Projektförslag för kandidatarbete vid Elektroteknik (E2)

EENX15-21-16 Self-balancing two-wheeled mobile robot

Bakgrund

A common characteristic of mobile robots is that they are passively balanced, *i.e.*, they are in a state of stable equilibrium for all times. However, in the case of passively balanced mobile robots, they can easily tip over if it is put off balance. Over the past few decades, Segway and humanoid robots, have found way into various applications. They primarily rely on active control for self-balancing, since their center of mass is located above their pivot points. They usually take advantage of the design of an inverted pendulum, and an unstable equilibrium to enhance their balancing capabilities. As a result, they have increased maneuverability and stability, although with an increased complexity in design.

Problembeskrivning

This project aims to design and implement a two-wheeled self-balancing mobile robot. In contrast to a three- or four-wheeled robot, the two-wheeled robot can rotate to instantly change its direction of motion, and thus can navigate tight spaces. Further, since it relies on active control for balancing, it can recover quickly even if its stability is disturbed, thus mimicking natural human tendency to avoid a fall. The primary objective of this project relies on balancing an inverted pendulum. Since an inverted pendulum is inherently unstable, designing a stabilizing controller to balance it is a challenging task. This project would require knowledge of control theory, filter design and programming.

Målgrupp: TKAUT, TKMAS, TKELT, TKDAT, TKTFY,
Gruppstorlek: 6 students
Antal grupper: 1
Förkunskapskrav: Controller design, filter design, programming
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