GUJARAT TECHNOLOGICAL UNIVERSITY

Chandkheda, Ahmedabad

Affiliated

GOVERNMENT ENGINEERING COLLEGE, SECTOR-28, GANDINAGAR

A Report on –

Bluetooth based Surveillance and Monitoring Robot System

Under the subject of

DESIGN ENGINEERING – IIB

B.E. III, Semester VI

(Electronics and Communication Engineering)

Submitted by:

GROUP ID: 413015

Sr. No.	Name	Enrolment No.
01	PREM RANJAN SINGH	200130111053
02	BAVDA KESAR SHAILESHBHAI	200130111003
03	PATIL JAGRUTI BHATUBHAI	200130111057

Mrs. Nehal M. Shyal
(Faculty Guide)

Mr. Tejas B. Sheth
(Head of Department)

Academic Year
(2022-23)

DEPARTMENT OF

ELECTRONICS & COMMUNICATION ENGINEERING
GOVERNMENT ENGINEERING COLLEGE,
SECTOR-28, GANDHINAGAR

A PROJECT REPORT ON

BLUETOOTH-BASED SURVEILLANCE AND MONITORING ROBOTIC SYSTEM

Contents

Abstract

Introduction

The use of robots for surveillance and monitoring has become increasingly common in recent years. These robots can be used to patrol large areas, monitor people and activities, used in disaster relief works, and provide early warning of potential threats. Bluetooth is a short-range wireless technology that is often used in these robots to communicate with other devices and to transmit data back to a central location.

This project will develop a Bluetooth-based surveillance and monitoring robot system. The system will consist of a robot platform, a Bluetooth module, a camera, and a power supply. The robot platform will be equipped with a camera and a Bluetooth module. The camera will be used to capture images and videos of the surrounding environment. The Bluetooth module will be used to transmit the captured images and videos to a central location. The power supply will provide power to the robot platform and the other components.

The system will be designed to be easy to use and to operate. The robot platform will be controlled using a remote control or a smartphone app. The captured images and videos will be displayed on a monitor or a smartphone. The system will be able to store the captured images and videos for later review.

System Design

The system will consist of the following components:

- *Robot platform*: The robot platform will be a small, mobile robot that is equipped with a camera and a Bluetooth module. The robot platform will be powered by a battery.
- *Bluetooth module*: The Bluetooth module will be used to transmit the captured images and videos from the robot platform to a central location.

- *Camera*: The camera will be used to capture images and videos of the surrounding environment.
- *Power supply*: The power supply will provide power to the robot platform and the other components.

The system will be designed to be easy to use and to operate. The robot platform will be controlled using a remote control or a smartphone app. The captured images and videos will be displayed on a monitor or a smartphone. The system will be able to store the captured images and videos for later review.

System Implementation

The system will be implemented using the following steps:

1. The robot platform will be designed and constructed.
2. The Bluetooth module will be installed on the robot platform.
3. The camera will be installed on the robot platform.
4. The power supply will be installed on the robot platform.
5. The system will be tested and debugged.
6. The system will be deployed.

System Evaluation

The system will be evaluated using the following criteria:

- The system's ability to capture and transmit images and videos.
- The system's ability to control the robot platform.
- The system's ease of use.
- The system's reliability.

Acknowledgement

We would like to express my sincere gratitude and appreciation to all those who have contributed to the successful completion of this project. Their support, guidance, and encouragement were invaluable in shaping the outcome of this endeavour.

First and foremost, we are deeply indebted to my supervisor, Mrs. Nehal M. Shyal, for their unwavering support throughout this project. Their expertise, insightful feedback, and constant guidance played a pivotal role in shaping the direction of this work. We are grateful for their patience, understanding, and willingness to share their knowledge and expertise, which significantly enhanced the quality of this project.

We would like to extend my heartfelt appreciation to the faculty members of Electronics and Engineering Dept, Government Engineering College, Gandhinagar, for providing an excellent academic environment that nurtured my intellectual growth. Their dedication to teaching and commitment to fostering a spirit of inquiry have been instrumental in my development as a student.

Finally, we would like to thank my family for their unconditional love, unwavering support, and constant encouragement. Their belief in my abilities and their sacrifices have been the driving force behind my achievements.

In conclusion, the successful completion of this project would not have been possible without the support and contributions of the individuals mentioned above. Their efforts have been invaluable, and I am deeply grateful for their assistance. This project has been a tremendous learning experience, and I am confident that the knowledge and skills gained from this endeavour will serve me well in my future endeavours.

Thank you all once again for your invaluable support.

CHAPTER 1

INTRODUCTION

The rapid advancements in technology have led to the development of various innovative solutions aimed at enhancing security and monitoring systems. Among these solutions, robotics and wireless communication have emerged as powerful tools in the field of surveillance and monitoring. In this project, we present the design and implementation of a Bluetooth-based Surveillance and Monitoring Robotic System, which combines the capabilities of robotics and wireless communication to create an intelligent and efficient monitoring system.

The objective of this project is to develop a robotic system that can navigate through different environments, capture real-time video footage, and transmit it wirelessly to a remote monitoring station. The system utilizes Bluetooth technology for communication between the robot and the monitoring station, allowing for seamless data transmission over short distances. The use of Bluetooth offers advantages such as low power consumption, ease of implementation, and compatibility with a wide range of devices.

The Bluetooth-based Surveillance and Monitoring Robotic System consists of two main components: the robotic platform and the monitoring station. The robotic platform is equipped with a camera module, motors for movement, and an onboard microcontroller for processing and controlling the system. The monitoring station, on the other hand, comprises a computer or a mobile device that receives and displays the video feed transmitted by the robot.

The robotic platform is designed to navigate through different terrains using a set of wheels or tracks, depending on the application requirements. The camera module mounted on the robot captures real-time video footage of the surroundings, allowing for remote monitoring and surveillance. The captured video is then compressed and transmitted in real-time to the monitoring station via Bluetooth communication.

The monitoring station receives the video feed and displays it on a graphical user interface, providing a live view of the monitored area. The user can control the robot's movement remotely using the interface, enabling them to explore different areas and adjust the camera angle for optimal surveillance. Additionally, the monitoring station can store the video footage for later analysis or retrieval.

The implementation of the Bluetooth-based Surveillance and Monitoring Robotic System involves a combination of hardware and software components. The hardware components include a microcontroller, motor drivers, camera module, Bluetooth module, and power supply. The software components encompass the programming of the microcontroller, development of the user interface, and implementation of the video compression and transmission algorithms.

The successful implementation of this system opens up a plethora of applications in various domains. In the field of security, the Bluetooth-based Surveillance and Monitoring Robotic System can be used to monitor critical areas, such as warehouses, banks, and industrial facilities, enhancing the efficiency and effectiveness of surveillance operations. It can also find applications in search and rescue missions, where the robot can explore hazardous environments and transmit vital information to the rescue teams.

In conclusion, the Bluetooth-based Surveillance and Monitoring Robotic System presented in this project report combines the power of robotics and wireless communication to create an intelligent monitoring system. The system's ability to navigate through different environments, capture real-time video footage, and transmit it wirelessly enables remote surveillance and monitoring. The project aims to demonstrate the feasibility and effectiveness of this system and explore its potential applications in various domains. The subsequent sections of this report will delve into the detailed design, implementation, and evaluation of the system, along with a discussion of the results and future work.

Necessity of Project:

In the current world, where security concerns are prevalent and the need for efficient monitoring systems is paramount, the Bluetooth-based Surveillance and Monitoring Robotic System offers a necessary solution.

With its ability to navigate diverse environments, capture real-time video footage, and transmit it wirelessly, this system provides a powerful tool for remote surveillance and monitoring. It enhances security measures in critical areas such as warehouses, banks, and industrial facilities, while also serving search and rescue missions. The project addresses the growing demand for advanced monitoring technologies, contributing to the safety and protection of individuals and assets in an increasingly interconnected world.

Background:

The Bluetooth-based Surveillance and Monitoring Robotic System project stems from the increasing need for advanced surveillance and monitoring technologies in today's world. With the rise in security concerns, the demand for efficient and intelligent monitoring systems has become crucial in various domains, including public safety, industrial facilities, and search and rescue operations.

Traditional surveillance systems often face limitations such as restricted coverage, manual monitoring, and lack of mobility. These systems heavily rely on fixed cameras or stationary monitoring stations, which can be easily compromised or fail to provide comprehensive coverage. Moreover, human monitoring of large areas can be labour-intensive, time-consuming, and prone to errors.

To overcome these limitations and enhance the effectiveness of surveillance and monitoring operations, robotics and wireless communication technologies have emerged as promising solutions. By combining the capabilities of robotics with wireless communication, the Bluetooth-based Surveillance and Monitoring Robotic System aims to provide a more efficient, flexible, and intelligent monitoring solution.

Robotic systems have the advantage of mobility, allowing them to navigate through different terrains and reach areas that are difficult for humans to access. With the integration of a camera module, these robots can capture real-time video footage, providing a visual perspective of the monitored area. This real-time data is then transmitted wirelessly to a monitoring station, enabling remote monitoring and surveillance.

Wireless communication, particularly Bluetooth technology, plays a pivotal role in the project. Bluetooth is a widely used wireless protocol known for its low power consumption, ease of implementation, and compatibility with various devices. It enables seamless communication between the robotic platform and the monitoring station, allowing for the transmission of video data over short distances without the need for complex infrastructure.

The development of the Bluetooth-based Surveillance and Monitoring Robotic System involves a combination of hardware and software components. The hardware components include a microcontroller for controlling the robot, motor drivers for movement, a camera module for capturing video, a Bluetooth module for wireless communication, and a power supply. The software components encompass programming the microcontroller, developing the user interface for the monitoring station, and implementing video compression and transmission algorithms.

The project's background also takes into consideration the increasing need for security and surveillance in various sectors. Industries and critical infrastructure facilities require robust monitoring systems to protect their assets and ensure the safety of personnel.

Furthermore, the system's potential applications extend beyond security. In search and rescue operations, where time and accuracy are crucial, the system can be deployed to explore hazardous environments and transmit critical information to rescue teams. The ability to remotely control and monitor the robot enhances the efficiency and safety of such missions.

Motivation behind the Project:

The team's motivation behind the Bluetooth-based Surveillance and Monitoring Robotic System project stems from the desire to address the growing need for advanced monitoring technologies. Recognizing the limitations of traditional surveillance systems and the increasing security concerns, the team aims to develop an innovative solution that combines robotics and wireless communication.

By creating a mobile, real-time monitoring system, the team seeks to enhance security measures, improve efficiency in surveillance operations, and contribute to the safety and protection of individuals and assets. The team is driven by the aspiration to make a positive impact in the field of surveillance and monitoring through technological innovation.

Advantages of Current System:

The Bluetooth-based Surveillance and Monitoring Robotic System offers several advantages over traditional surveillance systems:

- *Mobility*: Unlike fixed cameras or stationary monitoring stations, the robotic system is mobile and can navigate through various terrains. It can reach areas that are difficult for humans to access, providing comprehensive coverage and flexibility in surveillance operations.
- *Real-time monitoring*: The system captures real-time video footage and transmits it wirelessly to the monitoring station. This enables remote monitoring and surveillance, allowing users to have immediate access to live video feeds from any location with a monitoring station.
- *Flexibility and adaptability*: The system can be easily deployed and repositioned as per the surveillance requirements. It can be used in different environments and scenarios, making it suitable for a wide range of applications, from indoor security to outdoor surveillance.

- *Enhanced coverage*: With the ability to move, the robotic system can cover larger areas compared to fixed cameras. It can explore multiple locations and adjust its camera angle for optimal coverage, providing a more comprehensive view of the monitored area.
- *Ease of implementation*: The utilization of Bluetooth technology for wireless communication offers advantages such as low power consumption and compatibility with a variety of devices. This makes the system easy to implement and integrate into existing infrastructure without the need for complex wiring or extensive modifications.
- *Remote control and monitoring*: The monitoring station provides a user-friendly interface that allows remote control of the robotic system. Users can navigate the robot, adjust the camera angle, and monitor the video feed in real-time, providing them with a high level of control and situational awareness.
- *Efficiency and time-saving*: The system automates the monitoring process, reducing the need for human intervention and minimizing the chances of errors. It eliminates the need for manual patrolling or continuous monitoring, allowing security personnel to focus on other critical tasks.
- *Improved safety*: The robotic system can be deployed in hazardous environments or situations where human safety is at risk. It serves as a valuable tool in search and rescue operations, providing vital information and minimizing the need for human exposure to dangerous conditions.
- *Scalability*: The system can be scaled up or down based on the specific requirements of the surveillance operation. Additional robots can be deployed to cover larger areas or multiple locations, providing a scalable solution that can adapt to changing needs.

In summary, the Bluetooth-based Surveillance and Monitoring Robotic System offers advantages such as mobility, real-time monitoring, flexibility, enhanced coverage, ease of implementation, remote control, efficiency, improved safety, and scalability. These advantages make it a compelling alternative to traditional surveillance systems, offering a more intelligent, efficient, and comprehensive approach to monitoring and security.

CHAPTER II

OBSERVATION

AEIOU Framework:

AEIOU Design Thinking worksheets developed by Mark Baskinger and Bruce Harington is an interrelated framework that guides designers in thinking through a problem or scenario from a variety of perspectives: activities, environments, interactions, objects, and users.

They are useful in organizing thoughts, observations, and ideas into distinct categories. AEIOU differs from our Drawing Ideas Quick-Start Worksheets in its formality and strict adherence to these five dimensions of a design space.

Figure 2.1 AEIOU Framework Canvas

Activity (A) Canvas:

The Bluetooth-based Surveillance and Monitoring Robotic System engages in the activity of surveillance and monitoring. It captures real-time video footage, navigates through different environments, and transmits data wirelessly to a monitoring station.

Environment (E) Canvas:

The system operates in various environments, including indoor and outdoor settings. It can be deployed in locations such as warehouses, industrial facilities, banks, public spaces, or any area requiring surveillance and monitoring.

Interaction (I) Canvas:

Users interact with the Bluetooth-based Surveillance and Monitoring Robotic System through the monitoring station's graphical user interface. They control the movement of the robot, adjust the camera angle, and monitor the live video feed transmitted by the robot.

Object (O) Canvas:

The main object used in this project is the robotic platform. It consists of a chassis, wheels or tracks for mobility, a microcontroller (Arduino UNO) for processing and control, motor drivers (L293D) for movement, and a Bluetooth module (HC-05) for wireless communication.

User (U) Canvas:

The primary users of the Bluetooth-based Surveillance and Monitoring Robotic System are security personnel, monitoring operators, or individuals responsible for surveillance and monitoring tasks. They interact with the system through the monitoring station to monitor the video feed, control the robot's movement, and ensure effective surveillance operations. Additionally, the system can be utilized by search and rescue teams in hazardous environments where human access is limited or risky.

CHAPTER III

EMPATHY MAPPING

Mind Mapping Canvas:

A mind map is a diagram used to visually organize information. A mind map is hierarchical and shows relationships among pieces of the whole. It is often created around a single concept, drawn as an image in the centre of a blank page, to which associated representations of ideas such as images, words and parts of words are added. Major ideas are connected directly to the central concept, and other ideas branch out from those major ideas. Mind maps can also be drawn by hand, either as "rough notes" during a lecture, meeting or planning session, for example, or as higher quality pictures when more time is available. Mind maps are considered to be a type of spider diagram.

The following guidelines for creating mind maps:

i. Start in the centre with an image of the topic, using at least 3 colours.

ii. Use images, symbols, codes, and dimensions throughout your mind map.

iii. Select key words and print using upper- or lower-case letters.

iv. Each word/image is best alone and sitting on its own line.

v. The lines should be connected, starting from the central image. The lines become thinner as they radiate out from the centre.

vi. Make the lines the same length as the word/image they support.

vii. Use multiple colours throughout the mind map, for visual stimulation and also for encoding or grouping.

viii. Develop your own personal style of mind mapping.

ix. Use emphasis and show associations in your mind map.

x. Keep the mind map clear by using radial hierarchy or outlines to embrace your branches.

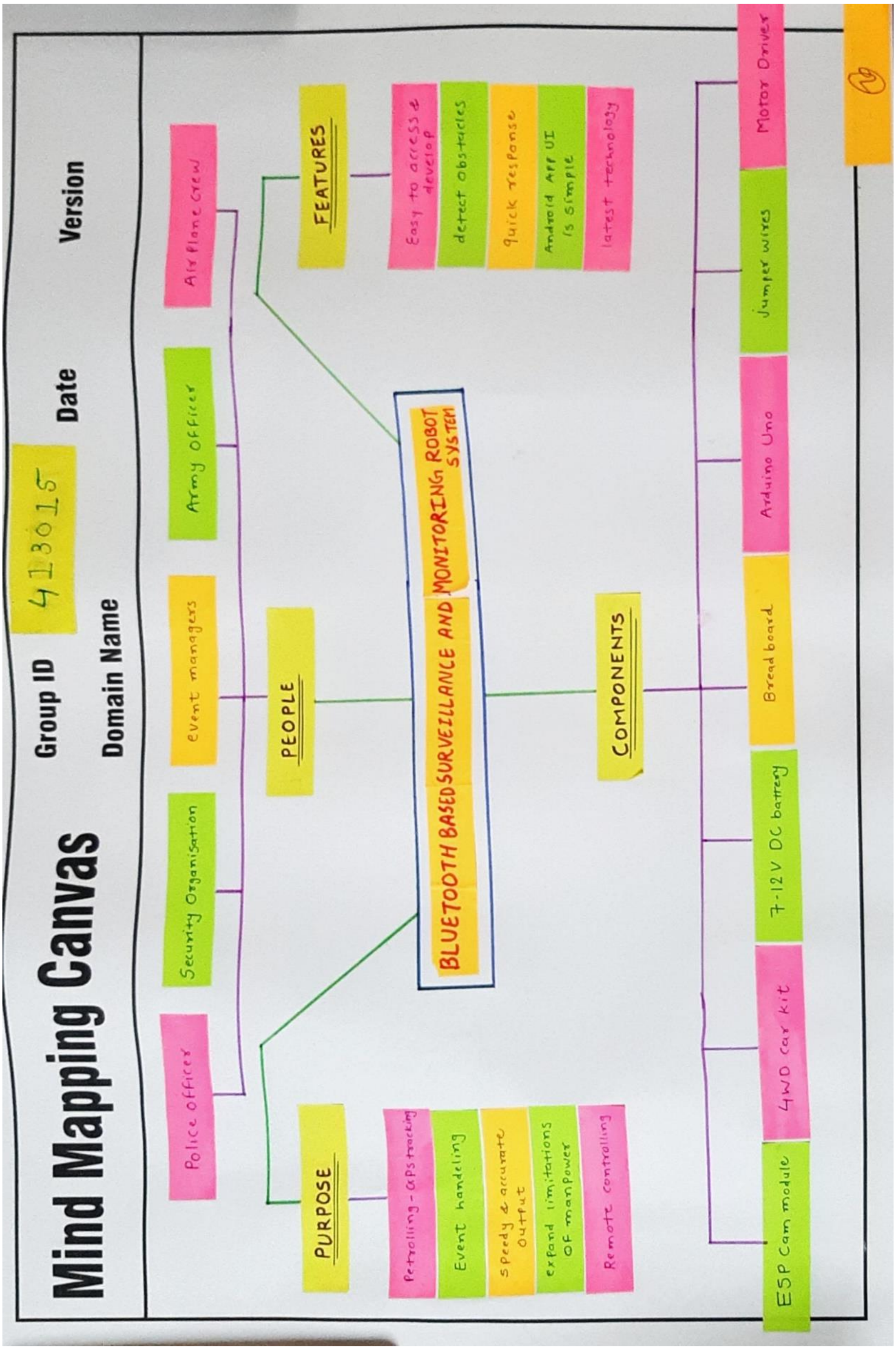


Figure 3.1 Mind Mapping Canvas

Empathy Canvas:

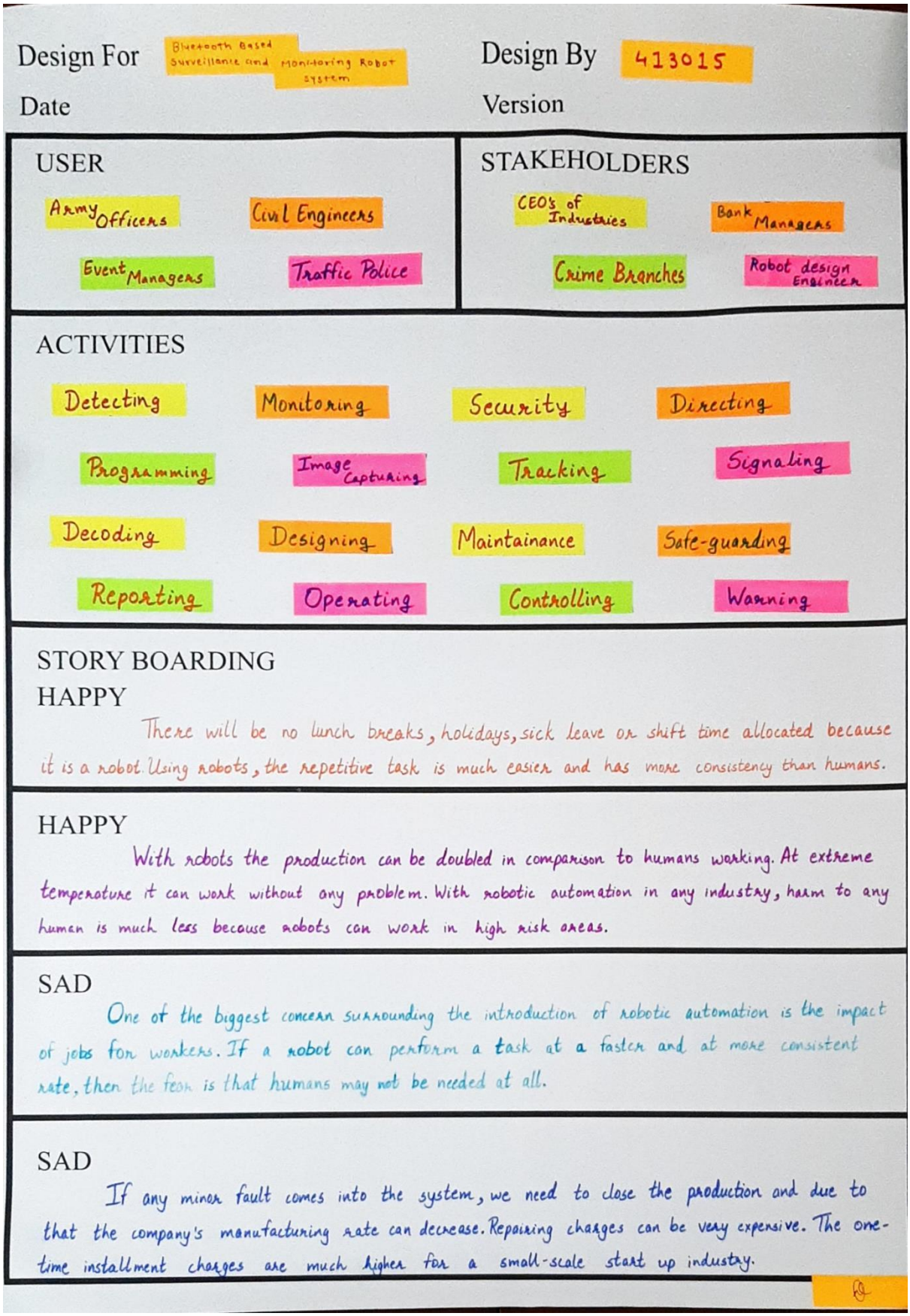


Figure 3.2 Empathy Mapping Canvas

Users:

In this Stage, we find the various users which are directly or indirectly related to our project.

Stakeholders:

Stakeholders mean person or organization with an interest. In this Stage, we find who will directly or indirectly relate to users.

Activities:

Activities are directly or indirectly related to stakeholders.

Story Boarding:

It consists of a happy story and a sad story regarding our project which shows the problem being tolerated by users.

Note: -

Understanding the problem of society is one of the biggest challenges for engineering student as till now they were making project on imaginary ideas.

So, we are understanding the domains of the problem in broader sense which emphasized on interacting with the people of our domain area which included more of casual talk rather than technical session.

CHAPTER IV

PRIORITIZING AND FINALIZING

Ideation Canvas:

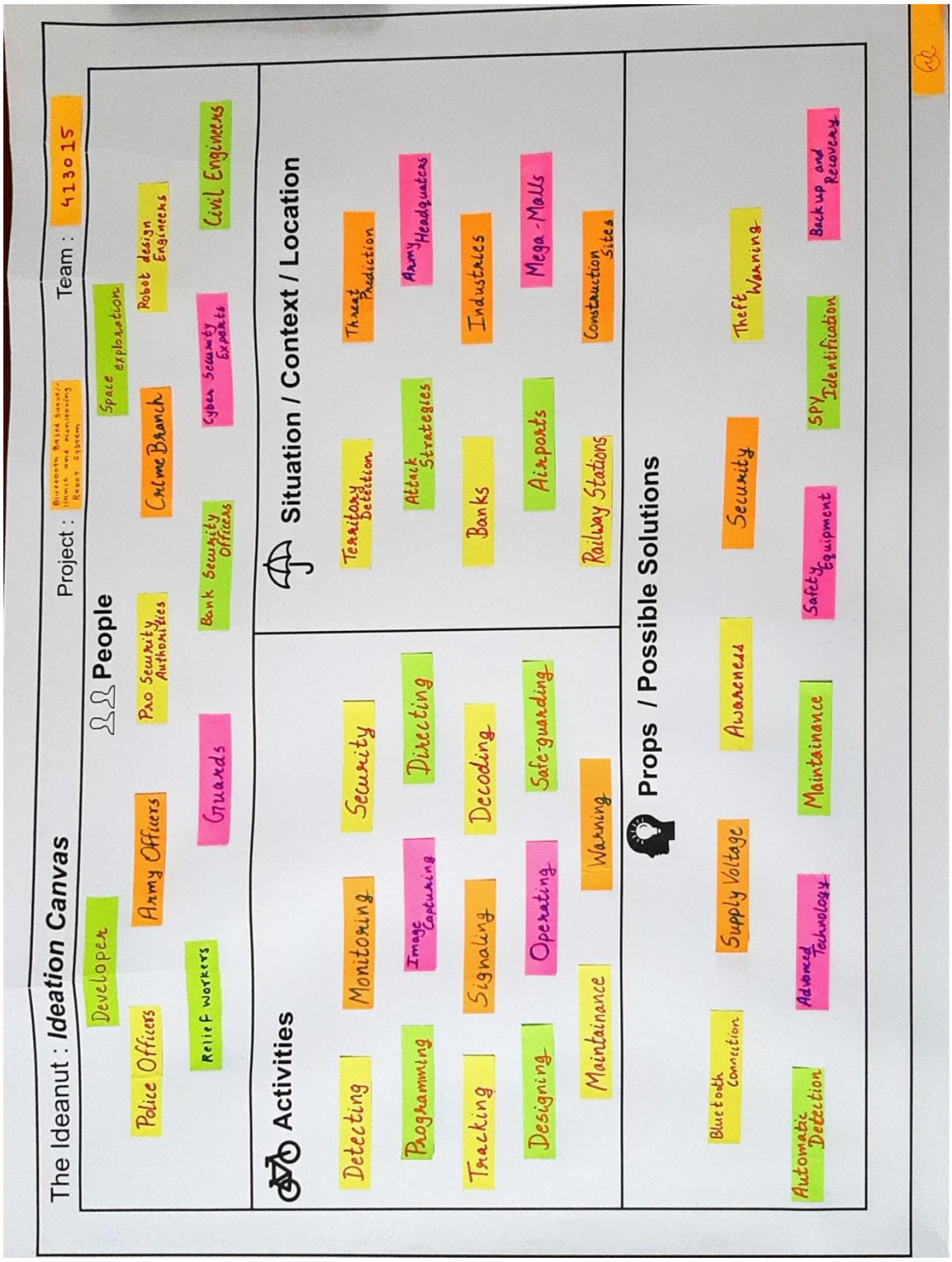


Figure 4.1 Ideation Canvas

Some Points Related to Ideation Canvas:

i. Ideation is the mode of the design process in which we concentrate on idea generation.
ii. Mentally it represents a process of ‘going wide’ in terms of concepts and outcomes.
iii. Ideation provides both the fuel and also the source material for building prototypes and getting innovative solutions into the hands of your users.
iv. In Ideation canvas we simply thought about the people for whom we want to solve the problem.

People:

The Bluetooth-based Surveillance and Monitoring Robotic System can have use cases for various individuals, organizations, and industries. Some examples include:

i. *Security Companies*: Security companies can utilize the system to enhance their surveillance operations. They can deploy the robotic system to monitor large areas, such as shopping malls, airports, or industrial complexes, improving their ability to detect and respond to security threats.

ii. *Industrial Facilities*: Industries with critical infrastructure, such as manufacturing plants, power plants, or oil refineries, can benefit from the system's monitoring capabilities. It can help them monitor equipment, detect anomalies or safety hazards, and ensure the smooth operation of their facilities.

iii. *Public Safety Agencies*: Police departments, fire departments, and other public safety agencies can utilize the system in emergency situations. The robot can be deployed in hazardous environments or disaster-stricken areas to provide real-time video footage and assist in search and rescue operations.

iv. *Educational Institutions*: Educational institutions, such as universities or research institutes, can utilize the system for research purposes. It can be used to monitor experiments, observe wildlife in natural habitats, or provide remote access to archaeological sites, enabling researchers to gather valuable data.

v. *Warehouses and Logistics Companies*: Warehouses and logistics companies can employ the system to enhance their security measures and monitor their operations. It

can help detect unauthorized access, track inventory movement, and ensure the efficient functioning of their supply chains.

vi. *Government Buildings and Public Spaces*: Government buildings, public parks, or crowded areas can utilize the system to enhance public safety and security. It can provide real-time video surveillance to monitor potential threats, ensure the safety of citizens, and assist law enforcement agencies.

