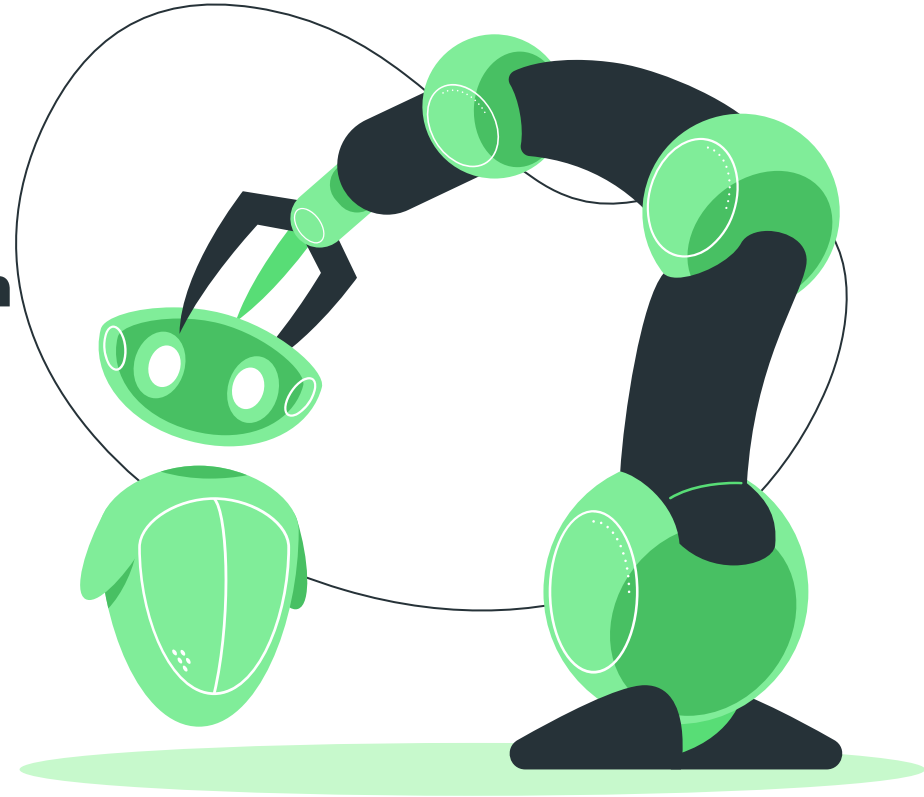


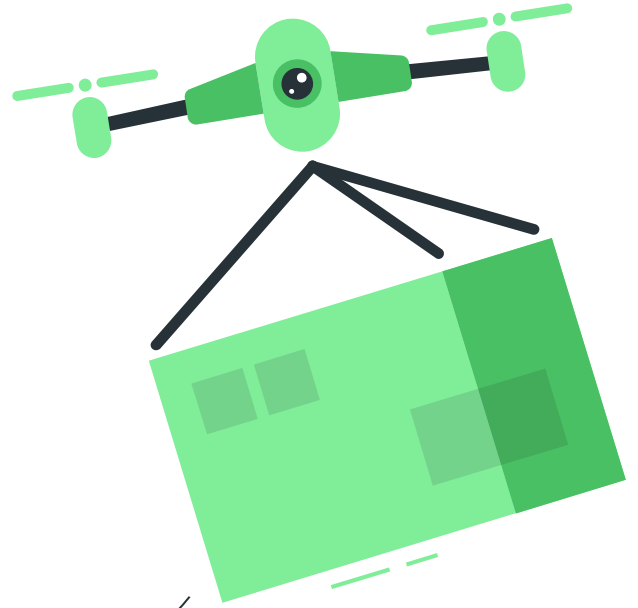
From Speech to Actions: Speech-based Robot Manipulation and Navigation System using Natural Language Processing

Savyasachi Gupta
Yogesh Raisinghani
Dhruvil Virani



Project Defination

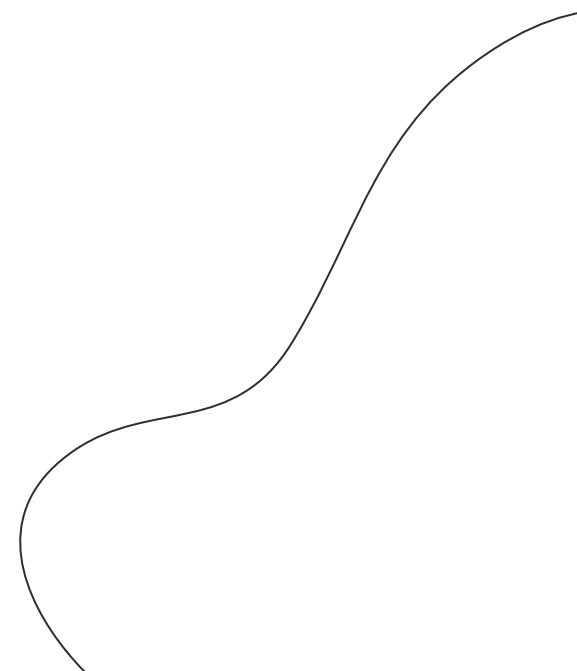
Create a system enabling robots to interpret and execute actions based on verbal human instructions.



Objective



- Enable Speech-to-Text translation
- Perform keyword analysis for actions & objects
- Transmit the actions to the robots
- The robot performs the actions



Robot Specification: Kuka IIWA

Innovative Collaboration:

- The LBR iiwa sets new standards in human-robot collaboration, suitable for delicate assembly with no need for safety fences.

