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***Proposal for the development of Smart Tennis Ball Machine***

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*Computer Engineering Technology Students*https://github.com/Warris-Sohi/SmartTennisBallMachine

**Executive Summary**

As a student in the Computer Engineering Technology program, I will be integrating the knowledge and skills I have learned from our program into this Internet of Things themed capstone project. This proposal requests the approval to build the hardware portion that will connect to a database as well as to a mobile device application. The internet connected hardware will include a custom PCB with the following sensors and actuators Infrared Sensors, Motion Sensors, Servomotors, Stepper motors. The database will store Our databases will keep the parameters for each play-type or practice session.. The mobile device functionality will include The app is gonna be able to set individual parameters, you can save your level of play (level of difficulty). Our just choose one of our presets for difficulty of play. and will be further detailed in the mobile application proposal. I will be collaborating with the following company/department Startup Life. In the winter semester I plan to form a group with the following students, who are also building similar hardware this term and working on the mobile application with me Gurwarris Sohi, Sahil Sahil, and Nicolas Cristiano. The hardware will be completed in CENG 317 Hardware Production Techniques independently and the application will be completed in CENG 319 Software Project. These will be integrated together in the subsequent term in CENG 355 Computer Systems Project as a member of a 2 or 3 student group.

**Background**

The problem solved by this project is Tennis ball machines today are costly and in the age where every aspect of our life can be remotely controlled from a mobile device, tennis ball machines are still stuck with buttons and 8 bit displays. Present machines are more hardcoded and way less autonomous than today's standards.. A bit of background about this topic is Tennis ball machines us a container filled with a number of balls (100 balls by present standards), and then some machine use pressure to launch the ball and at the end a pair of tires placed on either side of the ejection tube either horizontally or vertically to finally launch the ball give the needed spin for each serve type. The whole contraption at the end is moved and horizontally and vertically to aim the ball trajectory. This part only affects the elevation and direction of the ball. But a ball can have same max height and distance with different elevations, with different launch speeds..

Existing products on the market include [1]. I have searched for prior art via Humber’s IEEE subscription selecting “My Subscribed Content”[2] and have found and read [3] which provides insight into similar efforts.

In the Computer Engineering Technology program we have learned about the following topics from the respective relevant courses:

* Java Docs from CENG 212 Programming Techniques In Java,
* Construction of circuits from CENG 215 Digital And Interfacing Systems,
* Rapid application development and Gantt charts from CENG 216 Intro to Software Engineering,
* Micro computing from CENG 252 Embedded Systems,
* SQL from CENG 254 Database With Java,
* Web access of databases from CENG 256 Internet Scripting; and,
* Wireless protocols such as 802.11 from TECH152 Telecom Networks.

This knowledge and skill set will enable me to build the subsystems and integrate them together as my capstone project.

**Methodology**

This proposal is assigned in the first week of class and is due at the beginning of class in the second week of the fall semester. My coursework will focus on the first two of the 3 phases of this project:  
 Phase 1 Hardware build.  
 Phase 2 System integration.  
 Phase 3 Demonstration to future employers.

*Phase 1 Hardware build*

The hardware build will be completed in the fall term. It will fit within the CENG Project maximum dimensions of 12 13/16" x 6" x 2 7/8" (32.5cm x 15.25cm x 7.25cm) which represents the space below the tray in the parts kit. The highest AC voltage that will be used is 16Vrms from a wall adaptor from which +/- 15V or as high as 45 VDC can be obtained. Maximum power consumption will be 20 Watts.

*Phase 2 System integration*

The system integration will be completed in the fall term.

*Phase 3 Demonstration to future employers*

This project will showcase the knowledge and skills that I have learned to potential employers.

The brief description below provides rough effort and non-labour estimates respectively for each phase. A Gantt chart will be added by week 3 to provide more project schedule details and a more complete budget will be added by week 4. It is important to start tasks as soon as possible to be able to meet deadlines.

We are planning our machine on a Raspberry Pi 3, which will controll the servo motors that laungh the ball, and also the stepper motors that will aim the ball accordingly and motion sensors to modulate ball speed.

**Concluding remarks**

This proposal presents a plan for providing an IoT solution for Our machine is based on a simpler design than the present machine, which will make the machine cost effective and when the machine is connected to the app, most of the processing is done on the mobile side. So we can have smaller processing size on the machine.. This is an opportunity to integrate the knowledge and skills developed in our program to create a collaborative IoT capstone project demonstrating my ability to learn how to support projects such as the initiative described by [3]. I request approval of this project.

**References**

[1] Baldwin, D. M. (1977). Using the tennis ball serving machine. The Physics Teacher, 15(7), 432–434. doi: 10.1119/1.2339719,5. Understanding the Motion of the Ball (Ball Trajectories). (n.d.). Tennis Science for Tennis Players. doi: 10.9783/9780812201468.72,

[2] Institute of Electrical and Electronics Engineers. (2015, August 28). IEEE Xplore Digital Library [Online]. Available: https://ieeexplore.ieee.org/search/advsearch.jsp

[3] N/A