

Two Wheeled Balancing Robot

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INTRODUCTION

In today's modern world there are several different types of personal transportation. One of the more interesting ones is the two-wheeled balancing robot. It seems fascinating that this vehicle is able to keep upright while having a person driving it. The goal of this project is to build a similar vehicle. We will build the mechanical structure; design and build the electronic hardware and write the code for the microcontroller.

METHODS

The angle of the robot is usually determined using an accelerometer and a gyroscope. The measurements from the sensors are effected by noise, which makes the use of a filter necessary. We will use a Kalman filter implemented on a microcontroller. A PID-controller uses the input angle to output a signal to the motor driver. To monitor the data from the robot and the state of the system, an Android smartphone will be used to display values sent from the microcontroller. To make the tuning of the PID-controller efficient and easy, it is desirable to be able to adjust the PID-values while the robot is running.

LEGISLATION AND SAFETY

The robot is in the category of "electric one-axle vehicles" for which there has not yet been made any final legislation. Until the end of 2014 they are regarded as bicycles with a speed limit of 20 km/h (Trafikstyrelsen 23.12.2011).

To ensure a safe ride on the robot we will implement several safety features:

- Automatic stop when user dismounts
- Ensuring that the robot don't fall due to the motors reaching max speed
- Limit turning radius as the robot speeds up

The goal is to make the robot reliable and safe to ride and to minimize the risk of an accident.

GREEN IMPACT

The robot should be used for personal transportation over short distances instead of taking the car or going by moped. If this is achieved, the product will have a positive green impact. It is driven by electricity and is charged from normal power outlets. Powering the robot will thus be as green as the electricity while it will also be saving fossil fuel.

REFERENCES

Trafikstyrelsen 23.12.2011. Forlængelse af forsøg med elektrisk drevne en-akslede køretøjer (Segway o.l.). Retrieved 21.05.2014 from:

<http://www.trafikstyrelsen.dk/~media/Dokumenter/01%20Syn%20og%20koeretoer/03%20Regler%20om%20koeretoer/01%20Regler%20om%20koeretoer/Meddelelser/1964.ashx>