



**TRIBHUVAN UNIVERSITY  
INSTITUTE OF SCIENCE AND TECHNOLOGY**

An Internship Report on  
**"REMOTE CONTROL BOAT USING SAJILOBOT AND  
BLUETOOTH MODULE"**  
AS  
**"ROBOTICS ENGINEER INTERN"**  
**AT BEYOND APOGEE PVT. LTD.**

SUBMITTED TO  
**DEPARTMENT OF STATISTICS AND COMPUTER SCIENCE  
PATAN MULTIPLE CAMPUS**

*In partial fulfillment of the requirements for the Bachelor's degree in  
Computer Science and Information Technology (B.Sc. CSIT)*

SUBMITTED BY:  
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Under the Supervision of  
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**July, 2024**

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**Beyond Apogee**  
Pvt. Ltd.

23rd June, 2024

**TO WHOM IT MAY CONCERN**

This is to certify that Mr. Phursang Dong successfully completed an internship at our organization as a Robotics Engineer Intern from March 10, 2024, to June 10, 2024.

During his time with us, Mr. Dong demonstrated exceptional dedication and professionalism. He has strong skills in robotics and IoT device development, which he effectively applied in a corporate setting to enhance and manage feature development.

We found him to be intelligent, hardworking, innovative, and keen in his work. He possesses a friendly, outgoing personality, a very good sense of humor, and works well both individually and as part of a team.

On behalf of the company, I extend my best wishes to Mr. Phursang Dong in his future career endeavors. We are confident that he will achieve great success in his professional journey.

Please feel free to contact us for any further information.

For Beyond Apogee Pvt. Ltd.

Sudip Vikram Adhikari  
Chief Executive Officer  
Beyond Apogee  
9813039470







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मिति / Date: 7/29/2024

### Letter of Recommendation

I hereby state and verify that this internship carried out by **Phursang Dong** entitled **Remote Control Boat using SajiloBot and Bluetooth Module as Robotics Engineer Intern at Beyond Apogee Pvt. Ltd.** in partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Information Technology. I recommend this for further evaluation.

.....  
**Bipin Timalsina**  
Lecturer  
Supervisor  
Department of Statistics and Computer Science



तमसोमा ज्योतिर्गमय

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### Letter of Approval

This is to certify that this internship report prepared by **Phursang Dong** entitled **Remote Control Boat using SajiloBot and Bluetooth Module as Robotics Engineer Intern at Beyond Apogee Pvt. Ltd.** in partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Information Technology has been well studied. In our opinion it is satisfactory in the scope and quality as an internship for the required degree.

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## ACKNOWLEDGEMENT

The success and outcome of this project required a lot of guidance and assistance from many people, and I am very fortunate to have gone through this all through the completion of this project. I am very glad to express my deepest gratitude and sincere thanks to my respected supervisor MR. Department of Computer Science and Information Technology, Patan Multiple Campus, for his valuable supervision, guidance, encouragement, support and humorous remarks for completing this work. His useful suggestions for shaping up this whole work and cooperative behavior are sincerely acknowledged.

I am grateful for the support and guidance from my highly respected and esteemed **Head of Department (HOD), Mr. Prakash Bahadur Amatya**. I would like to express my sincere thanks to the **Coordinator of CSIT Department Mr. Dadhiram Ghimire, Mr. Manish Subedi, Senior Colleague** for guiding me to achieve my goal. Their inspiration and helpful guidance have made this project successful. I am proud of their presence and will be indebted to them forever. I am also thankful to other faculty members and department employees for their support.

I owe my deep sense of gratitude to the **entire Beyond Apogee Private Limited especially CEO Sudip Bikram Adhikari** for providing me an opportunity to carry out the Internship work at the organization and their encouragement. At the I would like to express my sincere thanks to all my friends and others who have directly or indirectly helped me during this project work.

At the end I would like to express my sincere thanks to all my college friends who have helped me directly or indirectly throughout this project.

## **ABSTRACT**

This project aimed to develop a small-scale, affordable, and multifunctional remote-control boat system. Utilizing a SajiloBot microcontroller as the central processing unit, the boat's movements and operations were controlled via communication with various electronic components. A Bluetooth Module (HC-05) enabled wireless connectivity between the boat and a smartphone, which served as the remote-control device. The control application, created using MIT App Inventor, facilitated real-time navigation through Bluetooth commands. Key components included DC motors for propulsion, a servo motor for direction, a power supply unit, and a propeller. The documentation includes step-by-step instructions and code snippets for replicating the project, covering circuit design, software development, and assembly processes. Performance evaluations demonstrated the system's efficiency and responsiveness, highlighting its potential applications in educational initiatives, leisure activities, and as a prototype for autonomous watercraft.

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## **LIST OF ABBREVIATIONS**

BO Motor	Battery Operated Motor
GSM	Global System for Mobile Communications
IC	Integrated Circuit
IDE	Integrated Development Environment
IoT	Internet of Things
IR	Infrared
IT	Information Technology
LDR	Light Dependent Resistor
LED	Light Emitting Diode
mBlock	Make Block
NASA	National Aeronautics and Space Administration
UI	User Interface
USB	Universal Serial Bus

# CHAPTER 1: INTRODUCTION

## 1.1 Background

"Remote control Boat using SajiloBot and Bluetooth Module" is referred to as "Bluetooth Based Control System" at various points in this text. "Bluetooth based Control System" puts into practice the new uses for Bluetooth technology. A control system that functions as an embedded system that can monitor and control appliances and other devices locally utilizing built-in input and output peripherals has been proposed using Bluetooth technology.

