

Ham and Eggs bot  
Team Management Report  
Robotics Group Project

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# Introduction

Throughout this report we will discuss the tools and techniques that our group used to be able to accomplish the tasks that were required for the RGP module. We also go into a brief discussion about how we allocated our time for the tasks over the two terms.

## Team Planning

To complete the number of tasks that were going to be set to us throughout both terms we realised that we needed an appropriate structure in place to address tasks in a timely and thorough manner. We decided that we would set weekly goals on what we wanted to achieve in our team management Gantt charts. Over the week the members of our team would individually think about how to implement these goals, then during our in-person meeting on Fridays we would put these into action.

To aid us in keeping on top of managing the team at the end of each of our meetings we recorded minutes. In these we kept note of what we had wanted to achieve in that session, what we had actually achieved, what our plans for the next meeting were as well as open topics to be continually discussed.

Another tool that we relied upon was using a shared repository, this allowed us all to review our code, contribute to it from our own devices and share updates remotely. It also acts as a backup in case data stores were lost or corrupted ensuring that we would not have to start from scratch.

To have communication throughout the week we used two main methods of contact. We created a WhatsApp group chat to have quick text-based conversations for when things did not require a long discussion. However occasionally this was not sufficient, so we made use of Microsoft Teams to have voice and video calls. Teams was also essential for screen sharing the simulation of the robot to illustrate what changes in the code had elicited.

Finally, when we were unsure about the specifications of the tasks we had been set or required a clarification we made sure to contact the teaching assistants via teams, as well as making use of the tutorial sessions provided by the lecturer.

## Term 1

At the beginning of the first term we did not yet know what the exact task would be. However, we did know that it would involve using ROS and Gazebo. So, our first week was spent individually getting Ubuntu running on our hardware. You can see that this was an individual task in our Gantt chart for this term (Figure 1) so there are 3 instances of it. For group tasks that only need to be done once there are only one instance.

Week 2 revolved around getting more familiar with the software we would be using; this was mainly accomplished using the provided tutorials. Then the next week we all individually installed the light sensor so that we would then be able to share robot model files with ease. It was during this week that we also decided on the design of our robot.

Then we spent the next week creating the tools we would use to get more organized as we now had our task for the term given to us and just working through it in a disorganized manner would waste time. Next week we started work on the PID controller for our line following robot. We decided to break this into 3 weeks where we focused on implementing additional terms each week. Also, in the week starting 16th of November we were also figuring out the constants for the PID controller.

For the final two weeks before the exam we worked on obstacle avoidance. This took us a bit longer than we

	05 October 2020	06 October 2020	07 October 2020	08 October 2020	09 October 2020	10 October 2020	11 October 2020
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry	Set Up Ubuntu and ROS Environment						
Anderson	Set Up Ubuntu and ROS Environment						
Michael	Set Up Ubuntu and ROS Environment						
	12 October 2020	13 October 2020	14 October 2020	15 October 2020	16 October 2020	17 October 2020	18 October 2020
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry	Familiarise yourself with ROS and Gazebo						
Anderson	Familiarise yourself with ROS and Gazebo						
Michael	Familiarise yourself with ROS and Gazebo						
	19 October 2020	20 October 2020	21 October 2020	22 October 2020	23 October 2020	24 October 2020	25 October 2020
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry	Install Light Sensor						
Anderson	Install Light Sensor						
Michael	Install Light Sensor						
	26 October 2020	27 October 2020	28 October 2020	29 October 2020	30 October 2020	31 October 2020	01 November 2020
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry	Create Gantt Chart						
Anderson	Create Minutes Document						
Michael	Create GitLab						
	02 November 2020	03 November 2020	04 November 2020	05 November 2020	06 November 2020	07 November 2020	08 November 2020
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry	Implement P control						
Anderson	Implement P control						
Michael	Implement P control						
	09 November 2020	10 November 2020	11 November 2020	12 November 2020	13 November 2020	14 November 2020	15 November 2020
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry	Implement PI Control						
Anderson	Implement PI Control						
Michael	Implement PI Control						
	16 November 2020	17 November 2020	18 November 2020	19 November 2020	20 November 2020	21 November 2020	22 November 2020
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry	Implement PID Control						
Anderson	Implement PID Control						
Michael	Implement PID Control						
	23 November 2020	24 November 2020	25 November 2020	26 November 2020	27 November 2020	28 November 2020	29 November 2020
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry	Implement Obstacle Avoidance						
Anderson	Implement Obstacle Avoidance						
Michael	Implement Obstacle Avoidance						
	30 November 2020	01 December 2020	02 December 2020	03 December 2020	04 December 2020	05 December 2020	06 December 2020
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry	Refine and Final Checks						
Anderson	Refine and Final Checks						
Michael	Refine and Final Checks						
	07 December 2020	08 December 2020	09 December 2020				
	Monday	Tuesday	Wednesday				
Henry	Examination Revision and Update Gantt						
Anderson	Examination Revision and Meeting Minutes recording						
Michael	Examination Revision and Code Checking						