Activities:

The Bluetooth-based Surveillance and Monitoring Robotic System enables a range of activities related to surveillance, monitoring, and control. Some of the possible activities are:

i. *Surveillance*: The system can conduct surveillance activities by capturing real-time video footage of the monitored area. It can monitor for security threats, unauthorized access, or unusual activities, providing visual evidence for subsequent analysis or action.

ii. *Monitoring*: The system facilitates continuous monitoring of designated areas or environments. It can monitor critical infrastructure, public spaces, construction sites, or industrial facilities, ensuring operational efficiency, safety compliance, and early detection of any abnormalities.

iii. *Remote Viewing*: Users can remotely view the video feed transmitted by the robotic system. This allows for real-time observation of the monitored area from a remote location, enabling prompt decision-making and response to any observed events or incidents.

iv. *Exploration*: The robotic system can explore different environments, providing visual access to areas that are difficult for humans to reach.

v. *Tracking*: The system can track the movement of objects or individuals within the monitored area. It can be used to monitor the flow of people in public spaces, track the movement of vehicles in parking lots, or keep an eye on the movement of inventory in warehouses.

vi. *Alarm and Alert Generation*: The system can be programmed to generate alarms or alerts based on predefined events or criteria. It can detect unusual movements,

intrusions, or safety hazards and trigger alerts to the monitoring station or relevant personnel, enabling timely response and intervention.

vii. *Data Logging and Analysis*: The system can log and store video footage for later analysis or reference. This allows for post-event analysis, identification of patterns, or retrieval of specific incidents for investigative or archival purposes.

viii. *Patrol and Area Coverage*: The system can be programmed to follow predefined paths or patrol routes, ensuring comprehensive coverage of designated areas. It can autonomously patrol a specific area or follow a set trajectory, reducing the need for manual intervention and providing continuous monitoring.

ix. *Situational Awareness*: By providing real-time video footage, the system enhances situational awareness for users. It enables them to have an up-to-date understanding of the monitored area, aiding in decision-making, incident response, or crisis management.

Situations/Locations:

The Bluetooth-based Surveillance and Monitoring Robotic System can be useful in various situations where advanced surveillance and monitoring capabilities are required. Some of the possible situations in which this project would be beneficial include:

i. *Security Threats*: The system can be deployed in areas prone to security threats, such as airports, train stations, or government buildings. It enhances security measures by providing real-time video surveillance, enabling early detection of suspicious activities or potential threats.

ii. *Industrial Safety*: Industries with hazardous environments, such as chemical plants or construction sites, can benefit from the system's monitoring capabilities. It helps ensure compliance with safety regulations, identifies safety hazards, and provides real-time monitoring of critical equipment or processes.

iii. *Emergency Response*: During emergencies, such as natural disasters or fire incidents, the system can assist emergency response teams. It can be deployed in disaster-stricken areas or hazardous environments to provide visual access, aiding in search and rescue operations and facilitating informed decision-making.

iv. *Perimeter Security*: The system can enhance perimeter security for facilities like military bases, prisons, or critical infrastructure sites. It monitors and detects unauthorized access attempts, provides visual evidence for intrusion detection, and assists security personnel in securing the perimeter.

v. *Border Surveillance*: The system can assist in border surveillance and monitoring. It helps monitor border areas, detect illegal border crossings, and provides real-time video feed to border control authorities for enhanced border security.

vi. *Critical Infrastructure Protection*: The system can be utilized for protecting critical infrastructure, such as power plants, water treatment facilities, or communication networks. It ensures continuous monitoring, detects potential threats, and aids in preventive maintenance and early fault detection.

Product Development Canvas:

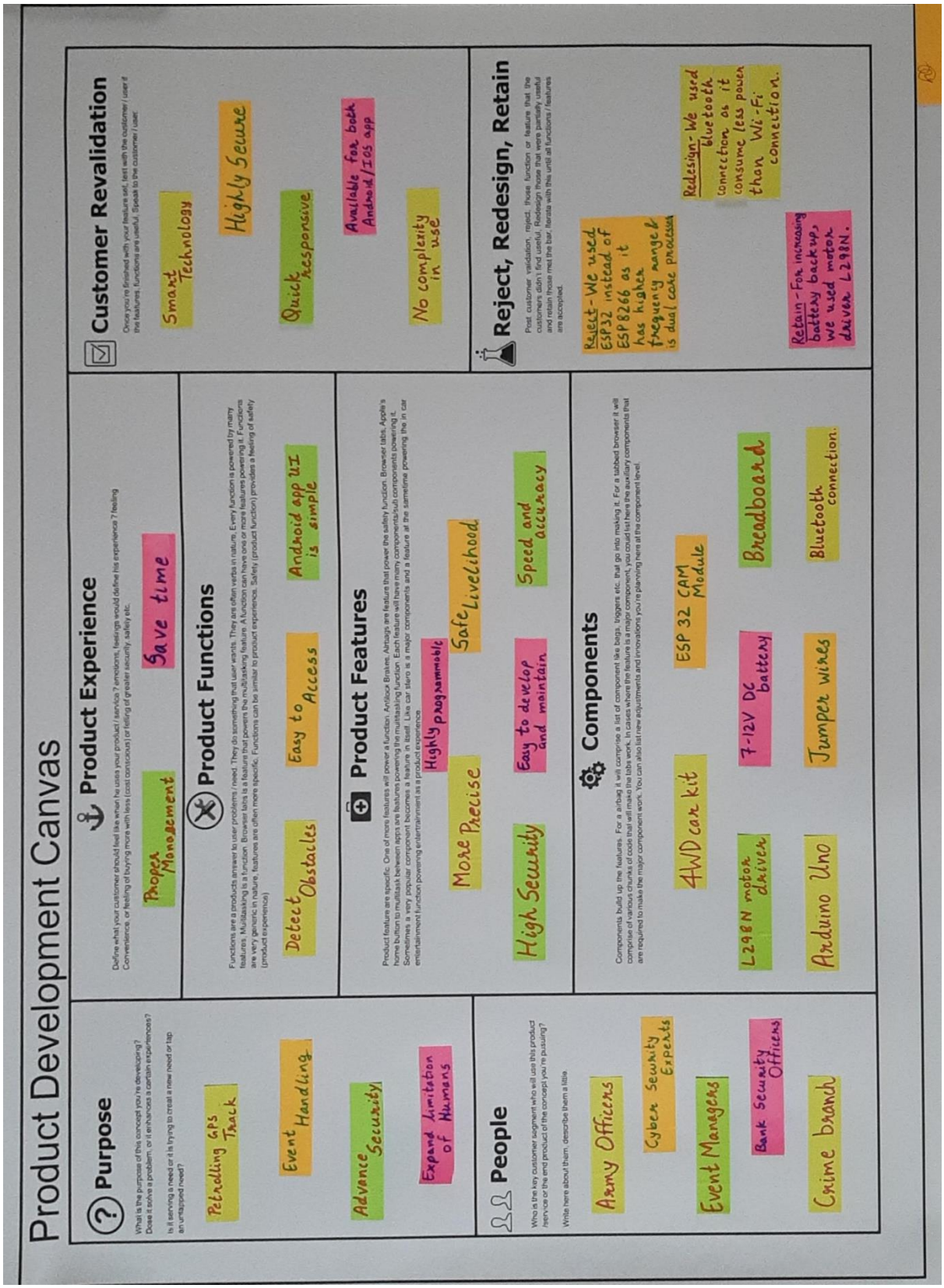


Figure 4.2 Product Development Canvas

CHAPTER V

LEARNING NEED MATRIX

Learning Need Matrix Canvas:

Learning's Need Matrix for the use by the students across all engineering branches. This tool was developed for exploring its usage in the semester VI, when a refinement is carried out in the Product Development Canvas. The purpose of LNM is to identify the requirements of learning among the team members. While a new product or process is under development based on a unique idea, the team members need to learn and explore a lot of new skills and documents, methods and guidelines.

