RAPHARM

SMART INDIA HACKATHON

Ministry/Organization Name: Government of Kerala

PS Code: SIH1327

Problem Statement Title: Developing a system for patient care in health sector.

Team Name: Robotic Arm for Patient Healthcare and Rehabilitation (RAPHARM)

Team Leader Name: Snehkumar Sabhaya

Institute Code (AISHE): U-0467

Institute Name: National Institute of Technology, Tiruchirappalli

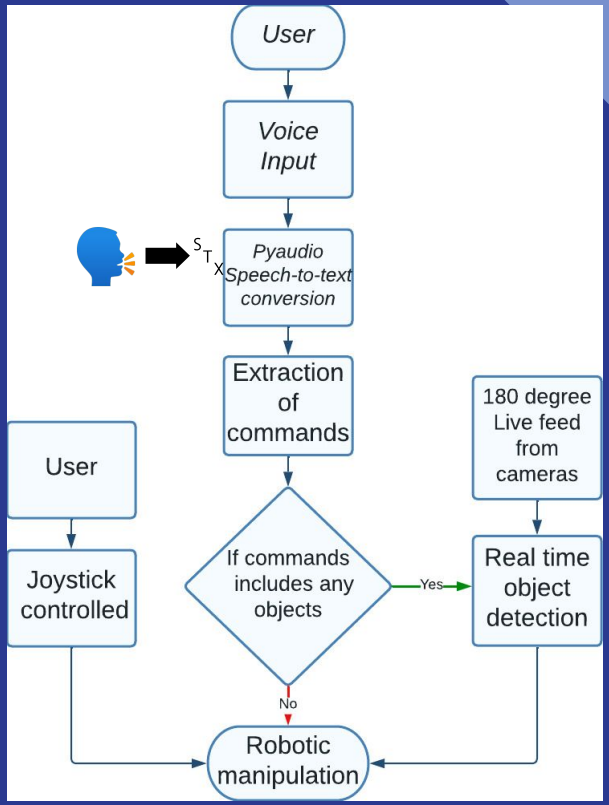
Theme Name: Robotics and Drones (Hardware)

Mentor Name : M. Sridevi (Computer Vision and AI)

Proposed Solution

The healthcare sector faces a challenge in providing comprehensive care for patients with upper and lower limb impairments.Upper limb-impaired individuals often confront hurdles in executing basic tasks like self-feeding or manipulating objects, leading to feelings of dependency. On the other hand, lower limb-impaired patients encounter mobility issues and require aid in wheelchair navigation and accessing nearby items. To address this, our solution integrates a robotic arm onto wheelchairs, enabling voice commands for upper limb-impaired individuals and joystick control for lower limb-impaired patients. This innovation enhances patient independence and well-being, significantly contributing to improved healthcare.

- **Audio-to-text:** Users communicate their intentions, and a real-time speech recognition system converts their voice into text, extracting key commands. The system leverages natural language processing to interpret user intents.
- **Textual command interpretation:** The robotic arm executes actions based on commands by translating textual instructions into executable tasks involving natural language understanding while live camera feeds provide a 180-degree view of the environment.
- **Joystick control:** Users can also manually operate the robotic arm using the joystick controller, providing them with the flexibility to achieve more complex actions in addition to the voice-controlled actions.



Use Case

User commands pick and place of objects through voice input

Audio to text conversion

Standard command interpretation

Standard command and live feed are inputs for actuation

Robotic Arm executes the action

Assisting user in daily tasks

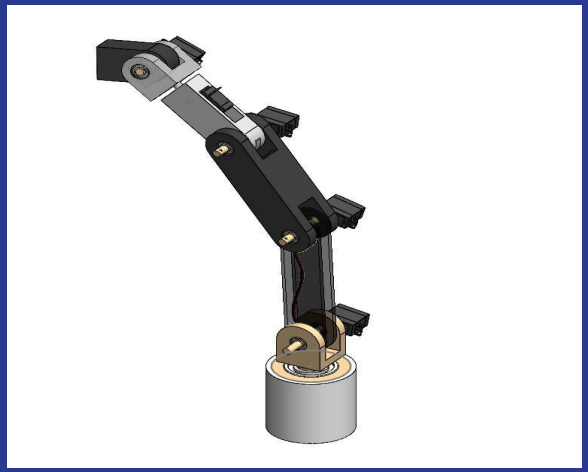
Commands for opening/closing doors and pressing buttons/switches

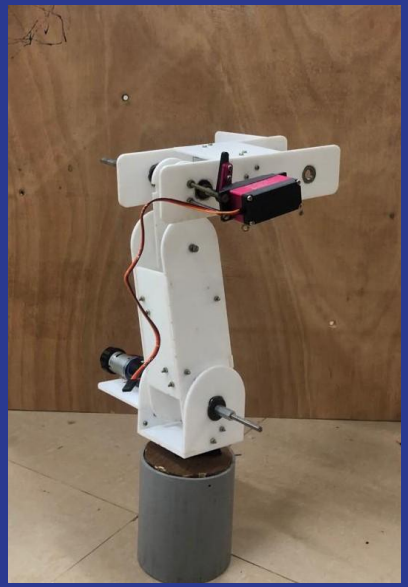
Standard command interpretation and execution

User commands pick and place of objects through joystick

Joystick sends input data to processor

Processor moves the arm to desired position





Technology stack used:

- **Libraries used:** Pyaudio speech-to-text, YOLOv8,NLTK.
- **Machine Learning Frameworks:** Tensorflow.
- **Hardware:** Nvidia Jetson nano, Camera module, mic, Joystick controller, Force touch sensor, ESP32.
- **Programming languages:** Python
- **Design Softwares:** Fusion360

Dependencies/Show Stopper:

- Speech recognition accuracy will be compromised in noisy environments, potentially leading to misinterpreted commands and information extraction errors.
- Achieving low latency in real-time systems, especially with complex speech recognition and object detection tasks is a challenging task.
- Complex integration of multiple components demands substantial engineering effort to create a cohesive system.

TEAM DETAILS

Members	Department	Year
Snehkumar Sabhaya	Mechanical	III
Ganishk D	Production	III
Hemeshwaran V	Electronics and Communication	III
Farhan Seliya	Mechanical	IV
Srivattsan S	Mechanical	III
Vallimayl V	Electrical and Electronics	III