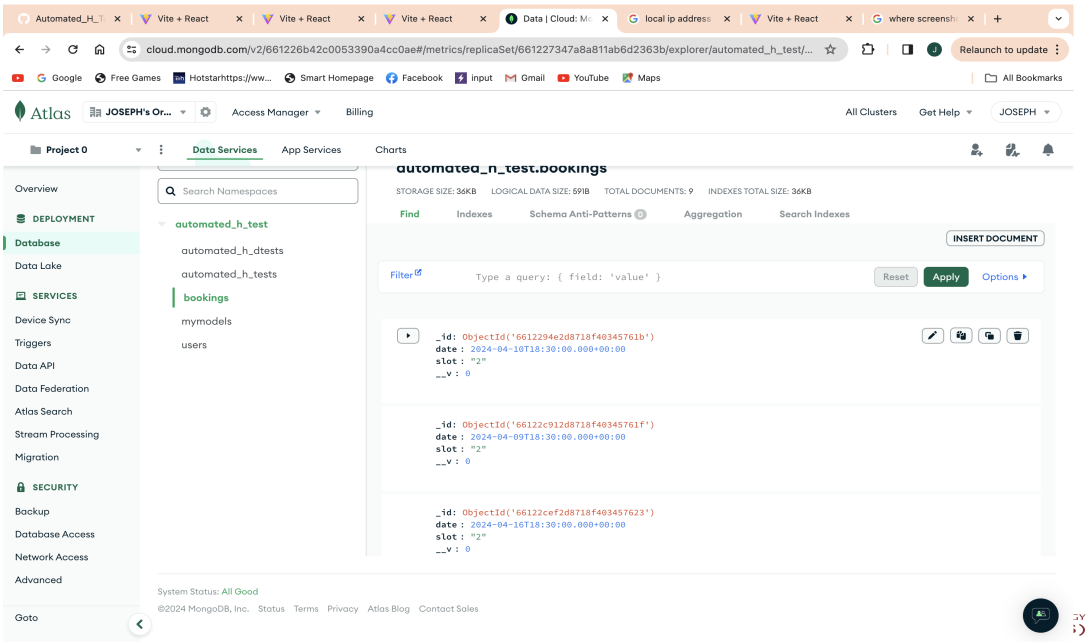


AUTOMATED H-TEST
Final Output

Final Output



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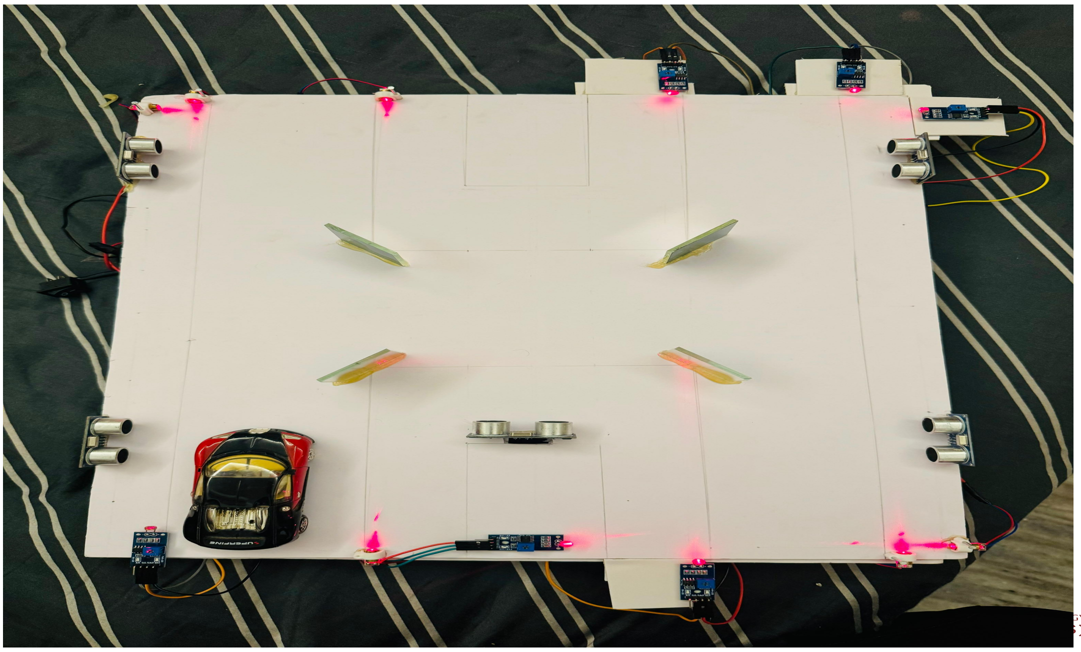

