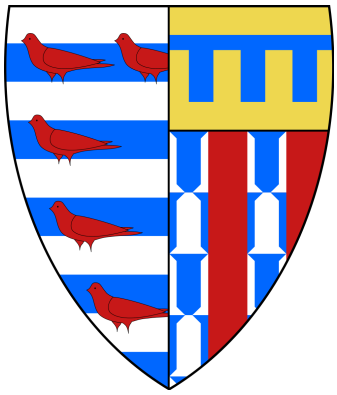
Part IB Integrated Design Project

Engineering Assessment of the Project



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I declare that this assignment is my own work and that I have correctly acknowledged the work of others.

Lab Group 102

Feburary 17, 2018

1 Introduction

Autonomous Guide Vehicles (AGV) are widely used within the industry, being responsible for tasks ranging from repetitive which incurs high labour cost to dangerous which could potentially harm a human operator. The Integrated Design Project (IDP) aims to provide a demonstration on the usages of AGV within the frame of agriculture. Selecting, harvesting and dropping agriculture products is a tedious process and should be made autonomous, reducing labour costs. It also provides challenging software problems such as autonomous vehicle driving and image analysis.
Within the 4 weeks time constraint, a fully working AGV which performs plant detection, collection and drop-off was produced. The software team was able to implement the line-following, hill-climbing, plant(image) analysis, harvesting algorithms through embedded programming.

2 Team Management Review

2.1 Overview

Overall the team has managed to produce a fully working AGV within the given 4 weeks time constraint, the result to some degree reflect good coordination between sub-teams.
Slack is used for team members to communicate with each other, three channels are created for each sub-team. Overall members of the team show good initial engagement on Slack, with daily communications and updates. Between week 3 and 4, the level of engagement on Slack decreases as each sub-team becomes more focused on their current tasks without updating members of other sub-teams. The issue of communication is more server between the mechanical and software sub-teams as they work in completely different locations. As a result of this, software code underwent major changes due to uninformed design decisions. Future projects shall place greater emphasis on sub-team communications with either:

i One team meeting per two days

ii One sub-team summary placed in the shared directory per week

iii Daily update on sub-team progress through Slack

Overall, the electrical team has managed to follow the Gantt chart produced at the beginning of the project, the mechanical team deviated from the Gantt chart due to the slight delay in design acceptance, as a result of this, the software sub-team had minimum work in week 2 and first half of week 3, the work load increases dramatically between week 3 and the day of competition.

2.2 Software Sub-team Management

Overall, coordination within the software sub-team has enabled a fully functioning code to be produced on the day of competition, with minimum numbers of unanticipated bugs (only a delay is added on the day of competition to ensure correct navigation of AGV).
However, due to 1. the short time constraint on the project and 2. sub-team members' reluctance in using version control; the majority of the software was coded by one person (out of a sub-team of three), with one person in the sub-team providing minimum contribution towards the code.
Again, this problem could have been mitigated with good communication within sub-teams, but a version control is almost essential had the project been larger.
Furthermore, as the mechanical sub-team only provided a working chassis towards the end of week 3, the majority of the code before week 3 was written under the hypothesis of the AGV's behaviour. The poor communication between mechanical and software sub-team resulted in a major design change in the plant detection algorithm (see 3). The process of re-writing the entirety of a major algorithm can be risky and stressful, further projects should emphasis on the mechanical team providing software a test chassis with sensors mounted for algorithm testing.

3 Design Decisions and Changes

4 Prototype Production Cost and Scaling