Design and Functionality:

- 'Leichtbauroboter' (lightweight robot) for sensitive tasks.
- Intelligent Industrial Work Assistant for enhanced cooperation.
- Dual payload variants: 7 kg and 14 kg capacities.

Technical Advancements:

- Reach of 800 - 820 mm, adapting to a variety of tasks.
- Integrated joint torque sensors for safe and immediate responsiveness.

Technical Specifications:

- Developed using URDF format.
- Utilizes .xacro files for configuration.



Environment Specification: PyBullet

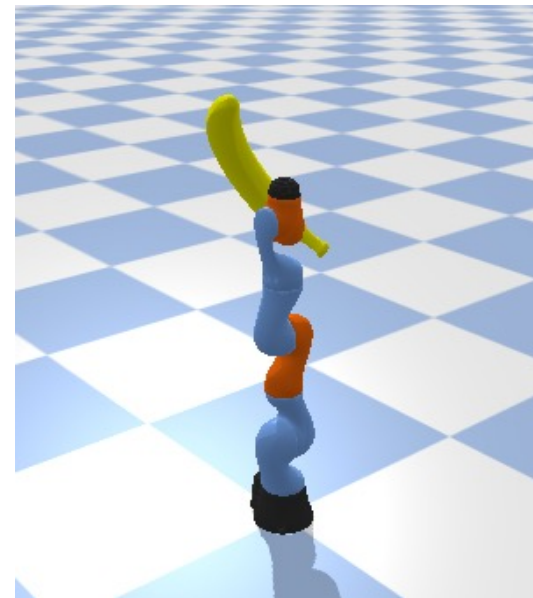
PyBullet Overview:

- PyBullet is a Python based on the Bullet Physics SDK for physics simulation, robotics, and deep reinforcement learning.
- It allows for loading articulated bodies from URDF, SDF, and other file formats.

Capabilities in Robotics:

- Provides forward dynamics simulation, inverse dynamics computation, and both forward and inverse kinematics.

In PyBullet, the **plane100** typically refers to a URDF file that defines a large, flat surface, which acts as the ground plane in a simulation environment.



Rendering Objects

3D Model Sourcing:

- Download custom 3D models (OBJ, STL files) from online repositories.
- Selection of diverse and project-relevant models to enrich simulation realism.

Designing URDFs for Each Object:

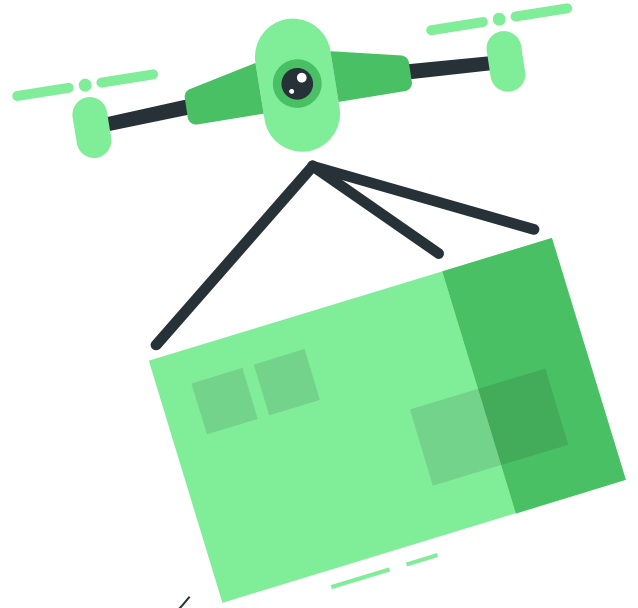
- Convert each 3D model into a URDF (Unified Robot Description Format) file.
- Configure physical properties (mass, inertia) and visual elements.

Integration into PyBullet:

- Import custom URDFs into PyBullet for simulation.
- Leverage PyBullet's physics engine for realistic object interactions.

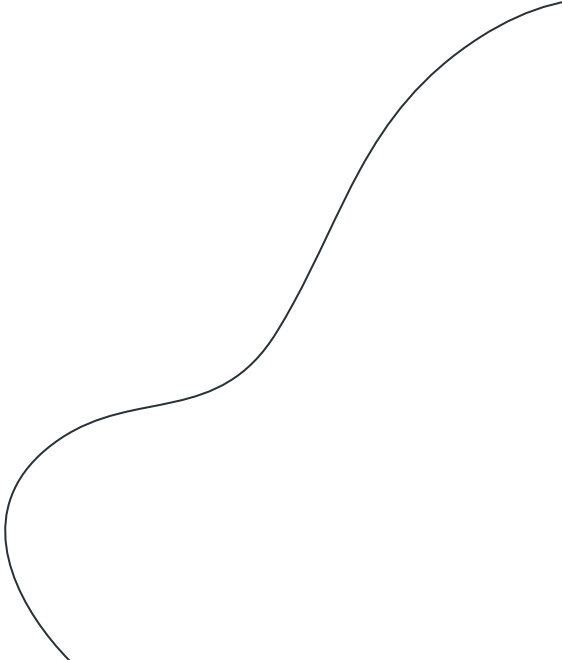


**LIVE
DEMO**



Future Scope



- Implement OpenAI's *Whisper API* for the Speech to Text module to have a more robust system and to support multi-language translation
 - Implement navigation capability to move the robot to the required coordinates.
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**THANK
YOU**

