ELEC 4000-003
Project Proposal – SwimView 2.0
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Harrison Burch, Demetris Coleman, Avion Foreman, Jungihn Kim, Dustin Spencer, William Stewart, Nick Thompson

The primary purpose of this project is to extend a previous senior design group's project of designing an automated camera tracking system for the Auburn University Kinesiology Department. The current system, SwimView, includes a remote controlled camera system that allows the user to capture video footage of a swimmer. The system provides a live-stream of the video while simultaneously storing the footage for later use. This project will focus on designing and integrating a tracking system that will allow SwimView to be completely automated.

The current system includes a motorized cart and an attached camera. The cart is designed to run on fixed tracks alongside the pool. The camera is connected to the cart and submerged in the pool. The cart is moved using a Servo motor and pulley system which is operated by a wireless Xbox controller. It currently operates as designed; however, the Kinesiology staff has noted a slight slip in the pulley system during takeoff and turnaround. The problem of slipping will be addressed as part of this project along with the development of the automated tracking system.

The tracking system will be implemented using a Raspberry Pi 3 with an attached camera module. This system will be mounted on the existing cart using a new arm that will allow the camera to look down on the swimmer. The Raspberry Pi will communicate with the Arduino, replacing the wireless Xbox controller. The camera will track colored markers, which will be placed on the swimmer. Image processing will be done using the Python programming language and the OpenCV library.

The current system uses an Xbox controller, which is wirelessly connected to an Arduino microcontroller. The Arduino is used to send control signals to the Sabertooth motor controller. This manual system will remain intact, and a new control system will be added to facilitate automatic operation of the cart. The Raspberry Pi will be responsible for issuing control signals to the Arduino microcontroller via Bluetooth. A button on the Xbox controller will be configured to allow the user to select the operating mode.

No machining equipment will be required for the project; however, the senior design lab will be used for electronic measurement and testing. The team will coordinate with the Kinesiology department to get footage of swimmers for image processing and testing of the system.

Each group member will be assigned a primary and secondary responsibility. The responsibilities are separated into three main categories: Image Processing, Controls, and Hardware. A summary of each member's responsibilities is provided

in the Table 1.

Table 1

Team Member	Primary Responsibility	Secondary Responsibility
Harrison Burch	Controls	Image Processing
Demetris Coleman	Image Processing	Controls
Avion Foreman	Controls	Hardware Integration
Jungihn Kim	Hardware Integration	Image Processing
Dustin Spencer	Image Processing	Controls
William Stewart	Controls	Project Management
Nick Thompson	Project Management	Hardware Integration
Dr. Robert Dean	Technical Advisor	
Dr. Wendi Weimer	Kinesiology Department Liaison	

The project is expected to cost $270. The budget is summarized in Table 2.

Table 2

Item	Price
Raspberry Pi Camera Module	$24.78
Adafruit Flex Cable (2m)	$7.97
Raspberry Pi Camera Case	$8.49
Rubber	$10.00
PVC Pipe	$50.00
extension cord	$70.00
Raspberry Pi Camera Lens	$30.00
Safety Seal for Ext Cord	$15.00
Colored Athletic Tape	$20
Overhead	$58.54
	$270.00

The project will take place over a series of 14 weeks. The project will be broken into three phases: Proposal (February 27), Phase One (March 22), and Phase Two (April 26). At the end of each phase, the group will present the status of the project. The estimated timeline for the project is provided in Table 3.

Table 3

Phase	Week No.	Wednesday Date	Objective
Proposal	1	11-Jan	Organizational Development
	2	18-Jan	Requirement Gathering
	3	25-Jan	Final Proposal
Phase One	4	1-Feb	Data Acquisition
	5	8-Feb	Data Acquisition
	6	22-Feb	Algorithm Development
	7	1-Mar	Image Processing Code
	8	8-Mar	Image Processing Code
	9	15-Mar	Spring Break
	10	22-Mar	Control Process Development
Phase Two	11	29-Mar	Hardware Integration
	12	5-Apr	Hardware Integration
	13	12-Apr	System Testing
	14	19-Apr	System Testing
	15	26-Apr	Presentation Development
	16	28-Apr	Senior Design Fair

All decisions will be made in accordance with the IEEE Code of Ethics. A copy of the code is provided below:

[1]"We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a **personal obligation to our profession**, its members and the communities we serve, do hereby commit ourselves to the **highest ethical and professional conduct** and agree:

1. to accept responsibility in making engineering decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding of technology, its appropriate
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons regardless of such factors as race, religion, gender, disablility, age, or national origin;

9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Works Cited

[1] IEEE Ethics Resouces:
http://www.ieee.org/web/aboutus/ethics/resources.html