Each learning need identified is required to be mentioned in form of a word. Using a sticky note, it should be pasted in a particular quadrant considering timeline decided to accomplish the learning/exploring. Below is the LNM format.

Top-right quadrant identified the learning requirement regarding applicable standards, design specification, exploration and understanding of scientific principles and identification of different types of experiment to be performed over a period of time.

Top-left quadrant suggests making identification of learning the use of various tools, processes, methods of application, theories to apply tools involved.

The lower-left quadrant contains identified needs for learning of software, simulation techniques, skills, mathematical learning requirements and so on.

Lastly, the lower-right quadrant shall have the needs identified pertaining to an understanding of various alternative materials, its strength and other properties, standards, as well as its testing requirements, depending upon envisaged quality.

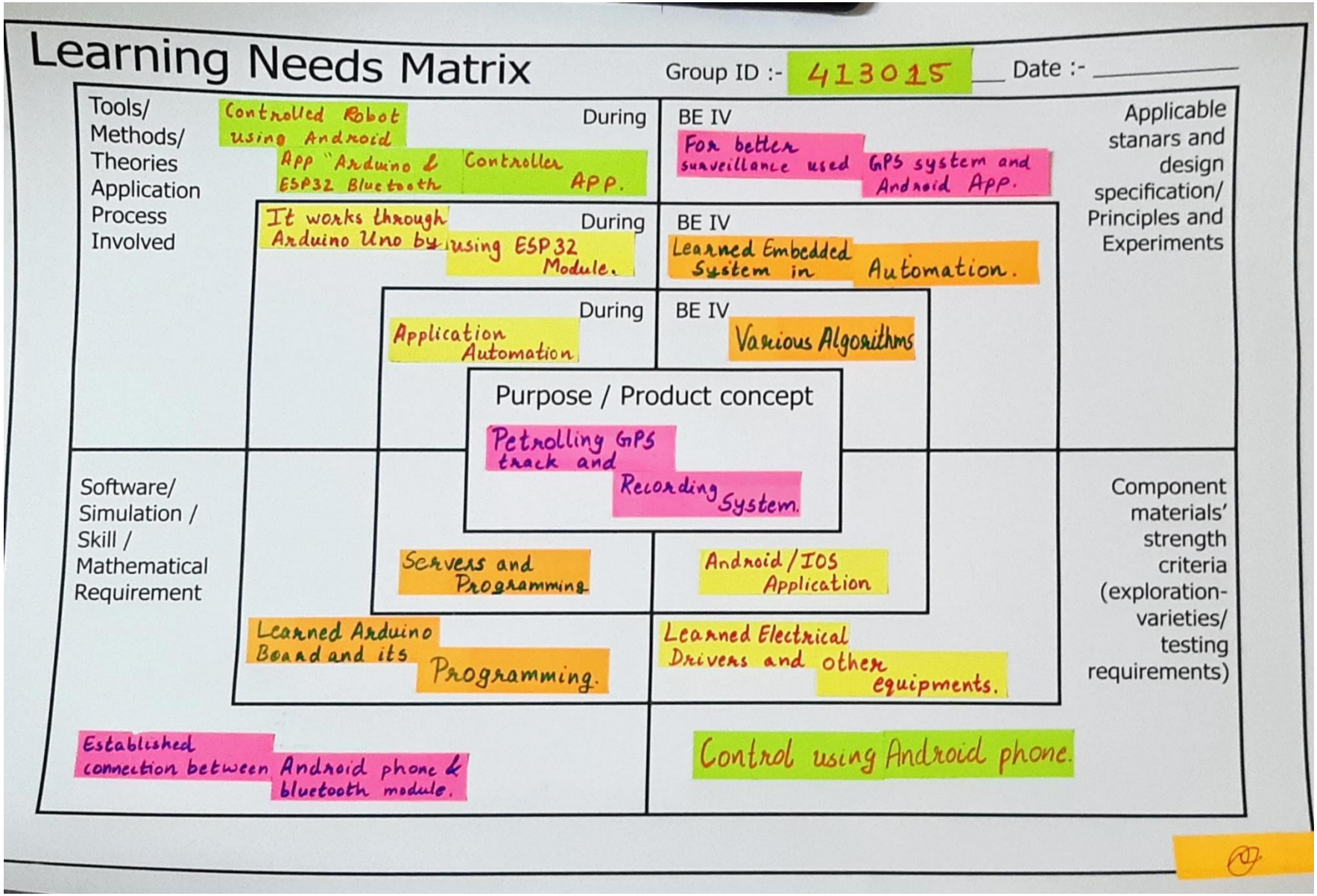


Figure 5.1 Learning Need Matrix Canvas

CHAPTER VI

PROTOTYPE

System Design and Architecture:

The block diagram is consisting of an Arduino Uno, a Bluetooth module, on the motor driver IC (L293D) and two geared motors which are connected through connecting wires.

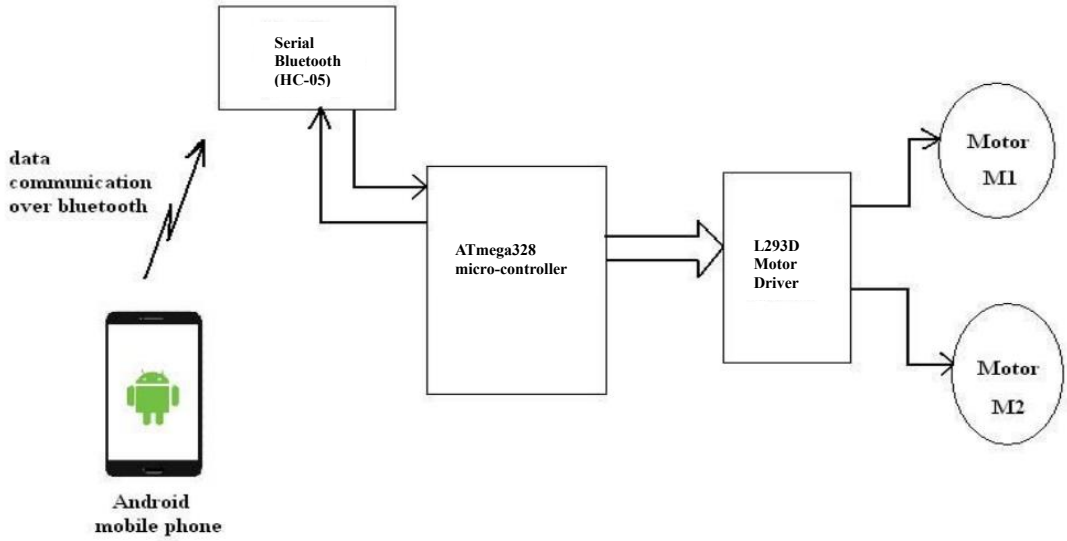


Figure 6.1 Architecture of the Project

Circuit Diagram:

