Team reflection

ES197 Project

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1 Assessment against project charter

In the project charter, we set out some purposes and objectives that we should abide by.

- Self-balancing robot that works on different surfaces for 1 minute at least -
  Our robot worked well on the provided surfaces. The robot had to work on the thick carpet provided, however we also managed to make it work on other surfaces, such as thinner carpet, felt, plastic, and a tabletop. Some surfaces were more able to be balanced on than others – the robot struggled more on the flat plastic and tabletops. However, it was able to balance for over a minute consistently on the other surfaces, which is to the project expectations.

- Robot will be returned in full and intact after Friday -
  We allocated a team member who was responsible for ensuring the robot would not get damaged. All members of the team made sure that the robot was not tested in a dangerous environment where it could easily fall. Due to these measures, we succeeded in this.

- MATLAB and Simulink will be the control system -
  From the start, we researched how to build out system on top of the provided Simulink skeleton. We found how to implement a PID controller with it, resulting in a successful system created with Simulink.

- Robot will be named in a way that is suitable for children -
  The first thing we did as a team was decide on the name Kiwi – named after the flightless bird. This name met the project specifications well, as it is friendly and suited to the audience, and thereby the customer's requirements.

2 What went well?

We were able to complete our tasks according to schedule and to a high quality. For example, we were able to get the robot balancing by the second day which gave us lots of time to improve on our initial design. This meant no one was waiting for work to be completed to begin their section of the work, which lead to the team being more productive. We were able to spend more time creating and practicing our presentation as a result.

3 What could be improved?

Ideally, we would have liked to make the robot more reliably stand on smoother surfaces with less traction. Whilst this was mainly a hardware problem (it would be much easier with grippier tires), we could have created an accurate model and transfer function for the system to allow automatic PID tuning.

4 How did the team work well together?

When working as a team we communicated well what needed to be done which allowed roles to be allocated accurately and lead to high productivity. When in their roles everyone worked well with minimal support, however when a problem arose, or an improvement was possible other members of the team were happy to help. The online integration worked effectively as the jobs were allocated appropriately. Overall, our teamwork was effective and individuals worked well across fields to provide appropriate support and through research, testing, or presentation.

5 How could the team work better?

Fortunately, everything appeared to work well as a team. We worked to support one another and had no difficulties when working together.

If we were to do this next time, there are a few things we could change. One such example of this would be doing more in-depth research which would give us significantly more detailed information. This may have allowed us to form a mathematical model, take measurements and calculate the PID coefficients instead of using trial and error to reach them. Another such example is in our presentation preparation. During our preparation, we went over some possible questions that we could have been asked at the end of the presentation. However, we were asked several questions that we were not prepared for, which could likely have been resolved by doing more research beforehand.

6 Challenges faced and remedial action

The challenges we faced as a team were few, but present nonetheless. Since one of our team was working remotely, they faced some technical issues which caused calls to temporarily freeze, but this was simple to work around by resetting the internet connection periodically. As well as this, one member of our team had an exam one morning that unfortunately clashed with the project week. Since said team member was working on testing the robot to ensure it met our specification, another member took over the testing that morning which caused no issue. The last issue we encountered was one of calibration. When tuning the PID control system in Simulink, there were times when it felt as if we were simply guessing values based on little information, instead of making informed adjustments. Eventually, we found a range of values that we could get informative results from adjusting within, which lead us to our final values.

7 Personal and team development

The team did things that cannot be done individually. We worked together in order to reach the target that is too hard for just one person. But a successful team must rely on each person doing their work perfectly. Therefore, to work as a good team we firstly worked well as individuals. Communication was very important in our team - we learnt to tell other people our progress, and were able to help each other across our allocated tasks. Each member was able to somewhat independently work on a subsection of the project to the proper specifications, which all came together well.