Robotics Society NITH - Information Document

1. Introduction

This document provides detailed information about the society, including its history, leadership, ongoing projects and events. This information will be used to train our chatbot, making it an effective tool for both members and visitors.

2. Society Overview

2.1. Founding Date

Founded: 2016

2.2. Mission and Vision

Mission: Build and sustain a culture to be self-reliant to accomplish our vision, by emphasizing the development of individual quality.

Vision: To be a luminary of the Indian society in the field of Robotics.

2.3. History

Brief History: RoboSoc NITH was co-founded by Kashish Verma and the late Lamyanba Heisnam. It aims to develop a strong culture of robotics within the NIT Hamirpur community.

4. Board Members and Their Roles

4.1. 2024-2025

Role	Member Name
President	Aakash Tiwari
Vice President	Neha joshi
General Secretary	Milind Gupta

Joint General Secretary	Varun Jain
Treasurer	Sarika Lakhotia
Technical Head (Programming)	Akhil Sharma
Technical Head (Mechanical)	Urvashi Lamba
Technical Head (Electronics)	Vanshika Gyanchandani

5. Executive Members

5.1. 2024-2025 Coordinator

Name	Roll Number
Putul Singh	22BME080
Akhil Sharma	22BEE015
Ritwiz Singh	22BCS047
Avisheet Srivastava	22DCS005
Yashita Arya	22BCS120
Purushottam Singh	22BME078
Nitya Pal	22BCH036
Kshitij Priyank	22BME048
Namrata Kaushal	22BCH034

5.2. 2024-2025 Executives

Name	Roll Number
Ashish Ranjan	23BME025
Kartik Sharma	23BCH032
Jai Krishan Sharma	23BCS041
Manya Singh Lalhall	23BCS060
Prakhar Pandey	23BCS077
Punitha Narasegowda	23BCS081
Rishabh Sharma	23BCS087
Rishabh Sharma	23BCS088
Nimish Saxena	23BEC068
Vaibhav Shukla	23BEE114
Areen Sharma	23BCE025
Chirayu Pandey	23BME033
Disha Sachan	23BME053
Khushi Pandey	23BME059
Robin Rawat	23BMS029
Sarthak Katiyar	23DCS024

5.3. 2024-2025 Volunteers

Name	Roll Number
Atul Koundal	24BCS031
Peeush Chauhan	24BCE054
Tanishka Sharma	24BCE081

Shubham Pathak	24BEC100
Shranya Thakur	24BEC098
Pallavi Pal	24BME060
Sakshi Kaushal	24BME083
Alvin Saini	24BME010
Ayush Kumar Sharma	24BEE028
Akansha	24BME007
Shreya Thakur	24BCE074
Himanshu Punpher	24BEC050
Garv Kapoor	24BEC040
Vaibhav Pandey	24BCH071
Somesh Gupta	24BPH046
Saumya Jaiswal	24BCS102
Ravi Kumar Verma	24BCS096
Vinay	24BCS121
Yashwin Sharma	24BCE088
Vyom Pant	24BCS123
Priyanshu Kaushal	24BEE074
Vanshika Sharma	24BCS119
Sambhav Agarwal	24BEE085
Kunz Sharma	24BMA021
Parth Thakur	24BCS077
Shashwat Singh	24BCS105

6. Projects

6.1. Robotic Surgical Arm

Description:
to assist surgeons during procedures. Here are some key features and benefits:

Types of Surgical Arm1. Robot-assisted surgical arms: These use advanced robotics

and artificial intelligence to enhance precision and dexterity.

2. Mechanical surgical arms:These use mechanical components to provide stability and support

during procedures

Status: In Progress

6.2. DeepFake

Description: “Deepfake generation” pertains to the automated creation of synthetic media such as images, videos, and audio that closely resemble real ones. This technology enables us to generate and manipulate media content via our computers or other devices, anytime and anywhere .

Steps: Speaker Encoder: The speaker encoder is responsible for capturing speaker characteristics from speech waveforms. It generates a fixed-dimensional vector representation of the speaker's voice, which is then used to condition the synthesis process.

