

# Robotic Unicycle

## Summary

The project will involve analysing the mechanics of a unicycle. An actuator driven unicycle will then be built along with a control system.

## Background

A unicycle is a unique form of transport that requires a great deal of skill and balance to ride. Because it is so unstable it can be very manoeuvrable and is entertaining to watch and ride. Autonomous unicycles have been attempted before but as far as I am aware have only been partially successful. A 'one wheeled vehicle' called a Loony Cycle has been built that is radio controlled and works, but is not 'top-heavy' as the COG is below the axle. Top-heavy robots with two coaxial wheels are relatively easy to build and control and are quite common.

## Aims

- To develop my understanding on control systems
- To become familiar with the hardware of control systems and their interfaces
- To investigate the mechanics of unicycles
- To apply skills learnt in mechanics and control lectures to this problem

## Proposal

It is proposed to build a radio controlled or autonomous unicycle that will mimic to some extent the way a human rides. This will involve:

task	may	june	july	august	september	october	november	december	january	february	march
Studying the mechanics of unicycles											
Develop equations of motion											
Propose a method of control											
Estimate physical requirements											
develop a specification											
Design and construct a unicycle to the specification											
Test and develop the control system											

Autonomous unicycles that have already been built have used a vertical axis reaction wheel to allow control of rotation about this axis. This has proved sufficient for control. The limiting factor in the past has been the quality of the sensory information and the design of the control system. It is proposed that a reaction wheel will be used. The equations of motion have already been developed by others and have proved to be a sufficiently accurate model for developing unicycle control systems.

## Equipment required

The majority of the practical work will be undertaken during the summer. I have access to machine tools and other equipment suitable for the construction. There may be some modification or additions required with the development of the control system and this may require access to cad packages and will require some workshop time. A small amount of machining may be needed.

The control system will require access to computers and the use of electronic circuit building and analysing equipment.