Figure 1: Gantt chart of term 1

thought however we had allocated a week for refinements, so this overrun was acceptable. Then on the week of the exam we all had different tasks to ensure that everything was ready and complete.

## Term 2

After over a month apart we decided to stay together as a group for the term 2 tasks however the details of those were not disclosed initially so for the first two weeks we were regrouping and planning for how we would structure our work throughout this term (see Figure 2). Then we performed the testing required to get error values for our open loop movements however we were one of the groups that suffered from uncontrolled turning when performing these movements.

For most of the major algorithmic development this term we adopted an approach of developing the code on a model before applying it to the robot, this allowed us to not have to deal with errors stemming from the movement of the robot while developing our algorithms. This meant that we knew our implementation was sound before we spent time applying it to the robot so if any errors then occurred we knew they must be in the commands we have given to the robot or due to ROS and Gazebo themselves.

The approach we took to complete the tasks for term two was to first solve localisation, then how to model our world, tackle A\* and finally the object avoidance. It should be noted that we did not have a specific week set out for driving into and out of the parking space as we planned to address this in the weeks where we were implementing object avoidance. Then for the final week of our group work we handled tasks to do with the examined deliverables themselves such as the presentation and well-commented code. We did not allocate group time for the individual report as that work is not to be produced by the group.

## Conclusion

By using a well-managed development cycle that consisted of constant but small amounts of work we managed to achieve all the tasks that were required of us within the necessary time frame. This also helped to avoid any last minute crunch as well as burning out due to overwork. It has been a good lesson for all of us in teamwork and time management.

	18 January 2021	19 January 2021	20 January 2021	21 January 2021	22 January 2021	23 January 2021	24 January 2021
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry Anderson Michael	Catch up and term planning						
	25 January 2021	26 January 2021	27 January 2021	28 January 2021	29 January 2021	30 January 2021	31 January 2021
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry	Think About How To Code Localisation						
Anderson	Think About How To Code Localisation						
Michael	Think About How To Code Localisation						
	01 February 2021	02 February 2021	03 February 2021	04 February 2021	05 February 2021	06 February 2021	07 February 2021
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry Anderson Michael	Test For the uncertainty of movement with an open loop						
	08 February 2021	09 February 2021	10 February 2021	11 February 2021	12 February 2021	13 February 2021	14 February 2021
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry Anderson Michael	Model Bayesian localization in Python						
	15 February 2021	16 February 2021	17 February 2021	18 February 2021	19 February 2021	20 February 2021	21 February 2021
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry Anderson Michael	Implement Bayesian localization on Robot						
	22 February 2021	23 February 2021	24 February 2021	25 February 2021	26 February 2021	27 February 2021	28 February 2021
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry Anderson Michael	Model world and robot in Python						
	01 March 2021	02 March 2021	03 March 2021	04 March 2021	05 March 2021	06 March 2021	07 March 2021
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry Anderson Michael	Model A* in Python in our world						
	08 March 2021	09 March 2021	10 March 2021	11 March 2021	12 March 2021	13 March 2021	14 March 2021
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry Anderson Michael	Add Use of Lidar sensor to Generate obstacle						
	15 March 2021	16 March 2021	17 March 2021	18 March 2021	19 March 2021	20 March 2021	21 March 2021
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry Anderson Michael	Apply A* to the robot obstacle avoidance						
	22 March 2021	23 March 2021	24 March 2021	25 March 2021	26 March 2021	27 March 2021	28 March 2021
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry Anderson Michael	Obstacle avoidance with A* on robot						
	29 March 2021	30 March 2021	31 March 2021	01 April 2021	02 April 2021	03 April 2021	04 April 2021
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Henry Anderson Michael	Work on Presentation and Report as well as make sure code is well commented						

Figure 2: Gantt chart of term 2