

RoboCup@Home Education

ONLINE CHALLENGE 2020

Online Classroom Open Platform

03 Robot Speech Interaction (2/2) : Speech Recognition

Jeffrey Tan, Jupiter Robot | 2020.04.30

Online Challenge 2020: Online Classroom OP

03 Robot Speech Interaction (1/2) : Speech Synthesis

Speakers: Jeffrey Tan, Jupiter Robot

Time: **Apr 30, 2020 (Thu) 10:00 - 11:00 am (GMT+8)**

03 Robot Speech Interaction (2/2) : Speech Recognition

Speakers: Jeffrey Tan, Jupiter Robot

Time: **Apr 30, 2020 (Thu) 11:00 - 12:00 noon (GMT+8)**

Zoom: <https://cernet.zoom.com.cn/j/63662912847> | PW: robocup

Facebook Live: <https://www.facebook.com/robocupathomeedu/live/>

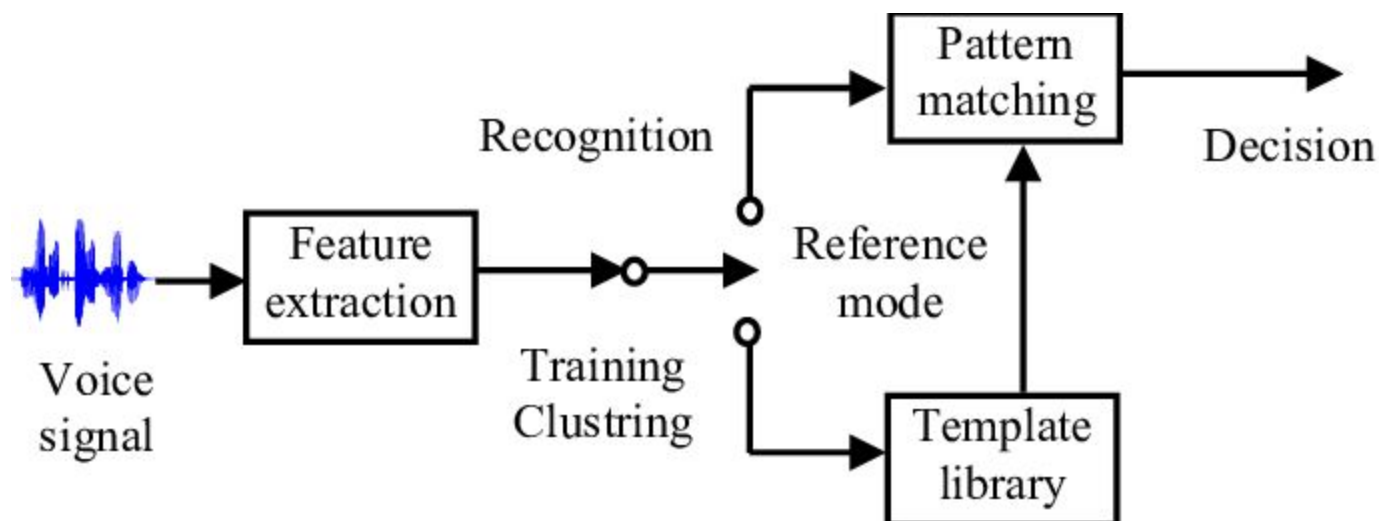
Web:
<https://www.robocupathomeedu.org/challenges/robocuphome-education-online-challenge-2020>

Online Classroom:
<https://www.robocupathomeedu.org/learn/online-classroom/online-challenge-2020>

** Privacy reminder: Video will be recorded and published online.

Speech Recognition

- Speech recognition is a process to extract speech contents from human's voice.
- An automatic speech recognition (ASR) system converts spoken words into text.



[Hamidia, Mahfoud, et al. "Voice interaction using Gaussian mixture models for augmented reality applications." 2015 4th International Conference on Electrical Engineering (ICEE). IEEE, 2015.]

Speech Recognition [offline]

- CMUSphinx - <https://cmusphinx.github.io>
- ROS Pocketsphinx - <http://wiki.ros.org/pocketsphinx>
- Installation
 - Install Pocketsphinx
 - `$ sudo apt-get install python-pip python-dev build-essential`
 - `$ sudo pip install --upgrade pip`
 - `$ sudo apt-get install libasound-dev`
 - `$ sudo apt-get install python-pyaudio`
 - `$ sudo pip install pyaudio`
 - `$ sudo apt-get install swig`
 - `$ sudo pip install pocketsphinx`
 - Install ROS package for Pocketsphinx
 - `$ cd ~/catkin_ws/src`
 - `$ git clone https://github.com/Pankaj-Baranwal/pocketsphinx`
 - `$ cd ~/catkin_ws`
 - `$ catkin_make`
 - Add language model
 - Download and copy the content of hub4wsj_sc_8k language model to `/usr/local/share/pocketsphinx/model/en-us/en-us/`
 - <https://sourceforge.net/projects/cmusphinx/files/Acoustic%20and%20Language%20Models/Archive/US%20English%20HUB4WSJ%20Acoustic%20Model/>

Speech Recognition (kws) [offline]

- Demonstration of kws mode (keyword spotting mode)
 - `$ less ~/catkin_ws/src/pocketsphinx/demo/voice_cmd.dic`
 - `$ roslaunch pocketsphinx kws.launch`
dict:=/home/<username>/catkin_ws/src/pocketsphinx/demo/voice_cmd.dic
kws:=/home/<username>/catkin_ws/src/pocketsphinx/demo/voice_cmd.kwlist
 - `$ rostopic echo /kws_data`
- Voice commands for TurtleBot simulation in Gazebo
 - `$ roslaunch turtlebot_gazebo turtlebot_world.launch` (takes time to load)
 - `$ rosrn pocketsphinx voice_control_example.py`
- Source code implementation
 - `$ roslaunch rchomeedu_speech talkback.launch` (with kws.launch)
 - Adjust the “volume=0.01” in talkback.py

Speech Recognition (Im) [offline]

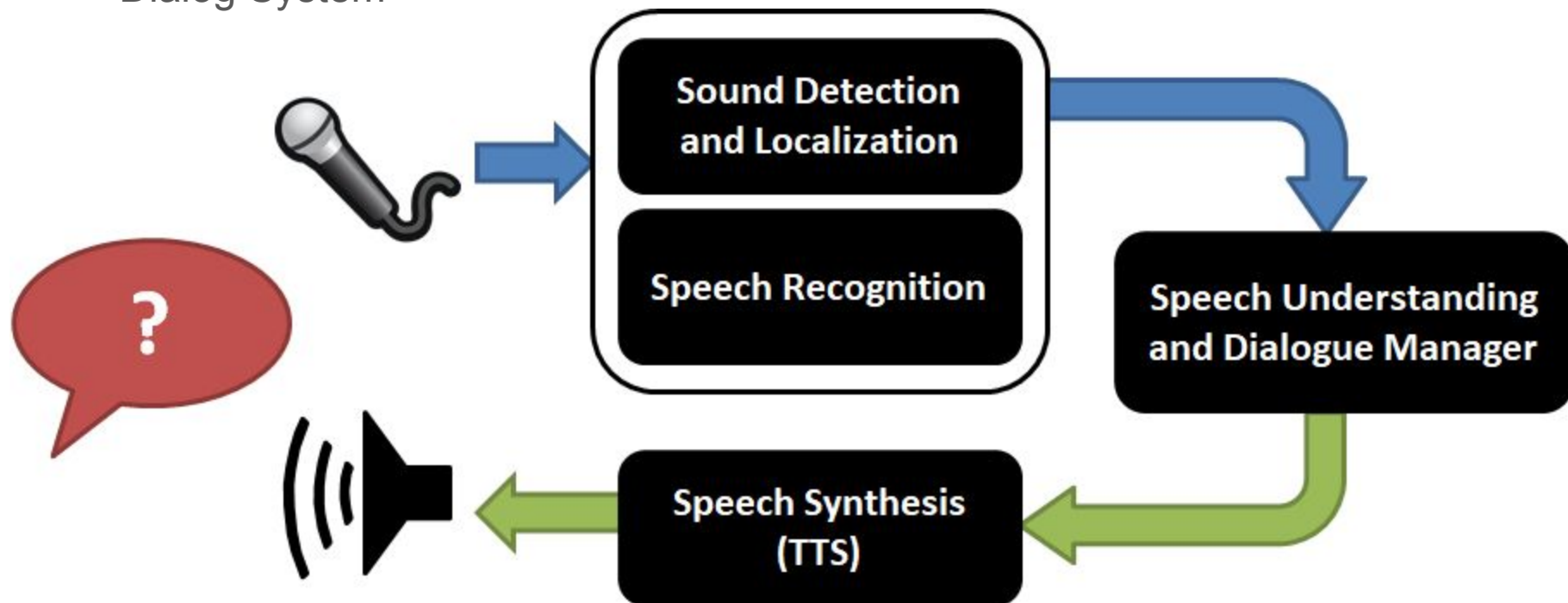
- Demonstration of Im mode (language model mode)
 - `$ less ~/catkin_ws/src/rc-home-edu-learn-ros/rchome_edu_speech/robocup/robocup.corpus`
 - `$ roslaunch rchomeedu_speech Im.launch`
dict:=/home/<username>/catkin_ws/src/rc-home-edu-learn-ros/rchomeedu_speech/robocup/robocup.dic
lm:=/home/<username>/catkin_ws/src/rc-home-edu-learn-ros/rchomeedu_speech/robocup/robocup.lm
 - `$ rostopic echo /lm_data`
- Creating a Vocabulary
 - `$ roscd rchomeedu_speech/robocup`
 - `$ gedit robocup.corpus`
 - <http://www.speech.cs.cmu.edu/tools/lmtool-new.html>
 - Update dic and lm files
- Add dic and lm files into launch file
 - `$ roscd rchomeedu_speech/launch`
 - `$ gedit Im.launch`
 - Add dic and lm files into respective argument's value