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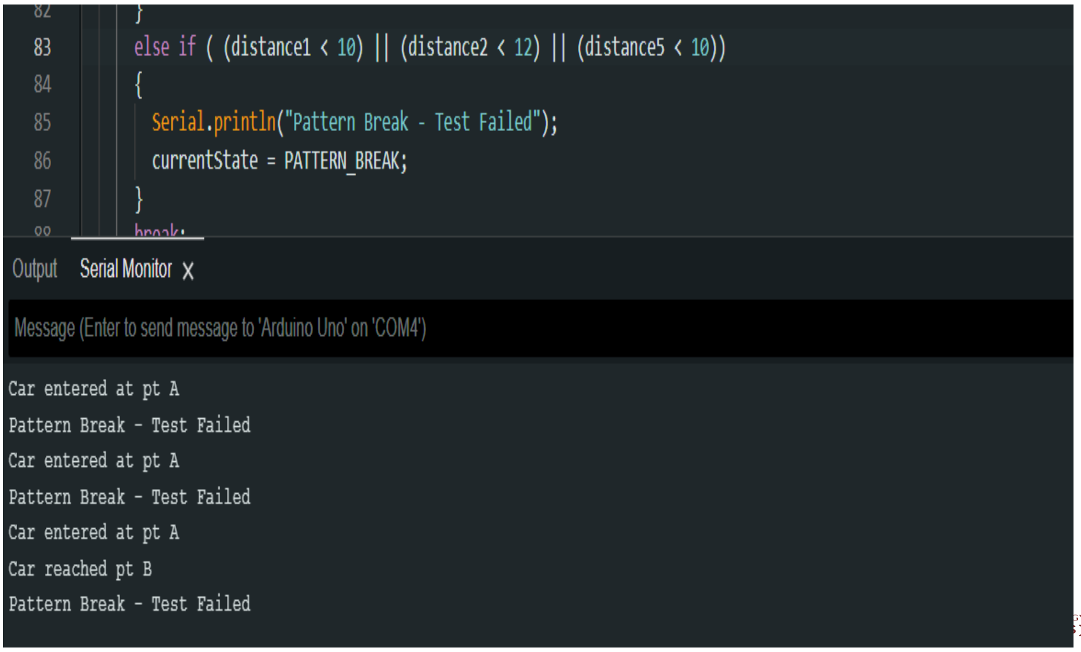


```
}
else if ( (distance1 < 10) || (distance2 < 12) || (distance5 < 10))
{
  Serial.println("Pattern Break - Test Failed");
  currentState = PATTERN_BREAK;
}
break;
```



```
Car entered at pt A
Pattern Break - Test Failed
Car entered at pt A
Pattern Break - Test Failed
Car entered at pt A
Car reached pt B
Pattern Break - Test Failed
```

Final Output

```
}
else if ( (distance1 < 10) || (distance2 < 12) || (distance5 < 10))
{
  Serial.println("Pattern Break - Test Failed");
  currentState = PATTERN_BREAK;
}
break;
```

Output   Serial Monitor ×

Message (Enter to send message to 'Arduino Uno' on 'COM4')

```
Car entered at pt A
Car reached pt B
Car reached pt C
Car reached pt D
Car reached pt E
Car reached pt C again
Car reached pt A again- Test finished
```