Remotely the system allows the user to effectively monitor and control the boat via the mobile phone set by controlling through the "Bluetooth Remote Control Application". The main concept behind the project is connecting the Mobile device using "Bluetooth Remote Control Application" to the Bluetooth Module and send the text signal from the Mobile then the data are further process by Microcontroller i.e. SajiloBot to accomplish the task according to the program for the Boat Project.

Certain terminologies used may not be familiar. Some of them are:

- Arduino: is an open-source electronics platform based on easy-to-use hardware and software. (Banzi, 2005)
- SajiloBot: is a Nepal based single microcontroller educational Robotics kit to learn new horizon of Robotics and exploring Robotics / type of Arduino Uno.
- Microcontroller: A small computer or processing unit for the SajiloBot.
- Bluetooth Module: is a circuit module used for wireless communication.
- USB code uploader is a USB used to upload code to the SajiloBot from computer.
- mBlock Programming: mBlock is a robust Scratch-based graphical programming environment that aims to make coding approachable and enjoyable. Because it makes it simple for users to build games, animations, and interactive projects, it is frequently used for educational reasons.

## **1.2 Problem Statement**

Wireless communication is vital to current robotics and remote-control systems because it improves human interaction and system flexibility. The range and convenience of use of robotic systems are frequently restricted by laborious wiring connections used in traditional control methods. With the use of a Bluetooth module and the SajiloBot, this project seeks to create a Bluetooth-controlled boat that offers a smooth and intuitive remote-control experience. The main goal is to create and put into place a system that would enable customers to wirelessly operate a boat using a smartphone or other Bluetooth-enabled device, extending its operational range and ease.

## **1.3 Objectives of Project**

The task assigned in intern was to build a prototype of a Bluetooth Control Boat that can control work wirelessly in the water. The objectives of the project are given below:

- To build the fully functional prototype of the Boat
- To integrate the electronic components and hardware devices to the boat
- To create User Interface to work with Bluetooth Control System

## **1.4 Scope and Limitation**

### **1.4.1 Scope**

Bluetooth Control Boat is the finest project which is more interactive and fun which enabling users to learn about SajiloBot, Bluetooth Module, Coding in Arduino etc. It provides large variations of knowledge to start the journey in Robotics and engage in the real-world projects using the SajiloBot. It enables path to learn IoTs and embedded systems. So, it has a lot of scopes, some of them are as follows:

- To build Wireless Control System
- Development of User Interface
- Working with SajiloBot and Bluetooth Module
- Variety of Motor control (eg.BO motor and Servo Motor)
- Testing and Validation of the project
- To educational purpose

### **1.4.2 Limitation**

Although it has a great benefit to learn new thing, there as some limitations as well which are:



- Limited range of the Bluetooth Module
- Limited Payload capacity
- Water proofing is the big challenge
- Without proper power supply project can be failed
- Design problems

## **1.5 Report Organization**

**Chapter 1:** provides the general introduction about the project and the objectives, scope and limitation.

**Chapter 2:** gives organization details, contact information and literature review.

**Chapter 3:** explore placement details, weekly log, problem analysis and time management.

**Chapter 4:** implementation strategies including testing strategies, hardware and software implementation

**Chapter 5:** result analysis with limitation of the System/Organization and recommendation to the organization and Internship program

**Chapter 6:** lesson learnt and possible future improvements

## **CHAPTER 2: ORGANIZATION DETAILS AND LITERATURE REVIEWS**

### **2.1 Introduction of Organization**

Beyond Apogee Private Limited is founded by CEO Sudip Bikram Adhikari in 2015. Beyond Apogee is a company based on Space Exploration, forecasting Artificial Intelligence and Robotics advancements, and aiming to educate Nepal in these cutting-edge technologies. It's working in the Satellite technology (United Nations, 2000) and IoT (Gillis A. S., 2023) projects including Robotics. The company is entirely handled by our respected CEO Mr. Sudip Bikram Adhikari. Beyond Apogee is committed to building a strong foundation for robotics and space technology in Nepal by utilizing advanced tools and technologies. The company provides young minds with the opportunity to learn about robotics and space technology, inspiring and motivating them through hands-on experiments and interactive projects. This approach not only fosters a deep understanding of these fields but also encourages creativity and innovation among students.

Beyond Apogee is a leader in the fields of space technology and robotics, making it one of the most renowned companies for robotics education and project development in Nepal. The company is deeply associated with Nepali space tech organizations and actively collaborates with them to initiate and execute large-scale projects. One of its significant achievements is the planned launch of its first Pico satellite (Apogeo Space, 2022) into space in 2025, in coordination with SpaceX. This ambitious project is currently in the research and development phase, highlighting Beyond Apogee's dedication to advancing space technology.

In addition to its space endeavors, Beyond Apogee provides extensive robotics education across various schools. The company offers students a better platform to explore new technologies and gain practical experience through hands-on activities. These programs are designed to engage students at different levels, from beginners to advanced learners, helping them develop a strong interest in robotics and space technology. By doing so, Beyond Apogee is nurturing the next generation of technologists and innovators.

