

# MECHATRONICS BOOK SERIES

## ROBOTICS AND AUTOMATION

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Rini Akmeliawati  
Wahju Sediono  
Nahrul Khair Alang Md. Rashid



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

# **MECHATRONICS BOOK SERIES: ROBOTICS AND AUTOMATION**

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## **Editors**

Rini Akmeliawati  
Wahju Sediono  
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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 describe 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.

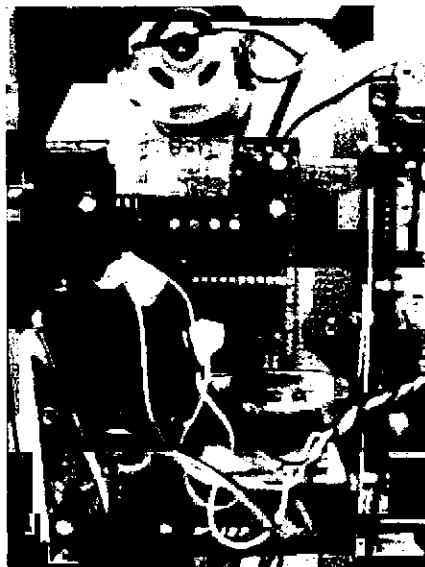


Fig. 1 IMU mounted perpendicularly to the ground

###### 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: