**Dynamically Stable Mobile Robotics Platform**

Arthur W. Aznive Jr, Daniel Warner, Andre Lacasse, and Grant Lebrecht

School of Engineering, Technology, and Aeronautics

EG333: Control Systems Analysis

Professor Mohammad Sadraey

March 6th, 2023

**Author Note**

Arthur W. Aznive Jr. – Electrical Engineering - https://github.com/Amoskeag

Daniel Warner – Aeronautical Engineering – https://github.com/danulw

Andre Lacasse

Grant Lebrecht

We have no known conflict of interest to disclose.

Correspondence concerning this article should be addressed to Arthur W. Aznive Jr., 379 Pembroke St. Pembroke NH. 03275, United States.

Email: arthur.aznive@snhu.edu

Table of Contents

[Introduction 3](#_Toc129009485)

[Mathematical Models 3](#_Toc129009486)

[Mechanical Models 3](#_Toc129009487)

[Controller Design 3](#_Toc129009488)

[Control System Implementation 3](#_Toc129009489)

[Conclusion 3](#_Toc129009490)

# Introduction

Team 404 has developed a Dynamically Stable Robotics Platform, hereby known as the “Robot on Ball” (R.O.B). This type of robot is commonly called a “Ballbot”, defined as a robot that produces locomotion using a ball to interface between three to four DC motors with omniwheels and the floor. R.O.B balances by continuously adjusting its position to maintain stability, to accomplish this task a series of sensors, actuators, and control algorithms are utilized. Commonly, Proportional-Integral-Derivative (PID) Control is used to adjust the control inputs, resulting in calculated torque and direction to apply to the ball.

To accomplish this task, it is necessary to take into account all the subsystems that will create the control system. Such systems include, but are not limited to:

* Mechanical Subsystem
  + Chassis
  + Motors
  + Deployable stand
  + Motor Joints
  + Roller Ball
  + Omniwheels
* Electrical Subsystem
  + Microcontroller/Single Board Computer
  + Power Supply and Regulation
  + Connectors
  + Inertial Sensor
  + Accelerometer
  + Gyroscope
  + Motor Drivers
  + Cables
  + Wireless Controller
* Software Subsystem
  + PID Feedback
  + Manual Control
  + Autonomous Control
  + Path Planning

This is a brief overview of the systems that are involved in creating a Ballbot.

# Block Diagrams

Diagram

Description automatically generated

Figure : Block Diagram of Electrical Subsystem

# Mathematical Models

# Mechanical Models

# Controller Design

# Control System Implementation

# Conclusion

# Appendix