Final Output

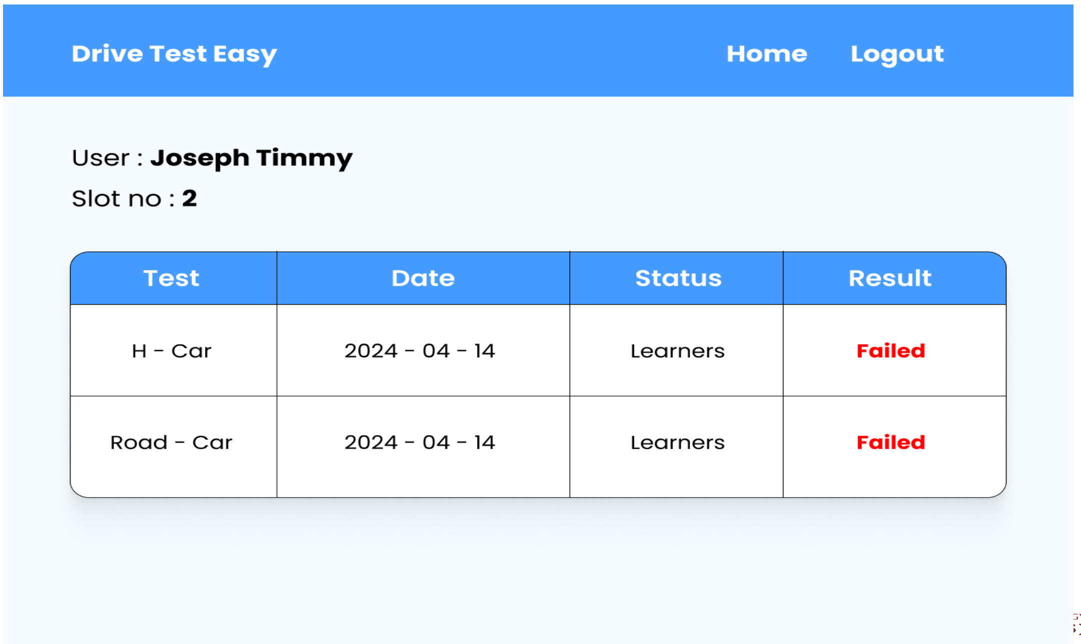
Drive Test Easy   **Home**   **Logout**

User : **George**

Slot no : **3**

Test	Date	Status	Result
H - **Car**	2024 - 04 - 14	Learners	**Passed**
Road - **Car**	2024 - 04 - 14	Learners	**Passed**

Final Output



Test	Date	Status	Result
H - Car	2024 - 04 - 14	Learners	**Failed**
Road - Car	2024 - 04 - 14	Learners	**Failed**

Conclusion

The proposed project represents a promising solution to tackle corruption and enhance road safety in the administration of driving tests in developing nations. By leveraging IoT technology, the project aims to increase transparency, reduce opportunities for bribery, and ensure a fair and effective testing process for all individuals. It not only advances the technical aspects of testing but also prioritizes the safety of people on the roads. While facing challenges and resistance, this innovative approach has the potential to significantly improve the integrity of the driving H-Test and contribute to safer roads with skilled drivers.

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Appendix B: Vision, Mission, Programme Outcomes and Course Outcomes

Vision, Mission, Programme Outcomes and Course Outcomes

Institute Vision

To evolve into a premier technological institution, moulding eminent professionals with creative minds, innovative ideas and sound practical skill, and to shape a future where technology works for the enrichment of mankind.

Institute Mission

To impart state-of-the-art knowledge to individuals in various technological disciplines and to inculcate in them a high degree of social consciousness and human values, thereby enabling them to face the challenges of life with courage and conviction.

Department Vision

To become a centre of excellence in Computer Science and Engineering, moulding professionals catering to the research and professional needs of national and international organizations.

