

Final Report
Research for Undergraduates 2005

Machine Intelligence Laboratory
University of Florida

Kevin Claycomb

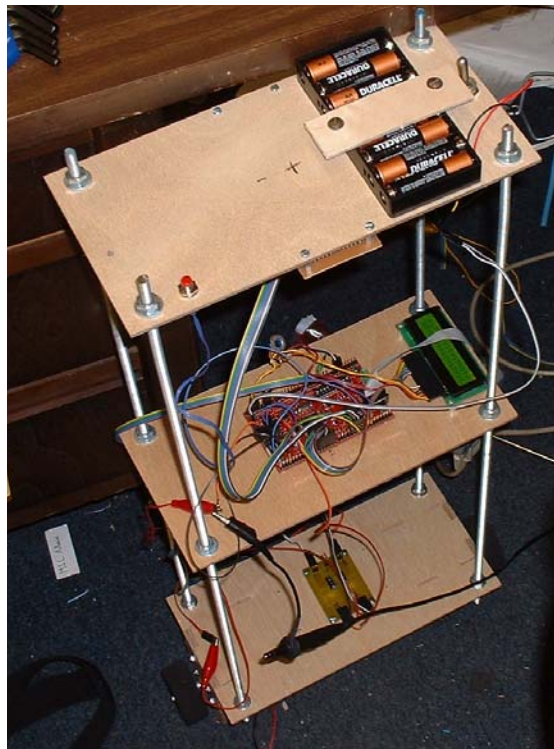
Inverted Pendulum Robot

My personal robotics project for the 2005 REU at MIL is the inverted pendulum robot or “balancing bot”. This goal of this project is to develop a platform that maintains its balance based upon inertial sensor data and control algorithms. This project is still on going and the following report is based upon progress made at the Machine Intelligence Laboratory during the summer of 2005.

To begin, my preliminary design concept revolves around an ATmega128 based development board made by BDMicro. The following is a list of all devices purchased for the construction of the robot.

- ATmega128 BDMicro development board
- Analog devices accelerometers and solid state gyro package
- Maxon 6 watt motors
- 12 - 1.4volt NIMH 21mAH batteries
- Blueradios Bluetooth Module
- Various electronic components

The platform was constructed using balsa wood and all thread and can be seen below:



Basically this prototype uses angular position and angular velocity data to adjust the motors in order to keep the body upright. This proved to be very difficult for several reasons.

1. My model for controlling the robot is not based upon actual physical quantities only a point in space.
2. The sensor data was unusable without some sort of state estimator
3. My platform was not rigid enough witch allowed for more noise to influence the system.
4. The motor response was not quick enough.
5. My microcontroller was not equipped to work well with floating point difference equations.

In conclusion, this project is one that I am still pursuing in my spare time. After more education in control theory I hope to be able to correctly model and control this complicated system.