

SET11516

Advanced Software Engineering Team Working

40056761 - Project Log

The goal of this document is to record and catalogue the progress made by Sam Dixon (40056761) during the progress of the SET11516 team working project.

2017-09-04

Start of term. Rasmus said that he had to keep a log of work he did during the teamwork project, so I have opted to write mine using markdown, for ease and speed.

2017-09-07

First team working lecture. Was surprised by the number of people, as Gareth was the only other masters student I was aware of – There is potential for multiple teams to form.

There is a good mix of interests and skills among the class, so teams should be well rounded in terms of disciplines.

Sally has asked us to come up with some ideas/interests that we can brainstorm in the coming weeks.

Gareth has created a Slack group for us to use to communicate.

2017-09-10

There are now 5 of us on the Slack group, and of them I have worked with 3 previously.

There were 9 of us in the lecture, so we will need to try and get them on Slack ASAP so we can start sharing ideas.

2017-09-14

Second lecture. People were sharing more of their interests, as well as technologies/applications currently in the spotlight.

We pushed the Slack group during the lecture, and everyone said they would get on it.

I said that I would create a Trello board as a means of organising resources, etc.

I have set up a Trello page, but getting to interface with Slack properly is proving more awkward than I feel it should.

2017-09-18

There are now 8 of us on Slack (not including Sally).

Not much conversation happening yet, but people are still settling in the term.

2017-09-21

Third Lecture.

There seems to be two distinct interests between students: Mobile applications or Genetic/Evolutionary computing.

Sally is pushing for us each to come with a semi-concrete idea to the next lecture.

Some good idea discussion on Slack, and Sally has mentioned Emma Hart has been asking for more robot based projects – which might be quite fun.

2017-09-25

We decided to split into distinct groups today on Slack. We used a poll to show our interest between a GA project or a mobile app project.

Angelos, Gareth, and myself have opted to be part of the Genetic Algorithm group, hopefully this will encourage us to focus on distinct ideas.

2017-09-26

Talked to Kevin Chalmers about project ideas. He said a previous masters student (Rob) was working with the robots and an Nvidia Tesla.

Seemed like an interesting idea of speeding the robots behavioural logic.

2017-09-28

We chose groups today, we were each asked to put our name next to a project we found interesting.

The choices that we settled on were the Robots and an AR tourism app.

Gareth, Angelos and Myself have all opted to be in the Robot team. There is a lot of potential avenues/techniques that can be done with the robots – parallel processing, GA, hardware, etc.

Will have to come up with a finalised project idea soon.

2017-10-12

Finalised project idea. We want to use the Tesla and the robots in tandem to simulate and execute an operation or "mission" simultaneously.

What the mission is, or the kind of parallel processing that will be performed does need to be decided, but that can be determined during the development stage.

2017-10-14

School of Computing Open Day. Helped Andreas set up the robots, and explained how they worked to potential students.

Got a good opportunity to talk to Andreas about the project and get some tips, insight on how to progress.

2017-10-16

Talked to Emma Hart about potential robot projects. She mentioned a technique called "MapElite" that is based around the concept of simulating multiple criteria combinations and then selecting the most appropriate for the situation. This idea could work quite well considering the parallel nature of the Tesla card.

2017-10-19

Been reading some of the papers I have found. Adding to lit review (sparse).

2017-10-23

Working on the project pitch with Gareth. Using Google Docs for convenience. Outlined the topics we want to cover during the presentation. Will continue adding content to slides in between coursework.

2017-10-25

Talked to Andreas again, he mentioned some papers I should try to find and look at. I have taken note of them to use in a literature review.

2017-11-02

Project Pitch I feel the pitch went well, we were within our time constraints and could provide answers to all the asked questions.

2017-11-08

Tech Meet Up Everyone is required to introduce themselves at the start of the event. When I mentioned the robot project a member of staff from Robert Gordon mentioned that we should check out the Edinburgh Robotic Forum. Will have to research this later.

2017-11-21

Been searching for further papers.

Found a few relevant ones in regards to using cheaper hardware (!) and using SLAM on small indoor robots.

2017-12-17

Exam period starts. Teamwork will be on the back-burner as I am focusing on Exams.

Will try to do some over the Christmas break (unlikely)

2017-12-06

Further research and documentation. There is no shortage of papers that use SLAM.

Found a few more that describe primitive mapping using very limited sensors.

2018-01-08

Trimeter 2 begins.

As expected, very little work occurred over Christmas.

Gareth has got the Simulator building and running on Debian.

I have got a loose literature review of relevant papers.

2018-01-14

First meeting back with Sally.

We had the simulator and the as well as the PS4 controller working, so we were able to demonstrate a working Linux build with the physical robot and the simulator.

Gareth has passed the build info onto me and given me a quick rundown of how to build/execute the simulator.

2018-01-15

Have gone through the processes of building the simulator. The process is complicated due to the required systems being spread over 3 repositories.

The python shell can interface directly with the simulator or the physical robot.

Current goal is to implement some form of SLAM as per the papers I have gathered.

2018-01-19

Had a quick chat with Jon Kerridge. He was saying how two of his honours students are working on projects with the Thymio II bots, and had hit some snags. Jon's students are trying to use a Java wrapper to send commands to the robots via D-bus. I told Jon about our progress, and that we are now able to use python to send commands via D-bus. He has asked if myself and Gareth would be in next Wednesday to chat to his students.

2018-01-22

Worked on a rough draft of our report today. Introduction boilerplate and a brief introduction to each section.

2018-01-25

Found an extremely detailed and useful paper title 'SLAM for Dummies'. While the name is somewhat tongue-in-cheek, the paper details clearly how to implement SLAM using the Extended Kalman Filter (EKF).

2018-01-26

There exists an issue with the Thymio II robot's odometry (or lack here of). The robots use naive motors that do not track distance travelled, but they can utilise simple Dead-Reckoning.

I have found a software library for the Thymio II (http://wiki.ros.org/thymio_navigation_driver) that claims to implement some form of odometry via software.

2018-01-28

There exists several papers detailing attempts to deal with the Thymio II's lack of odometry, but most are highly experimental.

It seems we have to design some form of calibration or use "magic-numbers" to make dead reckoning usable.

2018-01-30

The two requirements for implementing SLAM are some form of odometry and sensors. The current goal is to implement some form of Dead reckoning – where you estimate the current position of the robot based off of the speed of the motors and the time they were moving.

While dead reckoning is not as accurate as odometry, but will still allow for SLAM to operate.

The robots in the simulator have a maximum speed of 500 'units' – according to Andreas this relates quite accurately to the real robots.

The previous link (http://wiki.ros.org/thymio_navigation_driver) contains a git repo that lists a speed coefficient of 2.93 and wheel radius of 95mm (this is the only measurement that seems grounded in reality). Using the found metrics, it should be possible to implement a system that will allow for approximation of a location in 2D space.

Current steps consist of confirming that the 'magic-numbers' pulled from the repo match up with our version.

2018-02-06

Conducted some preliminary tests with our system to check the authenticity of the 'magic-numbers'.

It seems that each of the wheel motors can be issued a target speed, and the current speed of each motor can be queried – with them capping out at 500.

Tests need to be conducted to check the speed coefficient is valid, then a delta time can be calculated for the distance travelled in a set amount of time.

2018-02-12

So, the speed coef found in the ROS repo has been tested using the Aseba simulator, and seems to be accurate, I am however having issues with the physical robot as it seems to be listing leftwards as it travels forwards – will investigate why and possible solutions.

2018-02-21

I have taken the robot apart and reassembled it, as I thought the listing may be caused by friction between the wheel and body – no resolution yet.

2018-02-26

Robot listing is not caused by friction, or the tires – tested traction on multiple surfaces and leftward curve is still present.

2018-03-02

Issue with left wheel seems to be related to the power it is receiving? Will try simply reducing the power to the right wheel to see if causes alignment.

Reducing right wheel speed does reduce listing – for a limited time, as power in the battery runs down, the wheels slow and listing happens again.

Rather than reducing the right wheels speed by a constant rate I might be able to tie it to the remaining battery power.

2018-03-05

Trying to base wheel speed off the remaining battery is a no go it seems – the only solution I can consider to stop the listing is to implement some sort of alignment grid on the ground and have the robot adjust the speeds itself based on its alignment with the grid – this is a hypothetical solution and for outside the scope of this project.

It may still be possible to implement dead-reckoning within the simulator – but seems it is going to be no-go with the physical robot.

Going to move onto SLAM stage two – mystical detection.

2018-03-07

Bumped into Andrea and explained my problem with the dead-reckoning – he said he was considering a solution to a similar solution – attaching a mouse to the back of the robot and calculating the distance travelled by the amount of pixels the mouse moves.

A novel approach – but won't be compatible with the simulator or the listing robot.

2018-03-16

Been working with the Infrared sensors – they are almost completely useless. The Thymio specification claims they have a range of 10cm, but in reality it's closer to 5cm.

Going to have to experiment to see if it is going to be possible for the robot to avoid objects – never mind map identifying them.

2018-03-29

Had a meeting with Gareth about the Thymio's limited capabilities. He says it may be possible to hack the simulator, and increase the range of the robot's sensors and implement fake odometry.

While this would allow the implementation of SLAM – I do not want to distract Gareth from the other work he is doing with the simulator.

2018-04-02

Emailed Sally as it seems that it won't be possible to get a fully functional SLAM system in place.

Will try to get a meeting with her to discuss further.

2018-04-05

Had a meeting with Sally, discussed the short coming of the Thymio and she has reassured me that it is not a issue.

Final deadline has been decided – 11th of May.

2018-04-17

Started drafting the final report. Using a standard dissertation style layout – as project was primary research based. Because the project has two distinct sections. It is a simple task to split the required sections between us.

Each of us will write the relevant half of the background, methodology, evaluation and results, and we will split the remaining sections (intro, conclusion, and reflection) at a later date.

Deadlines are starting to pile up, so log entries might become sporadic.

2018-05-01

Work on report is progressing – made great headway the lit review and methodology.

Gareth has shown me some of the results he produced – looking like the simulator side of the project is going well.

2018-05-08

Final week! Got almost all of my sections complete, need to incorporate all of them together and proof read.