Department Mission

To inspire and nurture students, with up-to-date knowledge in Computer Science and Engineering, ethics, team spirit, leadership abilities, innovation and creativity to come out with solutions meeting societal needs.

Programme Outcomes (PO)

Engineering Graduates will be able to:

1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and Team work: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

10. Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

A graduate of the Computer Science and Engineering Program will demonstrate:

PSO1: Computer Science Specific Skills
The ability to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas by understanding the core principles and concepts of computer science and thereby engage in national grand challenges.

PSO2: Programming and Software Development Skills
The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products meeting the demands of the industry.

PSO3: Professional Skills
The ability to apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs thereby evolving as an eminent researcher and entrepreneur.

Course Outcomes (CO)

Course Outcome 1: Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).

Course Outcome 2: Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).

Course Outcome 3: Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).

Course Outcome 4: Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).

Course Outcome 5: Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).

Course Outcome 6: Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

Appendix C: CO-PO-PSO Mapping

CO-PO AND CO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	2	2	1	1	1	1	2	3		
CO2	2	2	2		1	3	3	1	1		1	1		2	
CO3									3	2	2	1			3
CO4					2			3	2	2	3	2			3
CO5	2	3	3	1	2							1	3		
CO6					2			2	2	3	1	1			3

3/2/1: high/medium/low

JUSTIFICATIONS FOR CO-PO MAPPING & CO-PSO MAPPING

MAPPING	LOW/MEDIUM/ HIGH	JUSTIFICATION
100003/ CS722U.1-PO1	M	Knowledge in the area of technology for project development using various tools results in better modeling.
100003/ CS722U.1-PO2	M	Knowledge acquired in the selected area of project development can be used to identify, formulate, review

		research literature, and analyze complex engineering problems reaching substantiated conclusions.
100003/ CS722U.1-PO3	M	Can use the acquired knowledge in designing solutions to complex problems.
100003/ CS722U.1-PO4	M	Can use the acquired knowledge in designing solutions to complex problems.
100003/ CS722U.1-PO5	H	Students are able to interpret, improve and redefine technical aspects for design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
100003/ CS722U.1-PO6	M	Students are able to interpret, improve and redefine technical aspects by applying contextual knowledge to assess societal, health and consequential responsibilities relevant to professional engineering practices.
100003/ CS722U.1-PO7	M	Project development based on societal and environmental context solution identification is the need for sustainable development.
100003/ CS722U.1-PO8	L	Project development should be based on professional ethics and responsibilities.
100003/ CS722U.1-PO9	L	Project development using a systematic approach based on well defined principles will result in teamwork.

100003/ CS722U.1-PO10	M	Project brings technological changes in society.
100003/ CS722U.1-PO11	H	Acquiring knowledge for project development gathers skills in design, analysis, development and implementation of algorithms.
100003/ CS722U.1-PO12	H	Knowledge for project development contributes engineering skills in computing & information gatherings.
100003/ CS722U.2-PO1	H	Knowledge acquired for project development will also include systematic planning, developing, testing and implementation in computer science solutions in various domains.
100003/ CS722U.2-PO2	H	Project design and development using a systematic approach brings knowledge in mathematics and engineering fundamentals.
100003/ CS722U.2-PO3	H	Identifying, formulating and analyzing the project results in a systematic approach.
100003/ CS722U.2-PO5	H	Systematic approach is the tip for solving complex problems in various domains.
100003/ CS722U.2-PO6	H	Systematic approach in the technical and design aspects provide valid conclusions.

