

# Two Wheels? That's One Too Many.

An experimental self-balancing robotic platform

Project # A3728



## **Introduction**

The two-wheeled Segway has been popularized in the media since its introduction as the transportation vehicle of the future. Using two parallel wheels, the rider stands on a platform and simply leans forward to accelerate, and leans backwards to slow down and stop. What lies beneath the intuitively simple operation is a hefty collection of accelerometers, gyroscopes, digital signal processors and enough redundant safety systems to warrant the \$4000 price tag.

Others on the internet have built two-wheeled balancing robots as well, including a full sized, home-brew balancing scooter. This project eliminates the extra wheel, brings the center of gravity of the body below the axle, yielding a unique single-wheeled balancing robotic platform.

Due to the majority of the weight being below the platform and only 1 contact point to the ground, a completely different set of problems arises that needs to be solved.

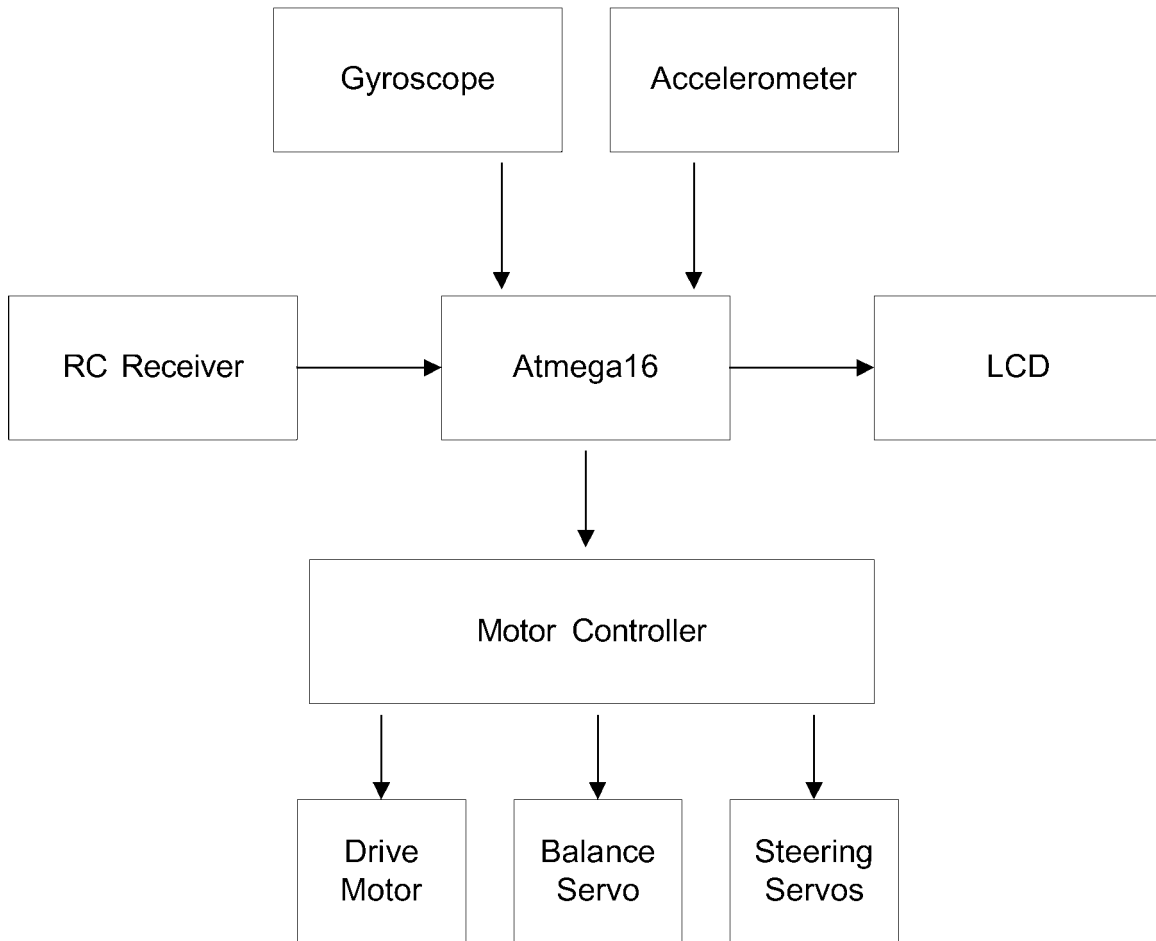
## **Chassis Configuration**

The chassis consists of a pair of aluminum corner bars attached in the center to a 16 inch bicycle wheel. The wheel is free to rotate about the axle with its built in ball-bearings.

Below the bars hangs a pair of modified drawer slides, chosen for their nylon rollers and smooth action. These rails support four standard RC NiCad battery packs that also act as counterweights. At each end of the drawer rails, a bar spanning the width of the chassis holds an RC servo which is attached to a counterweight. The servos can move the weights to the left and to the right of the center line of the wheel.

At the back end of the chassis, a giant scale servo motor with over 21 lb-inches of torque is installed with an actuator arm that can slide the rails back and forth, shifting weight towards the front or the back from center.

**Block Diagram:**



# Full Schematic:

