

Speech based Robot Navigation using ROS

Rahul Gurjar

Rohun Tripati

12532

rahugur@iitk.ac.in

11619

rohun@iitk.ac.in

Guide: Prof. Amitabha Mukerjee

Department of Computer Science and Technology

March 16, 2015

Objective

The aim of this project is to program a robot to perform predefined task using natural language commands. We intend to implement it on ROS(Robot Operating System) using Semantic interpretation of speech and perform the desired task with obstacle avoidance.

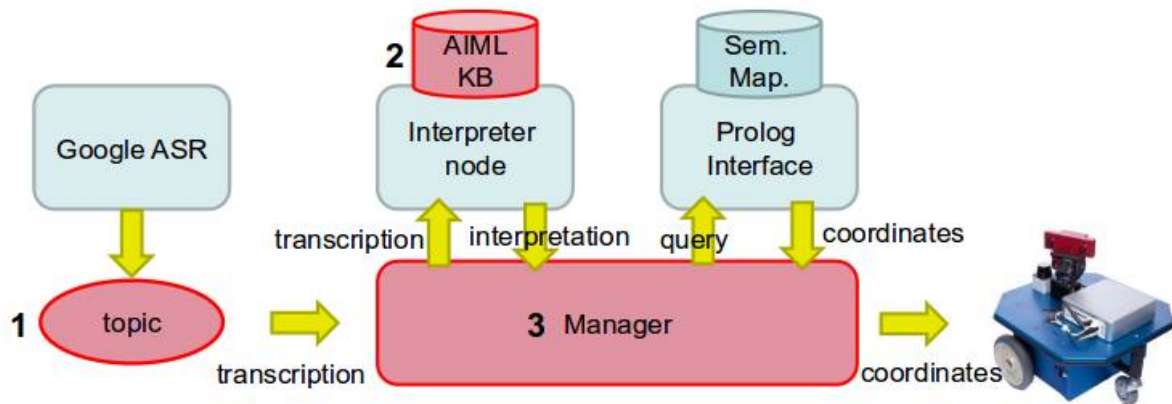
Motivation

The development of the robots in general and humanoids in specific has been aimed to aid humans and possibly replace them in dangerous and redundant work. Possible applications of the humanoids include assisting in daily chores of the humans, delivery of various items, disaster rescue operations etc. All these and more require programming of robot and then complete the specified task. However programming a robot to do every task is quite tedious work and it's not possible to use it for household or medical purposes. Thus, there is a need of robot which can understand commands given by people and then follow those commands.

Our Approach

Our framework include four tasks based on paper^[1]:

- **Speech to text:** Google "Speech to text" will be used for speech recognition. A ROS node embedding Google ASR will be developed which will return the transcription of the given command.
- **Semantic Interpretation:** Semantic interpretation of the transcription provided by the ASR will be done through Artificial Intelligence Markup Language(AIML). AIML provides a method to interpret NL using "Stimulus/Response" patterns. A knowledge base will be provided with parse motion commands. A ROS node embedding an AIML interpreter will be developed for the same.
- **Grounding through semantic map:** A Prolog interface will be developed to query in the semantic map extracted from given metric map. Another ROS node embedding the prolog interface will be needed. This node will return the details of the tasks that the robot needs to perform as specified by the command.
- **Articulated robot manipulation:** Finally we will implement tasks such as gripping(picking)^[3] and placing objects as per commands using ROS.



Future Work

If time permits, we would implement SLAM based obstacle avoidance and grounding of the robot.

References

- [1] Cynthia Matuszek, Evan Herbst, Luke Zettlemoyer, Dieter Fox. “Learning to Parse Natural Language Commands to a Robot Control System.” In Proceedings of the International Symposium on Experimental Robotics.
- [2] Daniele Nardi. “Human Robot Interaction in Natural Language.”
<http://www.dis.uniroma1.it/~nardi/Didattica/CAI/matdid/HRI.pdf>
- [3] ROS enhancement proposal. <http://www.ros.org/repos/rep-0120.html>
- [4] D. K. Misra, J. Sung, K. Lee, and A. Saxena. “Tell me dave: Context-sensitive grounding of natural language to mobile manipulation instructions.” In RSS, 2014.