MECHATRONICS BOOK SERIES:
ROBOTICS AND AUTOMATION

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CHAPTER 18
Autonomous Unicycle Robot Using Reaction Wheel Pendulum: Integration and Results

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18.1 Introduction

The previous two chapters describ the mechanical and controller design of the unicycle. In this chapter we discuss on the integration between the two designs and presents results related to the unicycle robot balancing.

18.2 Design Integration

There two main concern when integrating the mechanical and the controller part of the unicycle robot. They are; (1) the placements and reliability of the sensors and (2) the driver for the motors.

18.2.1 Sensor Testing

18.2.1.1 Placement of IMU 5 DOF sensor

IMU sensor must be mounted perpendicular to the surface. Hence, Fig. 1 shows how the sensor is placed on the unicycle robot body.

![IMU mounted perpendicularly to the ground](image)

Fig. 1 IMU mounted perpendicularly to the ground

18.2.1.2 Calibration and Sensor Reading

Next, the sensor is calibrated. Using the ADC built into the PIC, the sensor output can be captured by the PIC and displayed on the computer using PICBOOTLOADER+. The source code for calibration and reading the sensor is as below: