

Winter Quarter Project: Self-balancing Robot with Hand Gesture Control

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This is a very classical project. But I am trying to combine several classical projects together to make it more interesting. I am going to build a two-wheel self-balancing little bot, with microcontroller (Arduino or Atmega) and IMU (gyro+accelerometer).

- The theory is very simple. The IMU will sense the current tilt position and feeds it to the microcontroller.
- Then the microcontroller does PID control calculation, sends commands to motor driver unit.
- Motors are then activated to oppose the falling orientation.

Because the self-balancing bot itself might look too easy, I plan to add remote control to it so that I can actually drive it around. Ideally it would look like a “tiny Segway” running on its own.

- The “safe” way to achieve this is to use RC or bluetooth with joystick.
- The more “fancy” approach is the integrate hand gesture control. Myo could be a very good application to do some research on. But in case it didn’t work well. I can always use accelerometer and RF on a glove to achieve this.
- By turning the hand upwards, downwards, left and right, the accelerometer will invoke another microcontroller on the hand. Then RF transmitter will send the information to the RF receiver on the robot.

If this is still too easy to accomplish, I have a third stage plan, which is to add object tracking using computer vision.

- In this stage, the robot will feature a camera (stereo ideally), detecting the direction and distance of the object.
- The the robot will drive itself towards the object to stay in a certain distance.

Concerns:

- My first concern is that I’m not sure which kind of motors are good enough to make the robot stable enough to be driven around.
- Another concern is that in order to optimize the speed and stability, I might need to do a lot precise math calculation on what exact pose is the best when driving. This part might cause some trouble because the real robot is definitely not going to be ideal as most math model assumes.

The schedule will be updated once all the proposal details are confirmed.

Thank you very much!