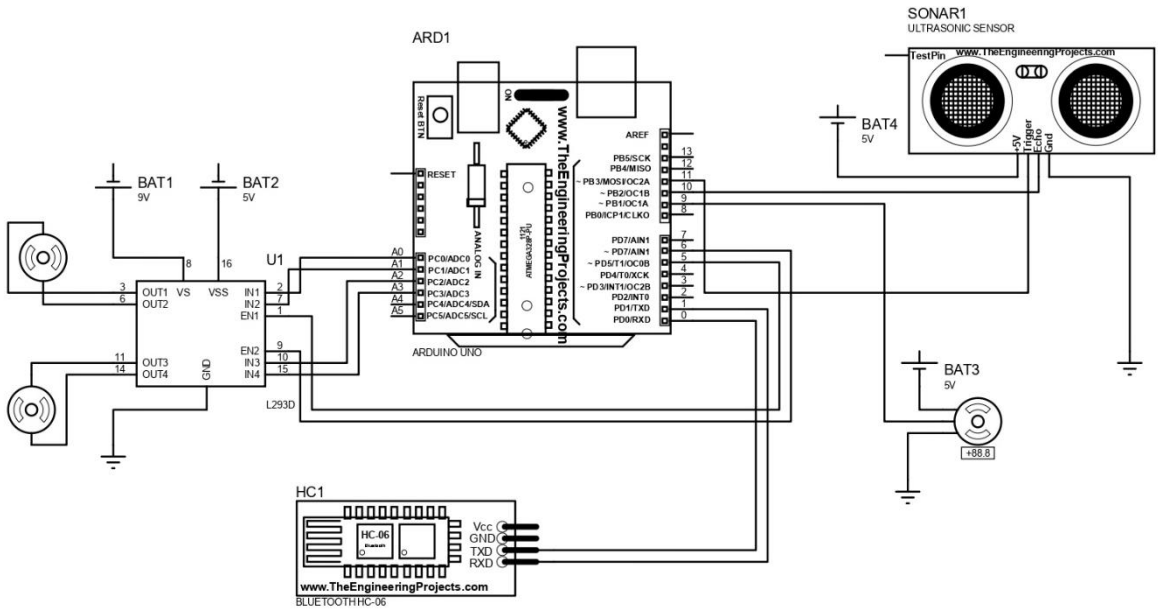


Figure 6.2 Circuit Diagram

Components:

Arduino UNO Board

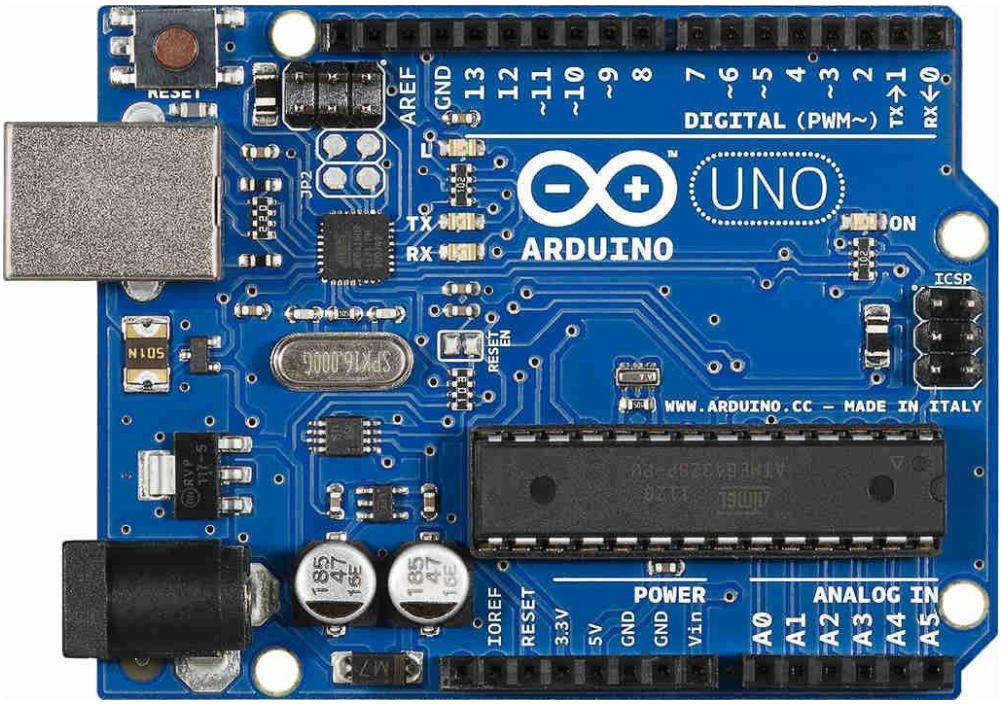


Figure 6.3 Arduino UNO Board

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (of which 6 can be used as PWM outputs), 6 analog I/O pins, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

The Arduino Uno is the most widely used Arduino board. It is a great starting point for anyone interested in learning about electronics and programming. The board is easy to use and there are many resources available online to help you get started.

Here are some of the features of the Arduino Uno:

i. 14 digital input/output pins (of which 6 can be used as PWM outputs)
ii. 6 analog input pins
iii. A 16 MHz ceramic resonator
iv. A USB connection
v. A power jack
vi. An ICSP header
vii. A reset button

Bluetooth Module, HC-05

The HC-05 is a Bluetooth module that can be used to create wireless serial connections between devices. It is a popular choice for projects such as remote controls, robots, and home automation systems. The HC-05 has a number of features that make it a versatile and easy-to-use module, including:

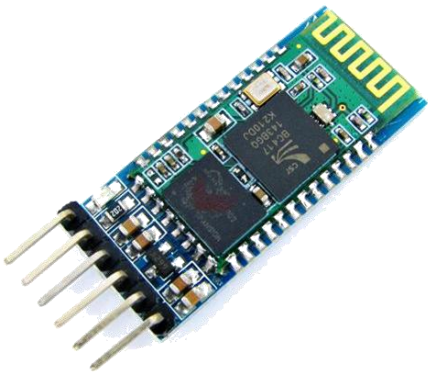


Figure 6.4
HC 05 Bluetooth Module

i. **Master/slave mode**: The HC-05 can be configured to operate in either master or slave mode. This allows it to be used to connect to other Bluetooth devices, such as smartphones, computers, and other modules.
ii. **UART interface**: The HC-05 has a UART interface, which makes it easy to connect to microcontrollers and other devices that use serial communication.
iii. **AT commands**: The HC-05 can be configured using AT commands, which are a set of standard commands that are used to control Bluetooth devices.
iv. **Low power consumption**: The HC-05 consumes very little power, which makes it ideal for battery-powered projects.

L293D Motor Driver IC:

The L293D is a 16-pin H-bridge motor driver IC that can be used to control two DC motors simultaneously. It is a popular choice for robotics and other projects that require the control of two motors.

The L293D has two H-bridges, each of which can be used to control a DC motor. An H-bridge is a circuit that allows a motor to be driven in both directions. The L293D can supply a maximum current of 1.2A per motor, and it can operate on voltages from 4.5V to 36V.

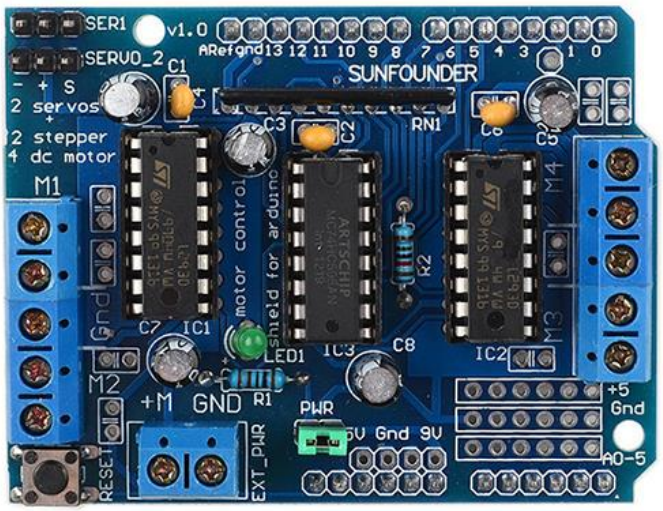


Figure 6.5
L293D Motor Driver

The L293D has a number of features that make it a good choice for motor control. These features include:

i. Two H-bridges
ii. Maximum current of 1.2A per motor
iii. Operating voltages from 4.5V to 36V
iv. Low input current
v. Low power dissipation
vi. TTL compatible

Arduino IDE

The Arduino Integrated Development Environment (IDE) is a cross-platform application that runs on Windows, macOS, and Linux. It is used to write and upload programs to Arduino boards. The IDE includes a text editor, a compiler, and a serial monitor. It also has a library manager that makes it easy to install and use additional libraries.