## 2.2 Organizational Hierarchy

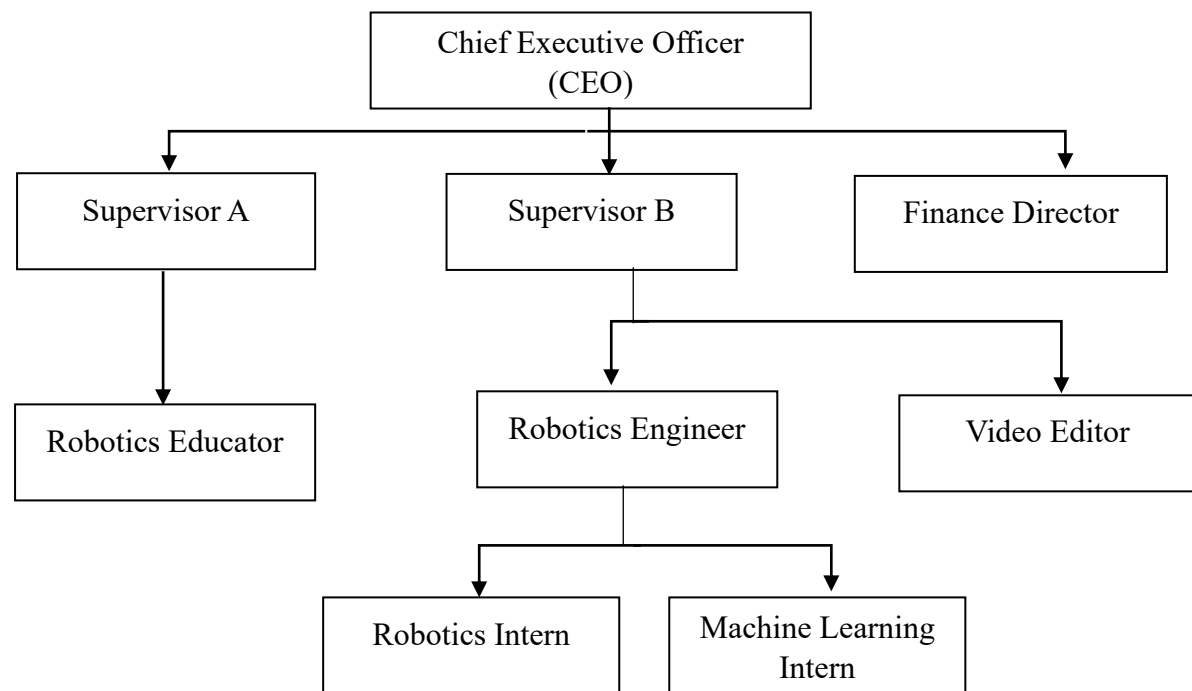


Figure 1: Organization Hierarchy

## 2.3 Working Domains of Organization

The working domains of the Beyond Apogee are given below:

- **Robotics:** Beyond Apogee is a pioneering company specializing in artificial intelligence and robotics. Our mission is to push the boundaries of technology and innovation, providing a diverse range of advanced robotics and Internet of Things (IoT) (Gillis A. S., 2023) devices tailored to meet the needs of both customers and educational institutions. It has its own Microcontroller called SajiloBot which is the main key helper to learn Robotics and makes different robotics projects.
- **Space Technology:** Beyond Apogee is also venturing into space technology, striving to secure new horizons for space technology in Nepal. It is set to launch its first Pico satellite (Apogeo Space, 2022) into space in 2025. The company has collaborated with esteemed organizations such as NASA and Orion Space to develop its expertise in space technology.
- **STEAM Education:** It also provides robotics and space technology education to various schools, offering a better platform for young minds to learn new technologies and inspiring them to explore robotics. Students gain hands-on

experience through interactive projects, engaging them at different levels and encouraging the generation of new ideas.

- **Research Sector:** Beyond Apogee is at the forefront of space technology research, driving innovation and exploration in Nepal. Their dedicated team of engineers and scientists is focused on advancing space technology through rigorous research and development. They are committed to making significant contributions to the global space industry and positioning Nepal as a key player in space exploration

## **2.4 Internship Placement Details**

The internship is done as a partial fulfilment of requirements of the bachelor's degree in computer science and information technology under Tribhuvan University. As part of the course requirements, the internship is assigned six credit hours, with a minimum duration of ten weeks or 180 hours. Candidates are called for interviews by the various organizations when they request interns. Following a non-formal interview, candidates for internships are chosen through a written exam and additional technical interviews.

### **2.4.1 Description of Intern Department/Unit**

During the first week, the working environments of the company were introduced to help familiarize and ensure comfort within the workspace. The Robotics team comprised a Robotics Engineer, a Robotics Intern, and a Machine Learning Intern, with the Robotics Engineer serving as the supervisor. The second week focused on learning about Arduino and SajiloBot, including their operation, coding, and code uploading. After a week of in-depth learning about SajiloBot, its internal components, and Arduino, the main projects were assigned. The supervisor provided continuous support, recommending relevant blogs and YouTube videos to enhance understanding of the projects. The team conducted daily stand-ups, meetings, and project requirements collection to track project progress.

Initially, project requirements were gathered and carefully analyzed for feasibility. A baseline overview of the system was designed in collaboration with the supervisor and the Robotics Engineer. Based on the system structure designs, materials were gathered, and various components of the boat were assembled one by one. The boat's design was iteratively reviewed and improved under the guidance of the supervisor and the engineer. Upon completing the boat design and implementation, the project was ready for testing. In the 10th week, the supervisor assisted in developing the UI application for the

Bluetooth Remote Control. Testing was conducted, and test cases were created. Throughout the process, documentation was maintained to facilitate communication with the user and the supervisor.

