**MECT 613 – MICROCONTROLLERS – FALL 2017**

**MIDTERM PROJECT**

SELF-BALANCING ROBOT

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# 0 Introduction

# 1 Hardware

# 2 Theoretical analysation

## 2.1 Inverted pendulum

The self-balancing robot can be described as an inverted pendulum. As a simplification we assume that the robot is mainly unstable in rotation around the wheel axis. Therefore, the model becomes 2-diminsional (z- and x-axis) and 2-DOF (position on x-axis and inclination angle).

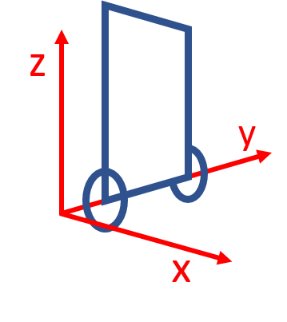


Fig. 1 Coordinate system for self-balancing robot. Relates to a fixed point on the ground. Assuming that robot will not rotate around z-axsis.

## 2.2 Calculation of angle

# 3 Design

## 3.1 Frist design approach

## 3.3 Reworked: Second design approach

# 4 Code

# 5 Others

## 5.1 Descriptions of attachments

## 5.2 Used references

<http://www.kerrywong.com/2012/03/08/a-self-balancing-robot-i/>

Ogata, 2010, Modern Control Engineering, Fifth Edition, p.69 ff.