Sound Event Detection and Recognition in Autonomous Robot Navigation

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PRESENTER:

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Background:

- This project introduces an autonomous robot solution which aims to detect and recognize activities in people's homes, with a focus on the aural layer of this multi-modal sensing system
- People's concerns about privacy implications of the use of cameras make sound an effective alternative
- The system may alert the user of any threats and dangers, call for emergency support, and be customized to provide help or reminders for the user's daily routines and activities

METHODS

Conducted literature review from scientific articles and web sources, as well as hands-on experiments, to acquire an in-depth understanding of the following:

- How sound behaves in a natural sense, and its paths through technology tools such as microphones
- AI Sound Event Detection and Recognition
- Autonomous Robot Navigation

RESULTS

- Spectrograms simplify representation of sound, and the extracted features are used in AI sound recognition
- Microphone array configured with ODAS software provide real time directional audio at the input of the sensing system
- Robot Operating System allows communication between the various sensors and actuators on the robot

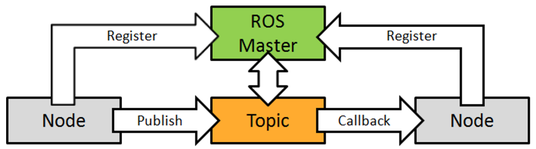

Figure 2: Illustration of a ROS network

DISCUSSION

Future research of this project includes:

- Implementation of the system
- Conditional robot behavior
- Developing AI algorithms for effective sound event detection and recognition

Exploring the use of **sound event recognition** in autonomous navigator **robots** to provide reliable and consistent **solutions for aspects of everyday life.**

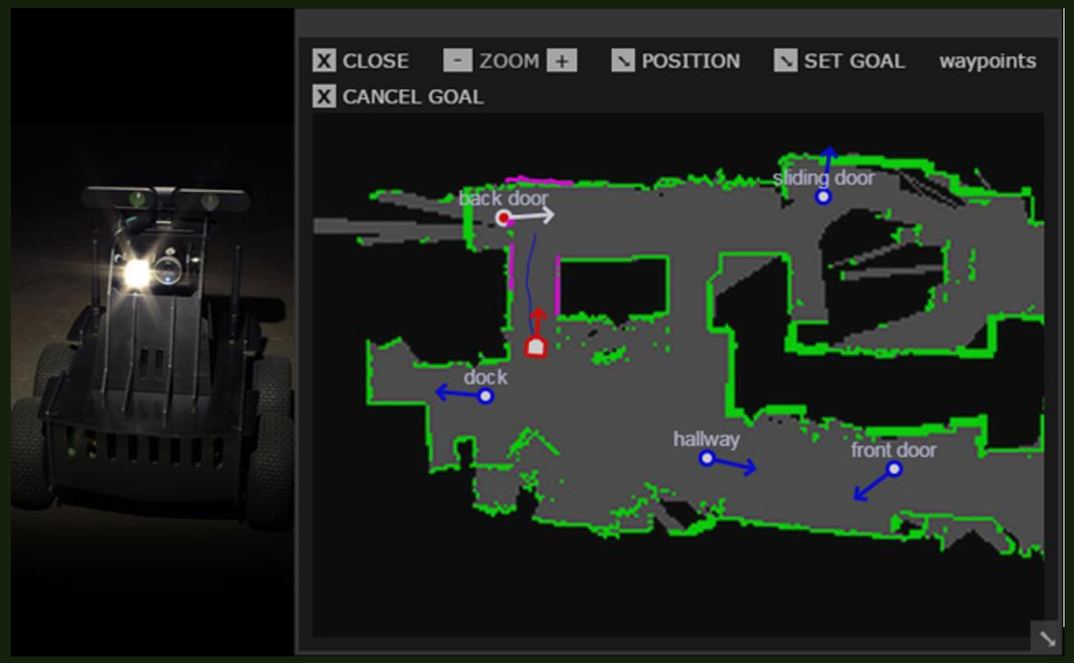

Figure 1: Oculus Prime navigator robot next to a map of a living space it has produced

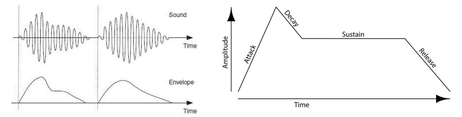

Figure 3: Envelop of a sound event over time

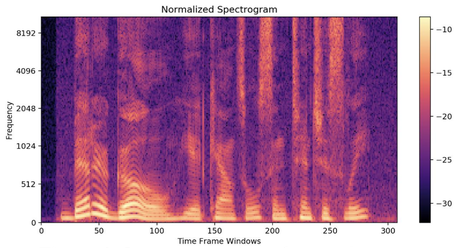

Figure 4: Spectrogram view of a soundscape

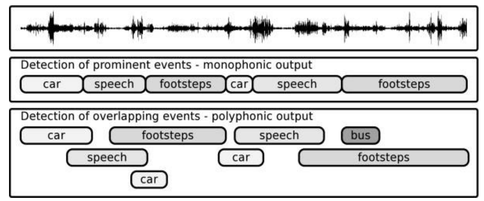

Figure 5: Example of SED by segmentation of an acoustic scene into multiples events

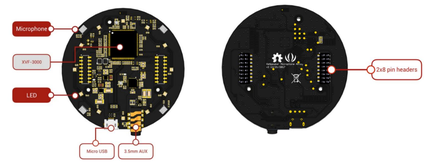

Figure 6: The top and bottom view of the ReSpeaker Mic Array v2.0 with labeled components

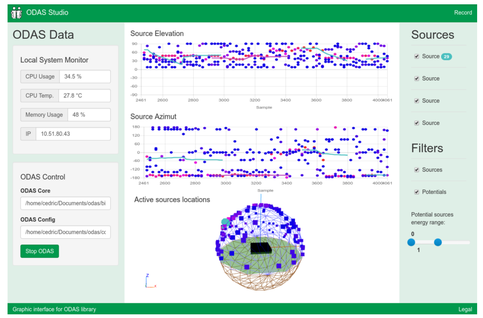

Figure 7: Screenshot of ODAS Software in action

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