## **2.5 Literature Review**

There are many projects involving Arduino using Bluetooth technology (Ardumotive\_com, 2023) available online. They are using different wireless technologies for the remote communication such as Bluetooth Module, GSM Module and Remote ID Modules etc. It is using C++ as the programming languages for the commanding and using Arduino IDE as the coding platform. We tried the minimal usage of modules and sensors to complete the project with the local materials such that the cost of the project was relatively lower than others.



## **CHAPTER 3: INTERNSHIP ACTIVITIES**

### **3.1 Roles and Responsibilities**

In my position as the organization's robotics intern, I was given the task of researching the many kinds of projects that could be constructed with SajiloBot and Arduino. During my three months as an intern at Beyond Apogee, I was exposed to a brand-new workplace and learned about the values, procedures, and obligations of an IT firm. My assigned responsibilities changed based on how long I had been with this organization and how involved I was in the project.

Given are the responsibilities assigned to me as an intern:

- Study about microcontroller used in SajiloBot and coding SajiloBot with Arduino and mBlock.
- The project focused on wireless communication, necessitating research on Bluetooth wireless communication using SajiloBot and a Bluetooth Module. Extensive data was collected from various sources to support analysis and requirements gathering.
- Designing the whole body of the boat and its propellor.
- Working with electrical components required soldering various parts together.
- Building Bluetooth App using MIT App inventor.
- Wiring and connection of the projects.
- Coding and uploading.
- Effective communication about research findings and conceptual ideas with the team members.
- Testing the projects.
- Continuous feedback necessitated making adjustments according to the requirements and iterating to improve the project.

### 3.2 Weekly Log

The following table shows the activities that were carried out weekly during the overall period of my internship:

Table 1: Weekly Log

Week	Activities Performed
Week 1	Introduced to Robotics and Space Technology, focusing on basic electronic components and circuit connections.
Week 2	Researched SajiloBot and its internal components, including their functions. Learned Arduino programming and worked with SajiloBot, starting with coding to blink LEDs.
Week 3	Soldered various components of SajiloBot and assembled it. Designed different circuits and worked with various sensors and motors.
Week 4	Explored different types of projects that could be built using SajiloBot, with the help of YouTube videos, websites, and blogs. Also generated ideas for unique projects.
Week 5	Assisted team members in gathering and analyzing project requirements.
Week 6	Learned to use TinkerCad for 3D design and created 3D models for the boat and its propeller.
Week 7	Researched waterproofing and buoyancy for the boat. Collected data from various websites and blogs to calculate the boat's weight, which was used to determine its balance and maximum weight capacity.
Week 8	Built the boat using available materials and completed the circuit connections. Placed the power source and waterproofed the boat.
Week 9	Reviewed and iteratively improved the project.
Week 10	Learned to build a UI for remote control and developed a Bluetooth application to control the boat.
Week 11	Coded and uploaded the programs to the boat. Worked with the Arduino IDE to write efficient code for the project, testing it regularly. Selected a testing location for the boat, created test cases, and successfully tested the boat. Made changes to enhance the boat's functionalities. Test the boat. Make changes to the boat to improve its functionalities.
Week 12	Completed all documentation for the boat project and continued with other

	projects.
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### 3.3 Description of the Project Involved During Internship

During the 3-month internship, involvement occurred in various projects. Some were dummy projects, while most were in-house, and some were client projects. The projects engaged in are explained below:

#### i. Making Games in mBlock

mBlock offers an excellent interactive environment for creating Scratch-based games and animations, making it ideal for beginners in game development. During the internship, involvement in game development projects included creating simple, interactive, and beginner-friendly games using mBlock. This opportunity facilitated the application of creativity in developing various games as part of the team. Games designed and created included Enemy Shooter Game, Shark Game, Tower Building Game, Snake Game, and more.

#### ii. Pico Satellite Project

As Beyond Apogee plans to launch its Pico Satellite into space in 2025, research was conducted on the mission patch, satellite designs, HAM radio signal examination, payload selection, and the satellite's mission. The opportunity arose to contribute to this project, gaining insights into different types of satellites, their missions, and goals. Training was received from Orion Space Nepal, and assistance was provided to the research team working on the satellite.

#### iii. Projects with SajiloBot

SajiloBot is the brain of robotics, much like the CPU in a computer. It is the central hub for processing all codes and making designs. We were given numerous mini projects to build using SajiloBot. My team created many simple and easily constructed projects using basic electronic components. Some of the projects we worked on were:

- **Traffic Light Project:** Traffic light is the signal light which are used in the road to control the traffic and cross the roads. By using SajiloBot, three LEDs (Red, Green, Yellow), Resistors, Jumper wires and Battery we built the traffic light.

- **Automatic Street Light Project:** Light which are automatically turn on when Night and off when day which can be built using SajiloBot, LDR Sensor and LEDs.
- **Line Following Robot:** Line Following Robot is the main Robotics project which can follow the black line drawn on the white surface. This project is the inhouse project specially built for the competition by using SajiloBot, IR sensor and Robots body.
- **Remote Control Robot:** Remote control robot is a type of robot which is controlled with the remote. By using different components such as GSM module, Bluetooth Module and IR Remote Module we can make the wireless remote control for the robot. In this project we used Bluetooth Module for wireless connection. The purpose of this project to build the Obstacle Avoiding Robot, Battle Bot
- **Micromouse:** Micromouse is a world-renowned competition robot, designed to resemble a mouse in shape, equipped with a control unit, power supply, actuators, and sensors. This robot is specifically built for competitions. We designed the structure of the Micromouse and built it for participation in such events.
- **Vending Machine:** Involved in the design and construction of a prototype for a vending machine project, which was built using SajiloBot, a BO motor, and a push button.
- **Automatic Gate Project:** The Automate Gate Project aims to automate the opening and closing of a gate. In this project, involvement was in the research and circuit design team, contributing to the development of the project prototype. The system was created using SajiloBot, an ultrasonic sensor, and a servo motor.

