WEEKLY REPORTS

• Week 9

- During the last week we have continued working on the modeling of LegoWay. We have worked out a model, although not really formalized, which seems to be working. We have tried to validate the model using a simple simulation of the system in MATLAB. Based on these simulations our model seems to be valid and we are going to move forward with what we have for now. Also simulations have been made for some control methods like PID and LQG, (we choose to not say anything more about them for now). There are still some “issues” with the model that have to be worked out, but we are hoping that with the use of some identification methods these “issues” will be resolved in the feature.

Before moving on to the next stage of our project, which would be to work with Lego and RobotC, we are going to formalize our results so far. So our goal for the next week is primarily to write a “memorandum” on our model and the simulation results. If time allows we will look into the programming environment and Lego.

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• Week 8

- For this week we’ve been mostly reading articles on the subject, “two-wheeled inverted pendulum” and focus have been on the physical and mathematical modeling of the system. Most articles derive the same models but they reach them in different ways. All the articles we have found useful are posted on our wiki-page, [http://user.it.uu.se/~pejo1781/pmwiki/pmwiki.php?n=Main.Inbyggda](http://user.it.uu.se/~pejo1781/pmwiki/pmwiki.php?n=Main.Inbyggda) under the headline “Modellering”. Some use Newtons equation of motion and an approach called Kane dynamics. Here the physical model consists of all the parts of the system decouple showing all the forces and torques acting on them. The mathematical models is derived using Newtons second law. The other approach was using Lagrange dynamics. This approach is much more elegant and is the approach we ha decided to take. The physical model here consists of a diagram showing all the generalized coordinates of the system and the relations between coordinates and other constraints. The mathematical model uses the idea of describing the motion of the centre of mass by means of the systems kinetic, rotational and potential energies. Using the Lagrangian and Euler/
Lagrange-equations a system of equations describing the motion can be derived fairly simple. Although the idea behind this is simple we were not equipped with the theoretical background for reasoning about the problem, (having non-conservative forces and non-holonomic constraints). Thus we’ve also been reading up using some literature about Lagrange Dynamics. Some good material can be found on our wiki-page under the headline “Teori/ Bakgrund för Modellering”. Our goal is to have finished the modeling by next week and perhaps having started with some basic testing and validation.

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