1.0 Introduction

*This section can entirely be written now, but will require lots of readings of other papers and patents.*

2.0 Theory

*This section can be entirely written unless the addition of another section in my work, which is currently not know about. This however is unlikely.*

***Sections to include:***

* Gyroscopic Theory
  + What is gyroscopic force?
  + How can we use gyroscopic precession for stability?
* System Model
  + Equations of motion
  + Moment of inertia equations
* Microcontrollers and Code
  + Arduino Uno for measurement
  + Arduino Genuino for control system
  + Code and libraries
* Circuits
  + Control circuit components
  + Measurement system
* PID
  + What is PID?
  + Application for control system

3.0 Methodology

*This can be part written for work already completed.*

***Sections to include:***

* Test frame, and frame evolution.
  + Basic frame
  + Servo Types
  + Angle measurement system
  + Motor placement
* Controller and code approaches
  + Motivation for the two controllers
  + Filtering and smoothing
  + Accuracy assumptions
    - How precise does the system need to measure?
  + Functions
* Physics in code approach
  + Why apply the physics? (not just PID)
  + Limits and assumptions in coded physics
* Flywheel design and moment of inertia measurement.
  + Flywheel requirements
  + Design thoughts
    - Ease of production
    - MOI/Mass ideas
  + How to find MOI experimentally
  + Implementation into code.
* RPM measurement system
  + Photodiode and LED.
* PID application
  + Used for system tunings, and physics correction
  + Less dependence on correct values for any system changes (like rider mass)
* Code manipulation and PID changes
  + Code Structure, and optimisation
  + Method of PID tuning
* Safety Precautions, both code and physically.
  + Safety code
    - Servo Limits
    - System Failure procedure
  + Physical protection

4.0 Results

*May not be able to start any of this until more work is completed and measurements start being recorded.*

***Sections to include:***

* New wheel MOI measurements
* Working with small wheel, and limitations (Need to go back and get some data for flat system)
* Raised system, and failures
* System optimisation, and PID changes.
* Issues!

5.0 Discussion

***Sections to include:***

* Results
* Issues
* Further development

6.0 Conclusions