- Sequence-to-Sequence Synthesizer: This component generates mel spectrograms from input text and the speaker embedding produced by the speaker encoder. It utilizes a sequence-to-sequence architecture .
- Autoregressive WaveNet Vocoder: The vocoder transforms the predicted mel spectrogram into time-domain waveform samples. It employs the WaveNet architecture. to generate high-quality waveform samples that closely match the predicted spectrogram

Status: Completed

6.3. Line Following Bot

Description: Creating a robot capable of following a predefined path using sensors, focusing on real-time data processing and control systems.

Components Used:

- Microcontroller (Arduino/ESP8266/other)
- IR Sensors (Array or Individual)
- L298N Motor Driver
- DC Motors with Wheels

Working Principle:The Line Follower Bot operates based on sensor feedback and motor control logic to autonomously follow a designated path. The key steps in its working mechanism are:

1. Line Detection using IR Sensors

- **The bot is equipped with Infrared (IR) sensors (either individual or in an array).**
- **These sensors detect the contrast between the line (black/white) and the surrounding surface.**
- **IR sensors work on the principle of light reflection—a dark surface absorbs IR light, whereas a bright surface reflects it.**

2. Signal Processing by the MicrocontrollerThe sensor readings are fed into a microcontroller (e.g., Arduino, ESP8266, etc.).

- **Based on the sensor values, the microcontroller determines the bot's position relative to the track:**
  - **Centered on the track → Move forward.**
  - **Drifting left → Adjust right.**
  - **Drifting right → Adjust left.**

3. Motor Control via Motor Driver (L298N)

- **The microcontroller sends control signals to the L298N motor driver module, which powers the DC motors.**
- **By varying motor speeds, the bot corrects its path and stays aligned with the line.**

4. Navigation & Adjustments

- **The bot continuously reads sensor data and makes rapid real-time adjustments to follow the track smoothly.**
- **If sharp turns or curves exist, advanced PID (Proportional-Integral-Derivative) control can be implemented for smoother movement.**

5. End of Track or Obstacle Handling (if applicable)

- **If the bot reaches an endpoint (e.g., an interrupted line or a stop signal), it can be programmed to stop or take an alternative path.**
- **Additional ultrasonic sensors can be integrated for obstacle detection and avoidance.**

Supply (Battery)

Status: Completed

6.4. Gesture-Controlled Bot

Description: A robot controlled by hand gestures. This project focuses on integrating sensors and machine learning algorithms to interpret hand movements and translate them into robotic actions.
Status: Completed

6.6. 3D Scanner
Description: Development of an affordable, high-resolution 3D scanner for personal use. It uses line lasers and 3D triangulation to generate a point cloud for creating 3D models. The scanner operates on a Raspberry Pi with onboard software, requiring no additional installations.
Status: In Progress

6.7. Driverless Car
Description: A prototype driverless car that detects roads, follows paths, and recognizes traffic signals using Raspberry Pi, camera, and ultrasonic sensors. The project focuses on object detection and neural network training using OpenCV.
Status: In Progress

6.8. Teleoperation Using Leap Motion
Description: Developing a system to replicate hand gestures for teleoperation using Leap Motion. The project includes a robotic hand controlled via a microcontroller, translating gestures into precise movements.
Status: In Progress

6.9. Mantis
Description: **SLam tech bot that finds it's way in developing Essential robust Technology in all autonomous bots ."**

ROS stands for Robot Operating System. It's not an actual operating system like Windows or uBUNTU, but rather a framework and set of tools used for building and controlling robotic systems. ROS provides libraries, drivers, and tools for creating and managing robot software, as well as for communication between different parts of a robotic system. It's widely used in research, academia, and industry for developing robots and robotic applications.

SLAM is Simultaneous Localisation and Mapping. By starting with an example, Let us take Google Map which has a complete path of the whole world, Mapping in SLAM resembles that part. Similarly by using GPS (Global Positioning System) every individual is located in that map using the coordinates of Latitude and Longitude. With another example, by using Lidar we can

Map the environment as well as by using SLAM Algorithm we can do localization and Mapping at the same time.
Status: Completed

6.10 Galactic Dodger

Description:Galactic Dodger: LED Tetris Adventure Experience the retro thrill of Tetris in a futuristic twist! Galactic Dodger merges LED lights and Arduino technology for an immersive gaming experience that transports you to the heart of the cosmos. Dive into the challenge today!"