The Arduino IDE is a free and open-source software. It is written in Java and uses the Eclipse IDE as its base. The IDE is constantly being updated and improved.

New features are added regularly, and bugs are fixed quickly. The Arduino IDE is a powerful tool that can be used to create a wide variety of projects. It is easy to use and learn, making it a great choice for beginners and experienced users alike.

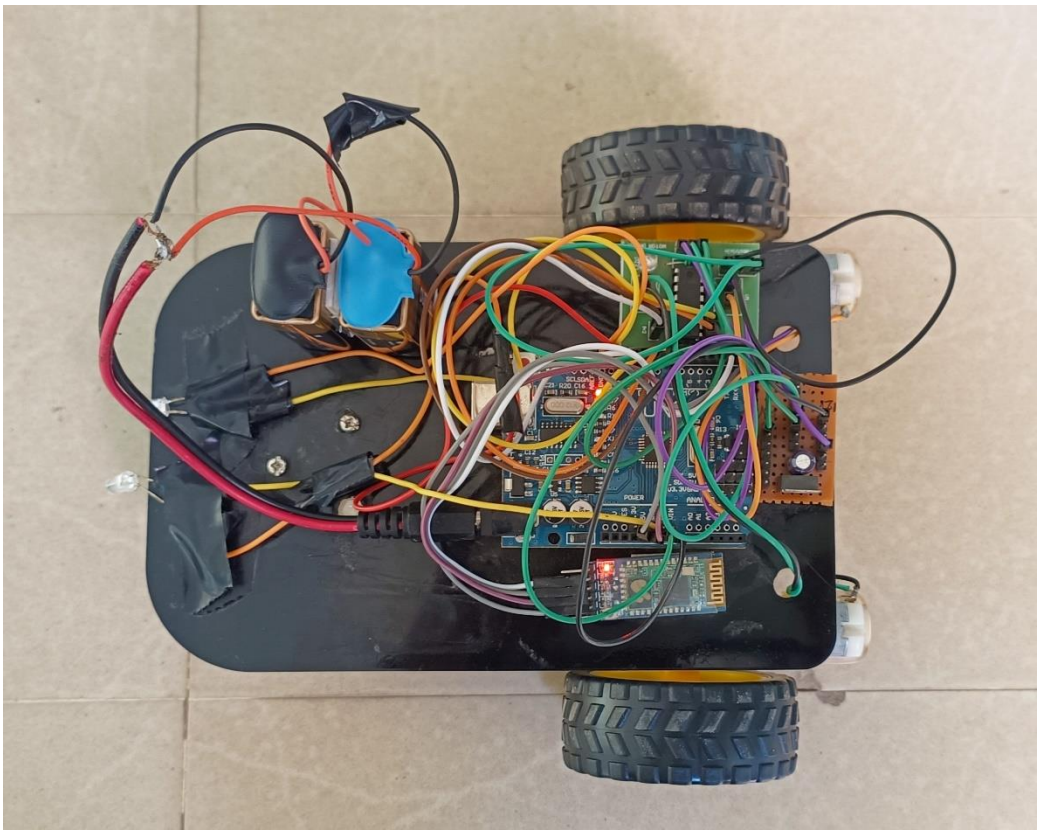
Arduino Code:

```
char t;
const int r1=8,r2=9 ,l1=11,l2=10,a=12,b=13;
void setup() {
Serial.begin(9600);
pinMode(r1,OUTPUT); //right motors forward
pinMode(r2,OUTPUT); //right motors reverse
pinMode(l1,OUTPUT); //left motors forward
pinMode(l2,OUTPUT); //left motors reverse
}
void loop() {
if(Serial.available()){
t = Serial.read();
}
if(t == 'F'){ //move forward(all motors rotate in forward direction)
digitalWrite(r1,HIGH);
digitalWrite(r2,LOW);
digitalWrite(l1,HIGH);
digitalWrite(l2,LOW);
}
else if(t == 'B'){ //move reverse (all motors rotate in reverse direction)
digitalWrite(r1,LOW);
digitalWrite(r2,HIGH);
digitalWrite(l1,LOW);
digitalWrite(l2,HIGH);
}
else if(t == 'L'){ //turn right (left side motors rotate in forward direction, right side motors rotate in reverse direction for 100ms & stop)
digitalWrite(r1,HIGH);
digitalWrite(r2,LOW);
digitalWrite(l1,LOW);
digitalWrite(l2,HIGH);
delay(100);
t = 'S';
}
else if(t == 'R'){ //turn left (right side motors rotate in forward direction, left side motors rotate in reverse direction for 100ms & stop)
digitalWrite(r1,LOW);
digitalWrite(r2,HIGH);
digitalWrite(l1,HIGH);
digitalWrite(l2,LOW);
delay(100);
t = 'S';
}
else if(t == 'S'){ //STOP (all motors stop)
digitalWrite(r1,LOW);
digitalWrite(r2,LOW);
digitalWrite(l1,LOW);
```

```
digitalWrite(l2,LOW);
}

else if(t== 'L'){
digitalWrite(a,1);
digitalWrite(b,1);
}
}
```

Project Model:



CHAPTER VII

CONCLUSION AND FUTURE SCOPE

Conclusion:

The Bluetooth-based Surveillance and Monitoring Robotic System is a promising solution for advanced surveillance and monitoring needs. It combines robotics and wireless communication to offer mobility, real-time monitoring, flexibility, and enhanced coverage. The system can be remotely controlled and efficiently monitored in various environments, contributing to the overall security and protection of assets, individuals, and critical infrastructure.

Future Scope:

The system has the potential to be further developed and refined to advance autonomous navigation, object recognition, and intelligent decision-making capabilities. Integration with emerging technologies such as artificial intelligence and machine learning can enhance the system's ability to detect anomalies, predict potential threats, and improve overall situational awareness. The system can also be expanded to include features like facial recognition, biometric authentication, or integration with existing security systems for a more comprehensive and integrated surveillance solution.

The Bluetooth-based Surveillance and Monitoring Robotic System can be customized and tailored to meet specific industry requirements. It can be applied in sectors such as transportation, manufacturing, healthcare, or smart cities, addressing unique surveillance and monitoring challenges faced by these industries. Collaboration with stakeholders, industry experts, and academia can further explore and unlock the full potential of this project, paving the way for innovative applications and advancements in the field of surveillance and monitoring.

Plagiarism Report:

Check Plagiarism

PLAGIARISM SCAN REPORT

Date	May 15, 2023
Exclude URL:	NO

Unique Content	87	Word Count	209
Plagiarized Content	13	Records Found	0

CONTENT CHECKED FOR PLAGIARISM:

The use of robots for surveillance and monitoring has become increasingly common in recent years. These robots can be used to patrol large areas, monitor people and activities, used in disaster relief works, and provide early warning of potential threats. Bluetooth is a short-range wireless technology that is often used in these robots to communicate with other devices and to transmit data back to a central location.

This project will develop a Bluetooth-based surveillance and monitoring robot system. The system will consist of a robot platform, a Bluetooth module, a camera, and a power supply. The robot platform will be equipped with a camera and a Bluetooth module. The camera will be used to capture images and videos of the surrounding environment. The Bluetooth module will be used to transmit the captured images and videos to a central location. The power supply will provide power to the robot platform and the other components.

The system will be designed to be easy to use and to operate. The robot platform will be controlled using a remote control or a smartphone app. The captured images and videos will be displayed on a monitor or a smartphone. The system will be able to store the captured images and videos for later review.