#### iv. **Developing Mobile Bluetooth App using MIT App Inventor**

MIT App Inventor is a platform for developing simple user interfaces for Bluetooth control applications. It provides an easy way to build mobile applications that can send control signals to devices, such as robots. I was given a basic UI for the app and tasked with building it. I contributed by creating the UI using MIT App Inventor and writing the logic behind it.

### **3.4 Tasks/Activities Performed**

“Remote Control Boat Using SajiloBot and Bluetooth Module” is the project based on IoT and Robotics for wireless communication and SajiloBot providing easy access for the electronic components and the UI for the user. As a Robotics intern, I was assigned with research and developing of the projects. We have the team for development and integration. Initially we must communicate through Viber after we have used Pumble and Slack for the meeting with CEO and Supervisor. Also update daily worklog into Pumble.

#### **3.4.1 Analysis Phase**

During this phase the requirements of the projects were determined. Feasibility analysis was carried out in this phase to determine if the UI and Project were technically, economically, scheduled and operationally feasible or not.

#### **3.4.2 System Requirements**

The requirement collection for the project were collected by Robotics Instructor along with my involvement for more exposure.

##### **3.4.2.1 Functional Requirement**

Functional requirement of the Boat project is most basic function or feature which is used for the real boat some of the most important functions are:

- Remote control functionality: Boat should be controlled through the smart phone using Bluetooth connection.
- Movement and Speed Control: The movement and the speed of the boat should be controlled from the Bluetooth Application in smart phone.
- Connection Status: It should automatically provide the connection status to the user through the application.
- Power management: It is the necessary functionality for the device to run smoothly into the water.



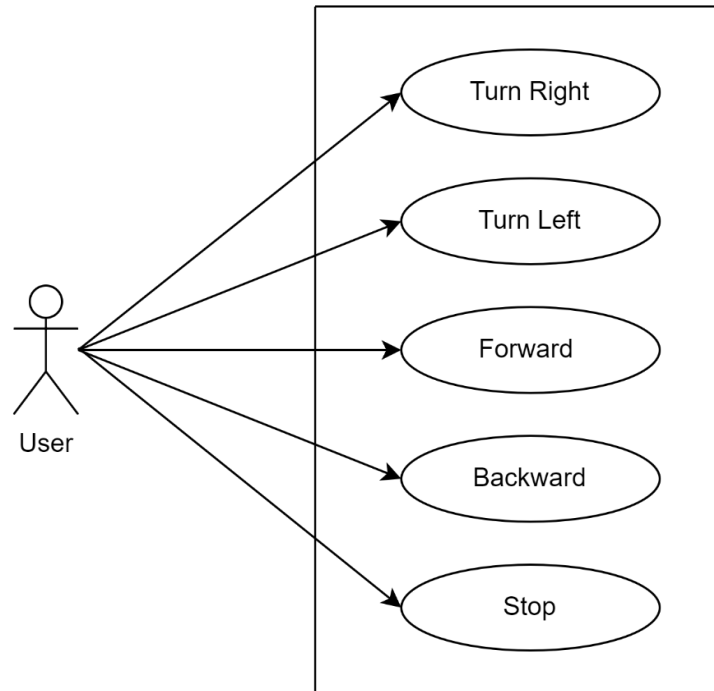


Figure 2: Use Case Diagram

#### 3.4.3.2 Non-Functional Requirements

Non-functional requirements specify how the system operates, and it covers all the user expectations. The following are some of the non-functional requirements:

- Reliability: The boat and the control unit can be separated by up to 10 meters, during which time the system should function dependably.
- Performance: Less than 100 milliseconds should elapse between submitting a control command from the app and the boat carrying it out.
- Usability: The control app should have an intuitive and user-friendly interface.
- Durability: The boat should be more durable to the bumps and aquatic reaction.
- Scalability: Future updates to the system, like adding more sensors or more control.
- Safety: Safety features should be installed on the boat to guard against the motor and other electronics overloading or overheating.
- Maintainability: Well-documented design and coding will make maintenance and troubleshooting simpler.

### 3.4.3.3 The Flow Chart or the System

This system enables remote control of a Boat using a smartphone and Bluetooth. The user interacts with a smartphone app, sending specific commands. These commands are relayed via Bluetooth to a module, which then transmits them to a microcontroller. The microcontroller interprets the instructions and communicates with the servo motor, causing it to move to the designated position. In essence, the smartphone acts as a remote control, wirelessly instructing the servo motor through a series of commands.

