**Hamster Ball AT328P Microcontroller Project Proposal**

**William Denning, Benjamin Betancourt**

**Goal:**

The primary objective of this project is to create a hamster ball like movement drone using the AT328P microcontroller. This drone will operate inside of a ball and will be capable of movement on a 2d plane. Movement will be handled by the embedded processor in the Arduino uno at the center of the ball.

**Problem Statement:**

This project was inspired by a battle robot idea that fell through due to its absurdity and its incapability for combat. The battle bot was planned to operate in a similar manor to this drone however, given that this project is not planned to be created for combat, the docile nature of a hamster ball drone is intended rather than a problem. This project was also selected due to its scalability and its balance of rigor and output. Other ideas were presented however, they either landed on the easy side of proposals, such as the stopwatch idea, or the hard side of being implemented successfully in the time constraints, like the RC-plane idea.

**Our approach:**

This project has two implementation methods that will be chosen based on time. The first is the hamster simulator implementation which will have internal movement-controlled seeming at random, like a real hamster, but a bit more robotic. The second is a Bluetooth implementation which will give a user remote control of the hamster ball to control its movement on a 2d plane. The hamster ball will be controlled with internal omni-wheels wired with transistors and 9v batteries for power. Omni wheels are required as the friction presented by regular wheels will damage the ball and mitigate any movement. The microprocessor at the center will be the control hub. This will handle any movement computations. The only point of contact between the center apparatus containing the batteries and processor and the external ball will be the omni wheels. This allows for a more efficient use of peripherals due to components such as gyroscopes and proximity sensors being omitted without design compromise. This approach allows for ease of control of the ball as the wheels extruding from the center will be the primary control of the ball and wheel combinations can dictate direction. This also allows for randomness to be added for hamster simulation.

**List of required tasks:**

* Design center apparatus with cutouts for wheels in SolidWorks or other CAD software
* Design wheel position pilons in CAD software and print assembly using 3d print lab
* Create and debug program for wheel control (Implementation methodology will be finalized here)
* Find and test wheel control output and handle any wireless inputs if required
* Design outer ball in two parts based on internal design sizes
* Assemble board, transistor, 9v battery and center apparatus. Conduct tests where necessary.
* Assemble the outer ball and lock in place, ensure design functionality prior to locking the outer shell.
* Demonstrate the final product!

The required tasks with the most rigor are interior assembly modeling and microcontroller programming. Handling Bluetooth inputs and outputs will be especially challenging. Once these tasks are completed, the project will enter its final stages.

**Outcomes:**

This project offers a great opportunity to apply the concepts being taught in class. Concepts such as IO, timer interrupts, timers, the bridge between AVR assembly and C/C++, and PWM are given real world connections. The requirement to supply additional power to the wheels outside of what the board can supply also adds an electrical engineering side to this project. Overall, our team will gain a deeper understanding of microcontroller applications and design constraints with this project.