PROJECT ATTRIBUTES

- **LED Matrix Setup: Arrange LED lights in a 10x20 grid to form the ame display.**

2. Player Controls and Movement: Use Arduino inputs to control

the player's movement left, right, and down to dodge

obstacles.

3. Obstacle Generation and Collision Detection: Randomly

generate obstacles resembling Tetris blocks falling from the

top. Detect collisions between the player and obstacles,

4. Score Tracking and Difficulty Adjustment: Track the player's

score based on dodging performance. Increase game difficulty

over time .

5. OLED Display for Health, Score, and Dynamic Background: Utilize an OLED display to show player health, score, and dynamic background representing space environmenT.

6.11 Braille Bot

Description:The Braille Bot is an innovative assistive technology designed to enhance accessibility for visually impaired individuals by enabling efficiencommunication and interaction with digital content. This bot utilizes advanced machine learning algorithms, natural language processing, and Braille translation systems to convert text into Braille and vice versa in real-time. It allows users to receive and send messages through Braille, facilitating seamless engagement with digital platforms, such as smartphones, computers, and smart devices. The Braille Bot is equipped with a user-friendly interface and provides both voice and tactile feedback to ensure an inclusive and intuitive experience. This tool aims to bridge the digital divide, empowering visually impaired individuals to access and interact with information, fostering independence and improving quality of life.

Technology and Components:a microcontroller board (like ESP32 or Arduino), servo motors to control the dots, a DFPlayer Mini module for audio, a memory card, a speaker, touch sensors, and jumper wires, all housed in a 3D printed case.

Here's a more detailed breakdown of the components:

Core Components:

- **Microcontroller Board: The "brains" of the BrailleBot, responsible for controlling the motors and interacting with the user.**

Example: Romeo ESP32-S3 Development Board

2. Servo Motors: These are used to move the six Braille dots up and down, forming the Braille characters.

Quantity: 6

3.DFPlayer Mini Module: This module allows the BrailleBot to play audio, providing spoken characters and instructions.

4.Memory Card: Used to store the MP3 files containing the spoken Braille

characters.

5.Speaker: To play the audio from the DFPlayer Mini.

6.Touch Sensors: Allow users to interact with the BrailleBot, for example, to select characters or start/stop the learning process.

6.12:Smart Glasses:

Description:We've built smart glasses using a Raspberry Pi 5 and Pi Camera to help Alzheimer's patients capture and retrieve memories. This compact system also has potential for crime investigation support.

Components:Raspberry Pi 5: Processes images and manages the system.

- **Pi Camera: Captures snapshots every 30 seconds.**
- **SQLite 3: Stores images and timestamps.**
- **OLED Display (SPI): Shows retrieved images/text.**
- **Image-to-Text AI: Generates detailed descriptions.**
- **Interface: Allows date/time-based retrieval.**

- The Pi Camera captures images every 30 seconds, storing them in an SQLite 3 database with timestamps. A highly trained AI converts each image into a detailed text description (e.g., clothing, scene details). Users enter a date and time in an interface to retrieve snapshots, which are displayed on an OLED screen connected via SPI to the Raspberry Pi 5. Flow: Pi Cam → SQLite 3 → Query → OLED.

6.13 Air MoNITORING SYSTEM

Description:A real-time IoT-based system for monitoring air quality, temperature, and humidity. It collects sensor data, transmits it via Wi-Fi, and visualizes real-time trends while using machine learning for predictions.

Working:he Air Quality Monitoring System is an IoT-based solution designed to measure and analyze air quality parameters such as temperature, humidity, and AIR QUALITY (IN PPM). The system transmits the collected data over Wi-Fi and provides real-time monitoring, visualization, and predictions using machine learning models.

Components:1 . ESP8266

2 . MQ135 – Air quality sensor

(measures pollutants in ppm).

3 . DHT11 – Temperature & humidity

sensor.

4 . Breadboard & Wires – Connect

components.

7. Events

7.1. Robosoc Workshop

Title: Robosoc Workshop
Date: []
Description: This event was organized for first-year students to introduce them to Robotics and the Robotics Society. More than 500 students attended the workshop.
Outcome: Approximately 300 students came for the interview for the Robotics Society.