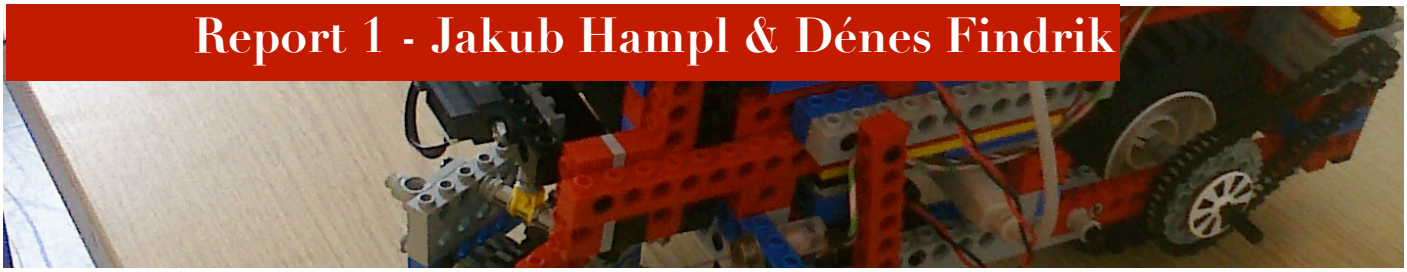
Report 1 - Jakub Hampl & Dénes Findrik



In the first two weeks we concentrated primarily on the construction of a robust frame for the robot that would support our chosen method of locomotion. For the first task (obstacle avoidance) we used a simple reactive architecture.

Building the robot

Our first decision was about locomotion. How to steer efficiently? We decided to use a three wheel design, with the back two wheels each having an independent motor and the front wheel using a servo to set its orientation. Due to the irregular build of the servo motor, we had trouble attaching the front wheel in a robust enough matter. However, after a couple of iterations we managed to attach it properly and also redistribute weight such that the front wheel is now very stable.

Another problem discovered while testing was that the wheels did not have sufficient traction to move the robot forward. This was solved using appropriate gearing and by moving the wheels closer to the center of mass of the robot.

Control and obstacle avoidance

Our control algorithm is very simple. The robot has three sensors (that is, only three are currently used): a front facing IR sensor and two whiskers facing forward with about 35° angles to the right and left. This spread is used such that this covers the entire front profile of the robot. Thus the presumption is that if neither the IR sensors or either of the whiskers are activated then the immediate area in front of the robot is clear. This assumption seemed to be validated in our testing in the robot arena where the objects have such shape and orientation that this holds. However, when testing elsewhere in the lab, our robot tends to get stuck on low or very thin objects that manage to evade the specific configuration of the sensors. We are thinking of adding a large bumper covering the area to mitigate this problem.

Thus the basic behavior of our robot is to drive forward. If one of the sensors is triggered, the robot will instead drive backwards while simultaneously turning in a different direction (this is generally away from the direction of stimulation, e.g. when the left whisker is triggered the robot will try to steer to the right, see Figure 1). The IR has an arbitrarily chosen direction in which the robot turns. The whiskers are given priority over the IR sensor due to the fact that the IR sensor has greater range and thus should trigger earlier than the whiskers.

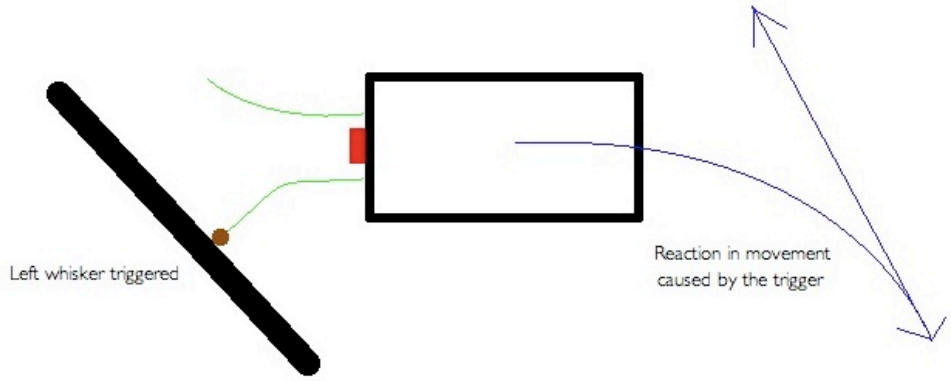


Figure 1: The reaction to the left whisker being triggered

Evaluation and further work

As previously mentioned the robot seems to use these primitive behaviors to avoid common obstacles. However, further parts of the task may require to either change these primitive behaviors or to create an overarching architecture that will prioritize other behaviors to meet the project goals.

Regarding the physical construction of the robot further challenges may include placing more sensors and creating robust frames for them. Also managing all the connecting cables has been a problem in our current design with cables often interfering with correct functioning of sensors.