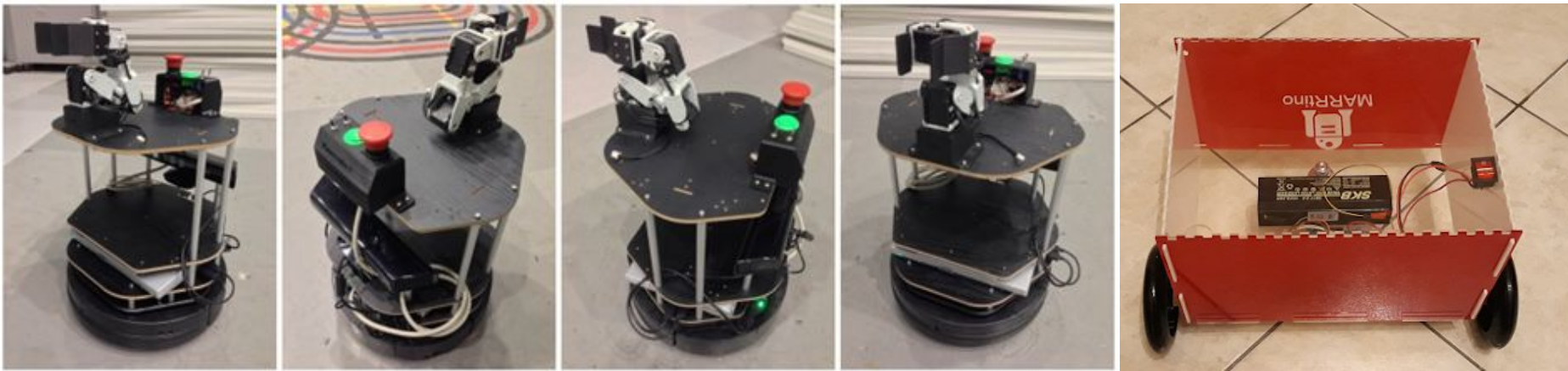
Assignments

1. Combine **speech synthesis** and **speech recognition** to develop robot speech question and answer system
 - a. Design and develop several question (speech recognition) and answer (speech synthesis) pairs for robot self introduction.
 - b. Display the results on the terminals too.
2. Upload to GitHub
 - a. Create own repository and upload the source code, system design and question and answer pairs, and speech interaction video (with terminal results) to GitHub.

More Robot Speech Interaction Classes

- Other Language Support
- Speech Synthesis [online]
- Speech Recognition [online]
- Sound Detection and Localization
- Speech Understanding and Dialogue Manager
- Dialog System





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Online Classroom: <https://www.robocupathomeedu.org/learn/online-classroom/online-challenge-2020>

Online Entry Form: <https://forms.gle/UBREeC1xTCVQ9wr78>

Online Entry Form (backup): <https://www.wjx.cn/jq/72082120.aspx>

Contact: oc@robocupathomeedu.org

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EDUCATION

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