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Synnove

SMALL SOLAR VEHICLE

Plan of Approach.

Introduction:

In this document you will find our plan of approach for building a small solar vehicle. The reasons for and the way we will handle this project are explained here with possible problems we will face during the project.

General description of the project:

The ultimate goal is to create a working small solar vehicle or SSV. This means a small vehicle that can drive a certain distance powered only by the sun using a small solar panel.

Plan:

This is a project for Engineering Experience four, for electromechanical engineering. It will teach us how to work as a team, how to properly plan the needed work and teach us a lot about mechanics and electrical components. The recipients of this project are our coach Tan Ye, the Solar Team and other professors from the EE4 course. The main recipient however is the Solar Team; their goal is to create a usable version of a solar powered vehicle. But before starting this project they would like to know if it's at least possible on a miniature scale and, if it is, what the best approach might be to achieve their goal.

Concept of the plan of approach:

The project is comprised of three parts: Engineering, Educating and Enterprising.

1) Engineering:

   The engineering part of our project has two parts called cases with a test and race afterwards to see whether or not the project was successful.

   For case one we start off with making decisions about the general design. Namely what kind of frame, wheels, solar panel, drive shaft, propulsion and so on, we would like to use. But, to make adequate decisions about these designs we of course need to make simulations and calculate the characteristics of our solar panel.
   We cannot choose a solar panel ourselves; we're going to receive a solar panel from our employer. So, we need to start off with calculating the characteristics of this solar panel. How much voltage and current does it provide? What is the most effective voltage to current ratio at which this solar panel work?
   When these characteristics are known, we can start making adequate decisions about the transmission. The optimal transmission between the DC motor and wheels need to be calculated considering a solar panel does not yet provide a lot of power and all the power losses need to be minimized.

When all these decisions are made a simulation needs to be done. In this project Matlab and Simulink will be used. These simulations will show where corrections need to be made to either make serious changes, because the calculations were too theoretical, or have an even more optimal performance if the calculations were correct. Case one has a deadline during week six.

After case one the actual building of the SSV can start. This is what needs to be done in case two.
Building the SSV is pretty straightforward if case one was done well. All the material and model designs should have been made already. So all that needs to be done is making the SSV in the manner that the model shows.
After the SSV is built the first small tests can start to see whether or not it was properly built.
The first test is one where the SSV is rolled down a two-meter hill with a very slight downward slope. Here the results are to be compared to the simulations. The next step is applying the conclusions of this comparison. All the following tests and simulations will show what needs to be changed for a more stable and adequately working SSV. These tests are not only transmission and speed tests, but also tests where the SSV is allowed to make a small collision against a wall to see if the car is strong enough for actual use. This is simulated in Simulink first to avoid serious damage. Case two ends here, with the deadline set at week eleven!

The engineering part ends with the actual race at the end of the project.

2) <u>Enterprising:</u>

The enterprising part of the project consists mostly of two parts. The first part is the creation of a webpage on Wikiversity where the progress of the project is blogged so our employer can follow our progress in an easy manner. The second part is the marketing of our SSV. The marketing consists mostly of doing theoretical market tests and engraving our team logo onto the frame of our SSV. We will also be working on a budget. This budget represents the budget of the Solar Team on a relative scale.

3) <u>Educating:</u>

This part of the project is mainly showing our results to our employer and project coaches. All the technical reports, calculations and project documents will be posted on the Wiki-page where they will be checked by our project coach.
At the end of the project our team should have learned more about doing proper research without the help of teachers or coaches. We should also be better at working in team, making adequate decisions about timing and working on a tight schedule and budget.
In short: “making stuff work”.

General Limitations:

The solar panel is a standard solar panel, the specifications of which cannot be chosen. We will have to make our design decisions based on these specifications. Another important limitation is the budget. This budget is a relative budget compared to the budget the Solar Team will have for their project. Considering this budget, the materials that can be used as frame and such will be limited as well. The final limitation is time. The deadline is set at week eleven and we are now already at the end of week one. Good planning is a definite necessity for the completion of this project.

Conclusion:

The project is a way of learning how to make stuff work with certain restrictions. Building a SSV on a tight budget, with a small solar panel that's the sole source of energy. This SSV will have to be able to drive through a course, so it has to do more than just work, it has to work well and eventually be useable in real life.