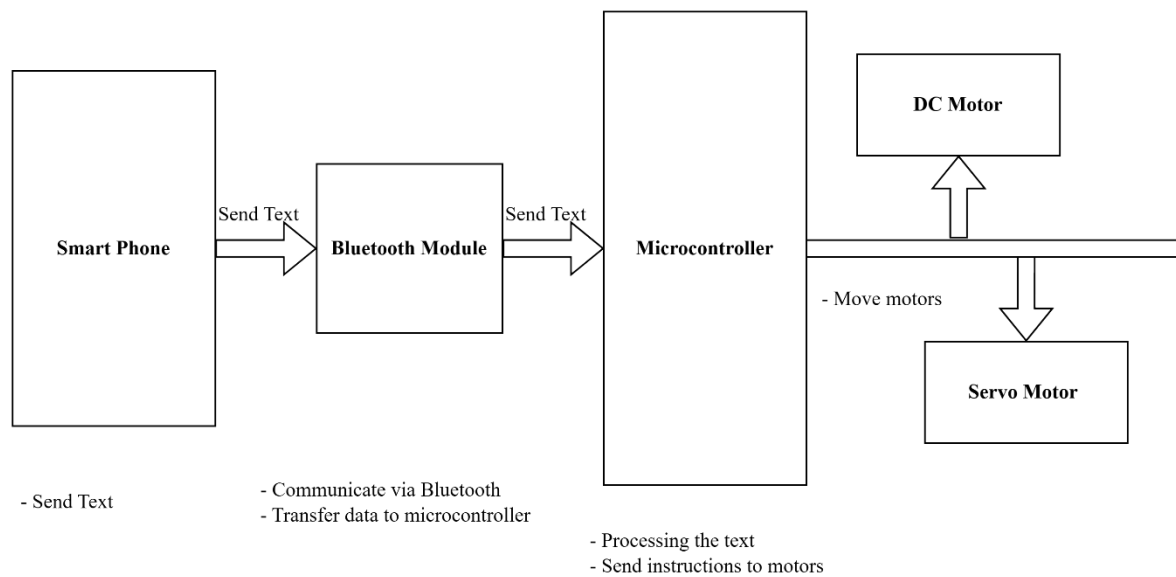


Figure 3. Flow Chart of the Remote-Control Boat

### 3.4.4 Design Phase

During the design phase the 3D model and Design of the UI was made. Using tools like TinkerCad and MIT app inventor the backbone or the layout of the project was finalized and shown to the team member and the CEO and supervisor for approval.

