CS497: Facial Recognition in ROS 2, Spring 2020

Advisor: Nathan Sprague
Student(s): Ryan Heick

Course Description

This course will focus on developing an application that blends robotics with facial recognition. However that is not the only aspect of the course. To go along with this application, there will be a final write-up which will include documentation of useful topics in ROS 2 as well as any needed instructions for use of the robots.

Some topics that we intend to look into during the final project are:
-The effects of the surrounding environment on face detection
-The area of effectiveness of facial recognition with these specific robots
-How movement could increase/decrease the effectiveness of facial recognition
-Whether ROS 2 is a viable/good option for future use by the robotics department

As for the logistics of the course, there will be weekly meetings with the Dr. Sprague along with weekly blog updates.

Final Project

The final project for this course will be an expansion of the CS 354 Autonomous Robots final project, now adding facial recognition and switching to ROS 2.

The finished application will take two command line arguments: a pre-created map file of the area to search and a configuration file indicating the robot's starting location. Along with this it will have a database of one or more possible faces that it will try to match to.

The robot will act as a greeting robot. Moving around ISAT, greeting anyone that it recognizes and offering help to anyone it does not. It will utilize facial recognition to analyze any people that it comes across and attempt to match them to the given faces. If it recognizes them, it will greet them accordingly. If not, it will mark that it ran into an unidentified person.

Tentative Schedule and Milestones

- **Weeks 1-2** - Familiarize with ROS 2 and new Robot
  -Read ROS 2 documentation
  -Read Robot documentation
  -Literature review
  -Practice with ROS 2 and Robot

- **Weeks 3-4** - Begin work with facial recognition software
  -Read facial recognition software documentation
  -Begin tests with facial recognition
  -Read "A Social Robot"

- **Weeks 5-7** - Begin final project
  -Get robot moving around the room using a shortest path algorithm
  -Read "Multi-subregion-based probabilistic approach to pose-invariant face recognition"

- **Weeks 8-10** - Implement facial recognition software with robot
  - Read "Spectrum"

- **Weeks 11-12** - Combine the facial recognition with movement

- **Week 13** - Final project testing and assessment

- **Weeks 14-16** - Write final paper and documentation

Grading

Preparing for and attending weekly meetings	20%
Weekly Blog Updates	30%
Preliminary Milestones	20%
Final Self-Evaluation	10%
Final Project	20%

Blog Updates

In order to document your progress you will complete weekly blog posts. Information in the weekly post will usually include:

- Progress on project work, including any necessary photos or video demonstrations.

- TODO items for the following week.

- Summaries of research done during the week.

Blog posts should be well organized and clearly written. They should be targeted to a professional/academic audience.

Final Write-up

This should include a short (1-2 page) document describing what you learned and what you accomplished during the semester. This document should include your proposed letter-grade along with a brief justification. Along with this, the final write-up should include documentation for basic ROS 2 aspects and some examples of how to use those aspects. As well as any instructions that might be necessary in order to operate the robots.

Reading List/Bibliography

Um, D., Park, J., Shin, J., Lee, W. H. (2018). A Social Robot, "Dali," for Aging in Place Technology. Journal of Robotics, 1–10. https://doi.org/10.1155/2018/6739652

Yamada, A., Kanade, T. (2006). Multi-subregion-based probabilistic approach to pose-invariant face recognition. Systems Computers in Japan, 37(8), 68–76. https://doi.org/10.1002/scj.20437

spectrum. (2015). Government Technology, 28(5), 39. Retrieved from https://search.ebscohost.com/login.aspx?direct=tr
livescope=site

Signatures

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