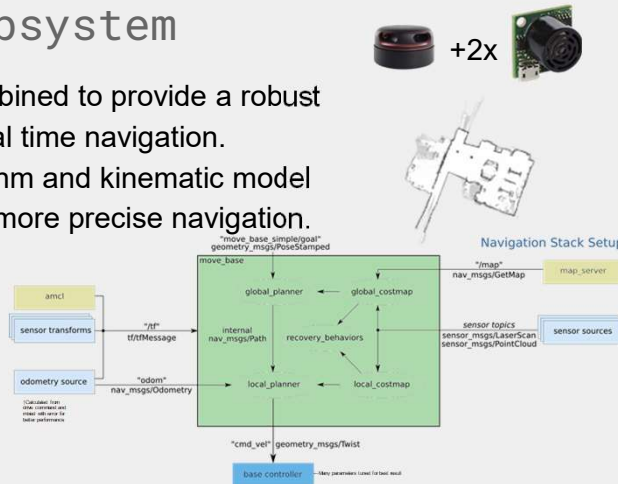


Abstract

With increasing demands for robots, a growing number of companies are investing in designing intelligent robots. Sponsored by Omnilabs Inc, a startup company specializing in telepresence robots, we explore the potential of adding artificial intelligence to the robots. We incorporate extra sensor, perform sensor fusion in ROS for navigation, include deep learning based model for facial recognition and cloud-based NLP for supporting conversations.

Navigation Subsystem

- **LIDAR** and **SONAR** combined to provide a robust information stream for real time navigation.
- Fine tuned **AMCL** algorithm and kinematic model specified to the robot for more precise navigation.
- **ROS** helps to provide a standard for adding new modules in the future.
- Fully Contained in a **Docker** image for cross platform uses.



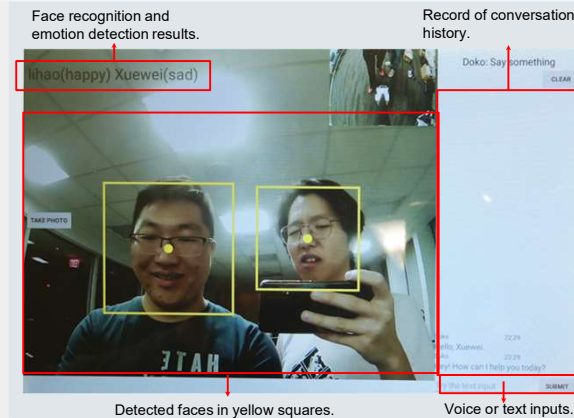
DōKō:

Japanese, to help and to assist.



Vision

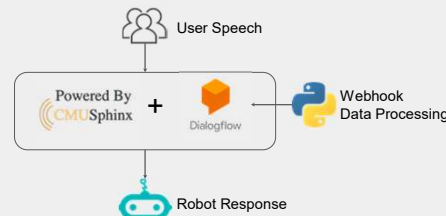
- An Android App integrates multiple functionalities.
- Face detection and image processing.
- **Face recognition** by a MobileNet CNN model.
- **Emotion detection** by a customized multi-layer CNN model.



DōKō Android App UI design.

Voice Assistance

- Use **CMU Sphinx** for speech recognition, with language model compilation and a public domain pronunciation dictionary, to provide real-time speech to text transformation.
- Apply Google **Dialogflow** as conversational agent, supported by webhook for richer data responses.
- Contextual response based on different detected emotions.



Result

- A navigation system uses multiple types of sensors to smoothly handle complex environments.
- High accuracy CNN models for vision:
 - face recognition: 92.06% on LFW dataset;
 - emotion detection: 68.32% on FER-2013 dataset.
- A voice assistant system capable of conducting basic conversations and providing useful information.