RESE412

Remote Control Car Charge Station

Design report: 30% of final grade
Complete by 2nd of October

Final report: 10% of final grade
Complete by 20th of October

Race day: 10% of final grade
Complete on 7th of October

Learning objectives:

- Analysis of site resources and understanding potential energy yield.
- Design and build a fit-for-purpose renewable energy system.
- Cost/performance optimisation of renewable energy systems.
- Oral and written communication of design and build decisions, and justifications.
- Work effectively in a group.

This project will see the design of a renewable energy (RE) based charge station, that will power a remote control (RC) car participating in an endurance race, held at the end of the term. On race day, each team will be expected to charge the car battery (or batteries) using their RE solution, with the goal of completing as many laps of the given track as possible in the time period. Moreover, the solution must be cost effective, with the dollars per meter ($/m) having a major influence on the quality of the solution. The winning team on race day will be the team with the most laps, while the overall winner of the challenge will be the team with a comparative distance and a low-cost solution.
The skills developed while designing the charge station should be scalable to larger power systems and will give you some insight into the complexity of nano/micro-grid design.
This project will be performed in groups of 2 or 3, but will require individually written reports, one due in week 10, the other week 12, as well as a group presentation on race day (held 7th of October).

Design Proposal Report

The design proposal report should outline the entire design process of the RC car charge station project. This includes the site conditions, load characteristics, power source selection, a detailed model of the system, potential risks and mitigations, system budget, and a

conclusion. Each design choice should be well motivated through rigorous testing or documentation. The sections of the report should be similar to the following:

Introduction (including a clear statement of the system requirements)
Environmental conditions (with an analysis of the available RE resources)
Race conditions (including the system utilisation strategy)
Component selection
System design
System modelling
Risk analysis
Budget
Conclusions

Final Report

The final report will discuss the process of creating the RC car charge station, as well as the final race. In this report, it is important for students to reflect on the design process and how this relates to the physical system. Along with discussing the teams result, students must identify their own contribution to the team, and critique the team dynamics throughout the project.
The report must give insight into improvements on the final solution and, if possible, on the project.
It is also important for students to discuss their personal learning achievements, which do not have to be technical.
The build should be well documented, with qualitative and quantitative results. The final budget should be discussed, with necessary and unnecessary expenditure.

All teams will be given a catalogue of items that they can use for the build along with the cost associated with each item. The items are available to be tested and it is encouraged that teams test as many variables as possible before selecting a solution (if not tested, qualitative and/or quantitative reasoning). For example, if three motors are listed, test the characteristics of each before making your final decision on which to select.

Final Race

The final race will be held at the Boyd-Wilson field (-41.291953,174.768295), on 7th of October. An approximate outline of the track is shown in figure 1. The length of the race day will be 3 hours, during which your team:

- Will need to set up your charge station.
- Will receive a flat battery to charge (equivalent to your chosen battery capacity).
- Will need to complete a minimum of 3 laps to participate in the $/m competition.

- Will present a 5-minute discussion on the system in which each team member will be tested on their knowledge of the system.
- Will need to document the system's power output, saving the data onto the provided memory card.

This year the appearance of your car will count towards your final race day marks, as identifying your car is important.

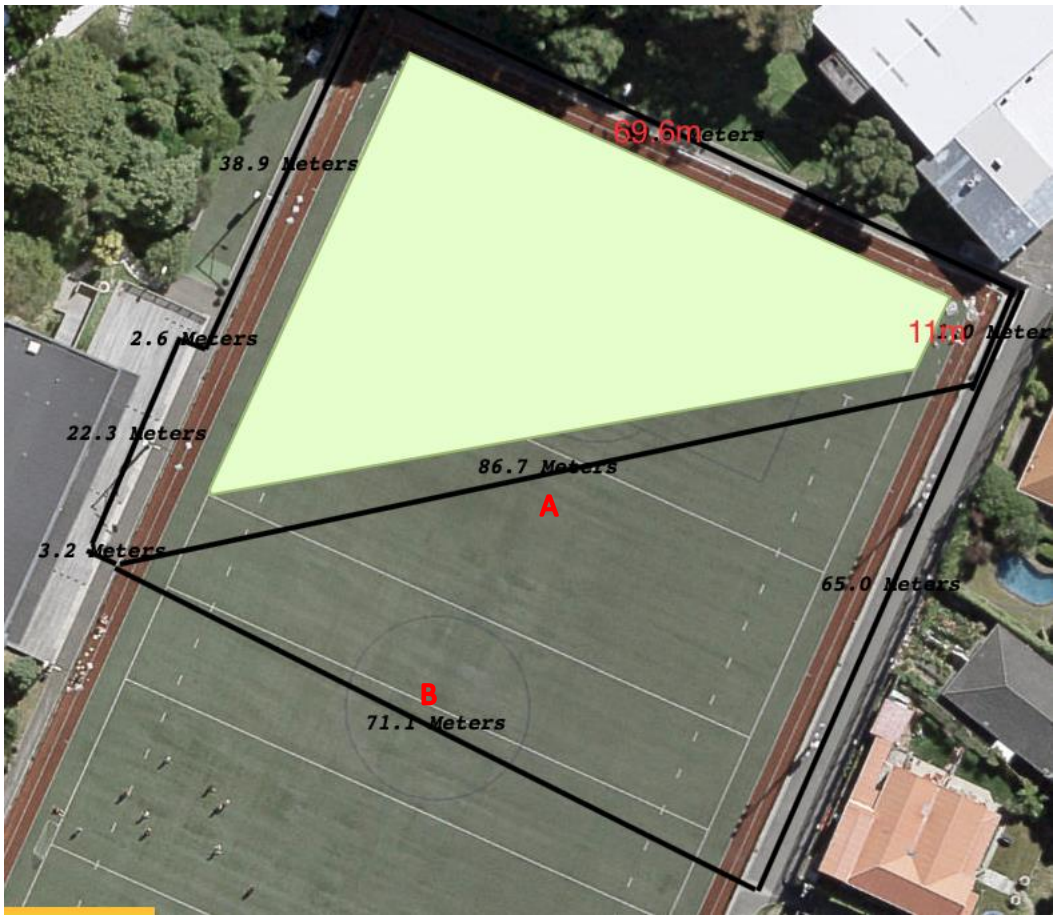

Figure 1: One of 2 race tracks can be selected before the race (A or B). Distance displayed here are approximate.

You Will Receive

The following is a list of items each team will receive:

- A catalogue of items you can use in your system, with the costs
- A remote-controlled car
- An arduino
- An arduino breadboard shield
- An arduino data logging shield, battery, and memory card
- An arduino battery pack

- A current sensor 20A (with dip converter)
- Tamiya battery connectors (male and female)
- Analog distance sensor
- Plywood board to mount charge station