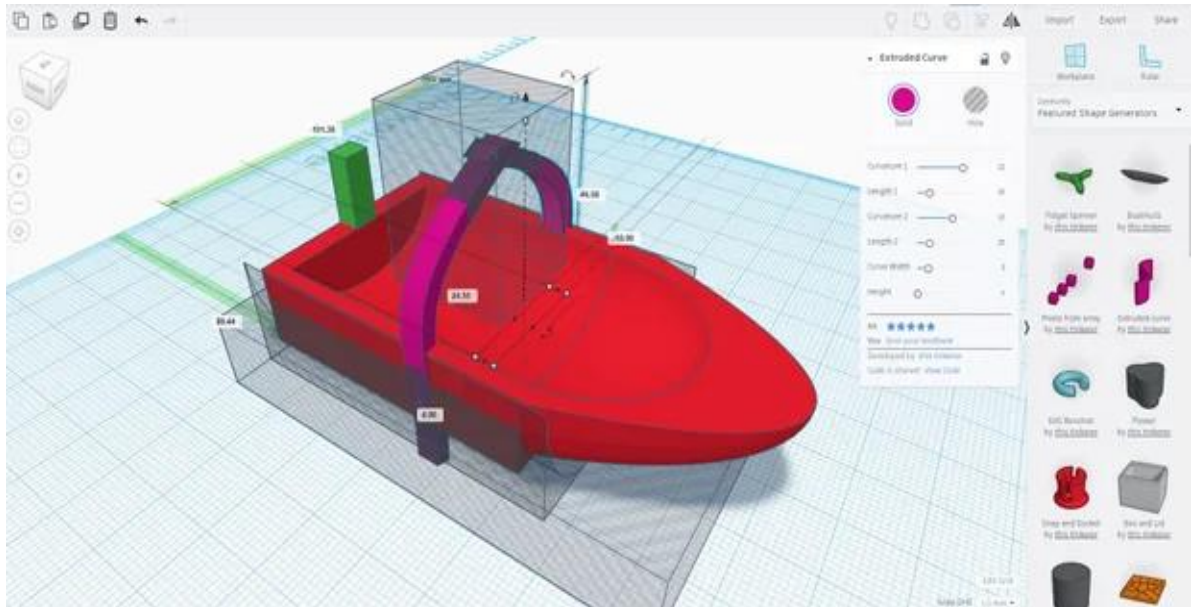


Figure 4: 3D design of Boat

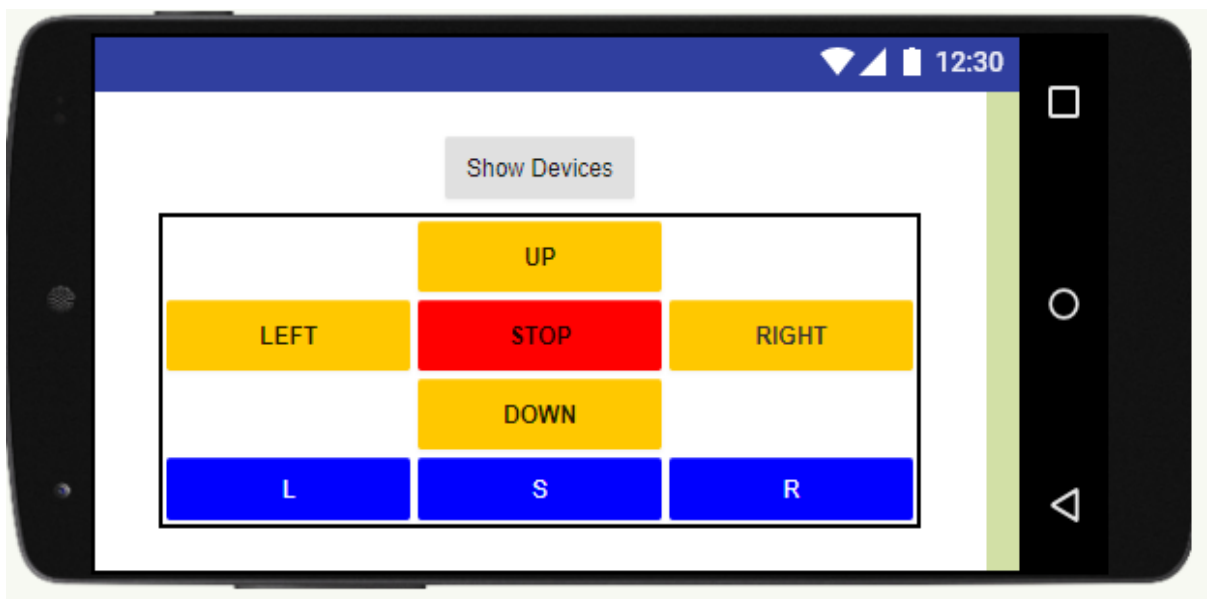


Figure 5: UI for the Bluetooth Application

#### 3.4.4.1 Development Phase

This phase involved developing the boat, integrating connections and Bluetooth control, and learning to use tools, techniques, and programming languages for efficient and professional project execution.

- Tinker Cad: It is used for 3D modeling of the boat and its components, such as the propeller and radar system, aiding in understanding basic 3D modeling and 3D printing.

- **Arduino IDE:** Arduino IDE, a C++-based platform, was used to program and control the Remote-Control Boat.
- **MIT App Inventor:** It is a platform for creating Bluetooth applications for mobile devices, offering an easy way to design the UI, write code, and develop the app.

### 3.5 Testing Phase

- Verify the functionality of the Bluetooth remote control boat.
- Ensure the boat responds accurately to commands from the Bluetooth control app.
- Validate the reliability and performance of the Bluetooth connection.
- Test the usability and user experience of the control app.
- Assess the durability and safety of the boat in a water environment.

#### 3.5.1 Testing Strategies

Various testing strategies were used to test and debug the program and make the prototype efficient.

##### 3.5.1.1 Unit Testing

All parts including SajiloBot, Bluetooth Module, Batteries, motors were tested properly.

##### 3.5.1.2 Integration Testing

Various components were combined and tested to see if they are compatible with each other and working.

##### 3.5.1.3 System Testing

All components (SajiloBot, Bluetooth Module, Batteries, motors) were joined together and tested to see if it gives any errors or have some bugs etc.

##### 3.5.1.4 Test Case

Table 2: Test Case for Remote Control Boat

SN	Test Case Scenario	Test Data	Expected Result	Actual Result	Status
1	Bluetooth Connection Testing	Turn on Bluetooth Module and try to connect from Smart Phone	Establish connection and show connected	Show Connected	Pass
2	Response Time	Click on to any of	Move instantly	Task process	Pass

	Testing	the Bottom	according to the bottom	in milliseconds	
3	Bottom Functionality Testing	Press FORWARD, BACKWARD, RIGHT, LEFT, STOP, L, R and S Bottom respectively	Move forward on pressing FORWARD and so on for all	Move according to the bottom	Pass
4	Power Supply Testing	Take a multimeter and check the voltage of the SajiloBot, and Motors	5V	5V	Pass
5	Range Testing	Move boat to the more the more than 10m	Not control	Not control, control in the Range of 10m only	Pass
6	Over Heating Testing	Run the boat in over speed for some time	Average level of heating	Heat up to 60°C	Pass
7	Direction testing	Move the boat into different direction (forward/backward)	Straightly move into the direction	Moving straightly	Pass

## **CHAPTER 4: CONCLUSION AND LEARNING OUTCOMES**

### **4.1 Conclusion**

Using SajiloBot and a Bluetooth module, the construction of the Bluetooth remote control boat has been an exciting voyage of creativity and teamwork for me as an intern at Beyond Apogee. We have created a dependable and adaptable boat that can maneuver the seas with agility and precision thanks to careful planning, execution, and testing. Every stage of the project, from conception to implementation, has been driven by a passion for pushing the frontiers of technology and a dedication to excellence. I'm proud of our achievement as we venture into uncharted territory because I know that our remote-control boat is a living example of the strength of imagination, willpower, and cooperation. Whether venturing into uncharted territory or taking leisurely travels, our boat with Bluetooth remote control is prepared for countless excursions that will delight and surprise everyone who sees it.

### **4.2 Learning Outcomes**

I've learned so much about different facets of robotics, satellite technologies and engineering throughout my three months as an intern at Beyond Apogee Robotics. This experience has been a remarkable learning journey, from understanding hardware integration foundations to implementing sophisticated control algorithms in real-world circumstances. I've learned throughout the internship how important it is to plan everything out carefully and carry it out methodically, especially when creating sophisticated robotic systems. Working with a diverse group of specialists has also improved my communication and teamwork abilities in addition to broadening my perspective. In addition to giving me practical robotics experience, this internship has stoked my love of creativity and problem-solving. All in all, working at Beyond Apogee Robotics has changed me and equipped me with possessing the expertise. Some of the things which I have learnt for three months period of internship are as follow:

- Learning and researching about SajiloBot, Arduino and working with it.
- Satellite technology
- Data collection, brainstorming ideas and perform competitive analysis.
- Teamwork and communication

- Differentiate low-fidelity and high-fidelity design and prepare design system.
- Working procedure in an IT company and procedures of getting projects from the clients.
- Skills to communicate and report to department in time regarding any kinds of issues that are dealt within the organization.



