

PROJECT : NAO Plays Marco Polo

Members: Tri Dung Su — Luka Manvelidze — Tuan Dat Nguyen

Project Overview

This project aims to develop a system where the NAO humanoid robot is able to play the game **Marco Polo**, acting in the **"Marco"** role. The robot will listen for a human responding with the word *"Polo"*, determine the direction of the sound, move toward the estimated location, visually identify a color-marked target, and perform a pointing gesture upon locating the target.

The project integrates audio processing, speech recognition, motion control, and computer vision modules to simulate a real-world interactive behavior.

Components

1. Sound Localization

- **Goal:** Estimate the direction of the incoming sound.
- **Description:** Utilizes NAO's built-in microphone array and sound localization APIs to compute the direction of the detected audio signal.

2. Speech Recognition

- **Goal:** Detect the keyword *"Polo"* from environmental audio.
- **Description:** Employs NAO's speech recognition engine to filter input and trigger a response only when the specific keyword is recognized.

3. Target Approach

- **Goal:** Move the robot toward the estimated sound direction.
- **Description:** Uses basic motion planning to walk in the direction of the sound source, guided by the localization output.

4. Computer Vision

- **Goal:** Detect a color-marked target and confirm the final location.

- **Description:** Leverages NAO's onboard camera and computer vision techniques (e.g., OpenCV-based color detection) to visually confirm the target and perform a pointing gesture.

Future possible improvements

- Improve robustness of speech recognition in noisy environments.
- Add dynamic obstacle avoidance during navigation.