100003/ CS722U.2-PO7	H	Systematic approach in the technical and design aspects demonstrate the knowledge of sustainable development.
100003/ CS722U.2-PO8	M	Identification and justification of technical aspects of project development demonstrates the need for sustainable development.
100003/ CS722U.2-PO9	H	Apply professional ethics and responsibilities in engineering practice of development.
100003/ CS722U.2-PO11	H	Systematic approach also includes effective reporting and documentation which gives clear instructions.
100003/ CS722U.2-PO12	M	Project development using a systematic approach based on well defined principles will result in better teamwork.
100003/ CS722U.3-PO9	H	Project development as a team brings the ability to engage in independent and lifelong learning.
100003/ CS722U.3-PO10	H	Identification, formulation and justification in technical aspects will be based on acquiring skills in design and development of algorithms.
100003/ CS722U.3-PO11	H	Identification, formulation and justification in technical aspects provides the betterment of life in various domains.
100003/ CS722U.3-PO12	H	Students are able to interpret, improve and redefine technical aspects with mathematics, science and

		engineering fundamentals for the solutions of complex problems.
100003/ CS722U.4-PO5	H	Students are able to interpret, improve and redefine technical aspects with identification formulation and analysis of complex problems.
100003/ CS722U.4-PO8	H	Students are able to interpret, improve and redefine technical aspects to meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
100003/ CS722U.4-PO9	H	Students are able to interpret, improve and redefine technical aspects for design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
100003/ CS722U.4-PO10	H	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools for better products.
100003/ CS722U.4-PO11	M	Students are able to interpret, improve and redefine technical aspects by applying contextual knowledge to assess societal, health and consequential responsibilities relevant to professional engineering practices.
100003/ CS722U.4-PO12	H	Students are able to interpret, improve and redefine technical aspects for demonstrating the knowledge of, and need for sustainable development.

100003/ CS722U.5-PO1	H	Students are able to interpret, improve and redefine technical aspects, apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
100003/ CS722U.5-PO2	M	Students are able to interpret, improve and redefine technical aspects, communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
100003/ CS722U.5-PO3	H	Students are able to interpret, improve and redefine technical aspects to demonstrate knowledge and understanding of the engineering and management principle in multidisciplinary environments.
100003/ CS722U.5-PO4	H	Students are able to interpret, improve and redefine technical aspects, recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
100003/ CS722U.5-PO5	M	Students are able to interpret, improve and redefine technical aspects in acquiring skills to design, analyze and develop algorithms and implement those using high-level programming languages.
100003/ CS722U.5-PO12	M	Students are able to interpret, improve and redefine technical aspects and contribute their engineering skills in

		computing and information engineering domains like network design and administration, database design and knowledge engineering.
100003/ CS722U.6-PO5	M	Students are able to interpret, improve and redefine technical aspects and develop strong skills in systematic planning, developing, testing, implementing and providing IT solutions for different domains which helps in the betterment of life.
100003/ CS722U.6-PO8	H	Students will be able to associate with a team as an effective team player for the development of technical projects by applying the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
100003/ CS722U.6-PO9	H	Students will be able to associate with a team as an effective team player to Identify, formulate, review research literature, and analyze complex engineering problems
100003/ CS722U.6-PO10	M	Students will be able to associate with a team as an effective team player for designing solutions to complex engineering problems and design system components.
100003/ CS722U.6-PO11	M	Students will be able to associate with a team as an effective team player, use research-based knowledge and research methods including design of experiments, analysis and interpretation of data.

100003/ CS722U.6-PO12	H	Students will be able to associate with a team as an effective team player, applying ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
100003/ CS722U.1-PSO1	H	Students are able to develop Computer Science Specific Skills by modeling and solving problems.
100003/ CS722U.2-PSO2	M	Developing products, processes or technologies for sustainable and socially relevant applications can promote Programming and Software Development Skills.
100003/ CS722U.3-PSO3	H	Working in a team can result in the effective development of Professional Skills.
100003/ CS722U.4-PSO3	H	Planning and scheduling can result in the effective development of Professional Skills.
100003/ CS722U.5-PSO1	H	Students are able to develop Computer Science Specific Skills by creating innovative solutions to problems.
100003/ CS722U.6-PSO3	H	Organizing and communicating technical and scientific findings can help in the effective development of Professional Skills.