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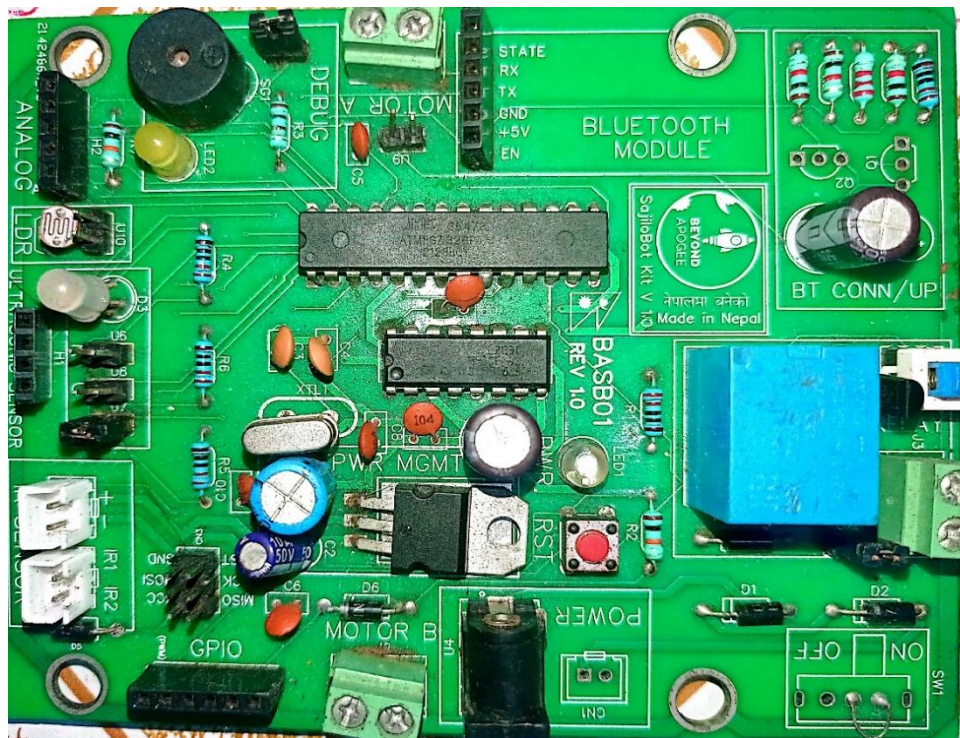
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## APPENDICES

Below are the devices used in the project:



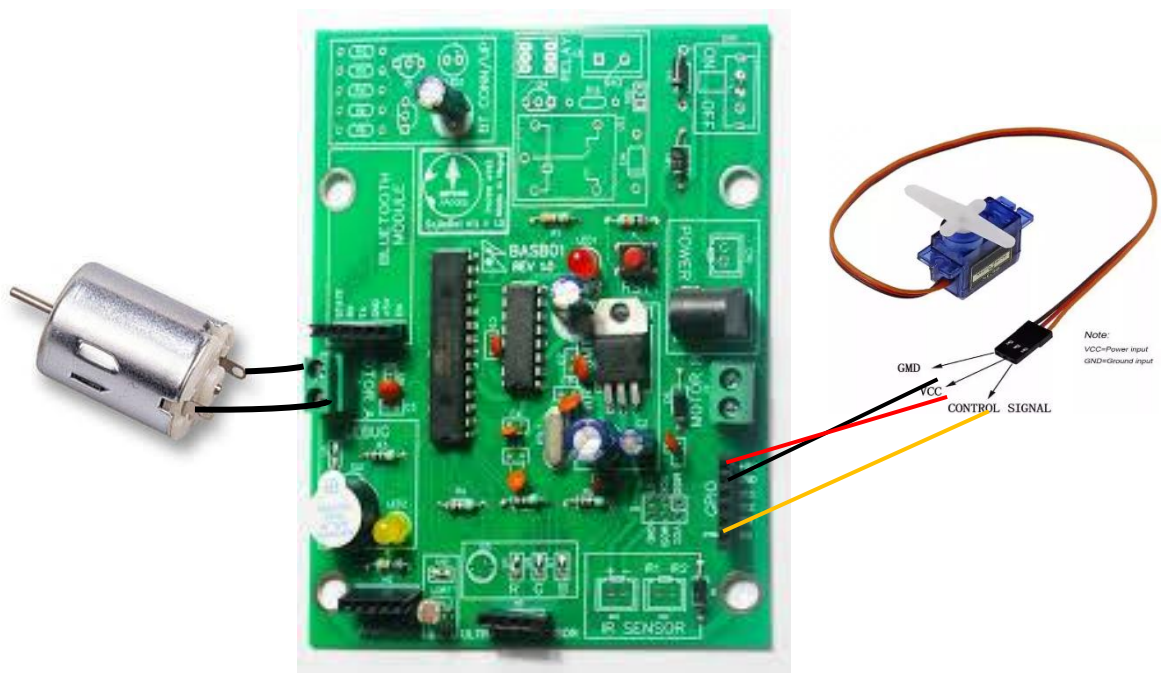
SajiloBot



Servo Motor and DC Motor



Bluetooth Module (HC-05)



Circuit Diagram