

Summer 2018 Project Proposal

Clara Chun

Big Picture

Currently creating a large system of robots, able to communicate with one another and recognise their surroundings, is both a project being worked on by companies across the globe as they work to perfect self-driving cars, as well as groups working to find a way for robots to be able to recognise landmarks and other objects to create an internal map.

This project is aiming to create a system of robots which can both see and communicate, with other robots, as well as determine where it is in conjunction to its surroundings, using less costly technology, as well as technology available to the everyday person.

The general approach to solving this problem has been to develop the different systems needed for the robot to do individual tasks, keeping in mind that at the end they'll all have to be slotted together.

This is important to people because it has many real life applications. Ranging from keeping automated vacuum cleaners from bumping into the dog, to providing a way for cars to be able to see and communicate with other cars around them. The hope of this project will be robots which are both cost effective, and able to perceive multiple variables in their environment, helping to advance the field of robot localisation



Fig. 2: A Create 2 iRobot, or the robot being used for this research

Specific Project Scope

This research will be aimed on being able to allow the robots to communicate information such as their location, tags, and how far away the tags are from them, at a given time. This system will be set up with the idea that these robots will be able to communicate with each other this information later on. For this I'll be using firebase and their Python API in hopes of integrating it with ROS easier than using javascript might be.

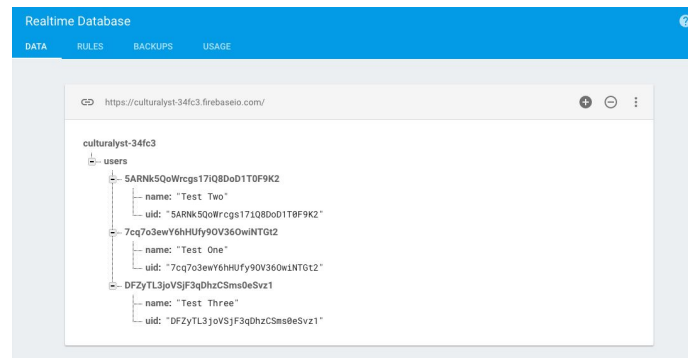


Fig. 2: A firebase database structure similar to how set up of our own would be.

I will also be working on setting it up so that we have control over the robots movements, whether we wish for it to move randomly, in a square or any other way. The ultimate goal will be that remote control of the robot and it's movement will eventually be possible, and various options, whether it's specifically choosing the movement of the robot, or driving it in a square, will be possible.

Goals, Deliverables, & Tasks

Goals

- My goal is to have a robot which is able to take the information about its location, the location of a marker, the time it sees it, and other data collect,

and then upload it to a firebase database where this information will be more easily accessible for whomever is using to robot to look though. I hope that this will allow for analysis of the robots localisation system to be easier.

- Another goal is to make it so that the robots movements can both be controlled, but also can be randomised if needed. This will simply allow for easier control of the robot if measurements are needed that randomised movement would mess up, but also allow for a set of randomised movements so that data results are more accurate.
- Having a set of instructions for others to follow if they wish to set this system up on their own robot or roomba is also a goal, so that others are able to repeat this project.
- Have a finished presentation and poster to show my teachers and fellow students.

Deliverables

- By the middle of August I'll have written a set of instructions on how to set the needed packages in order to control the robot, making it so that others can repeat the process with no errors.
- I will also have written two programs, both in python, one for sorting and uploading information to the Firebase database making data collection and analysis easier, as well as a program which randomises the robots movements. Both of these will have been tested to ensure that they work.
- I will also have make a presentation by the end
- I will also have made a poster by the end
- The robot will have randomised, but controllable, movements, as well as communicate with other robots it's location. The deliverable product will be the finished systems, and code, hopefully compounded so people are able to use them easily, as well as the results of the actual testing of the

system as well. This will both prove that it works, but also will provide a springboard for possible other projects related to this.

Timeline

June 1: Meet Shengkang about project and discuss what's been done and what needs to be done.

Week 1: Read through documentation for Firebase + familiarise myself with previously done work.

Week 2: Write and test Firebase code

Week 3: Read through documentation on ROS

Week 4: Set up ROS on computer

Week 5: Setup create_autonomy package and robot controls

Week 6: Setup remote robot control so that remote control of robot with choices is possible.

Week 7: Integrate all ROS systems onto computer and robot

Week 8 + 9: Set up other robots and computers + framework