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Proposal for the development of Germinator

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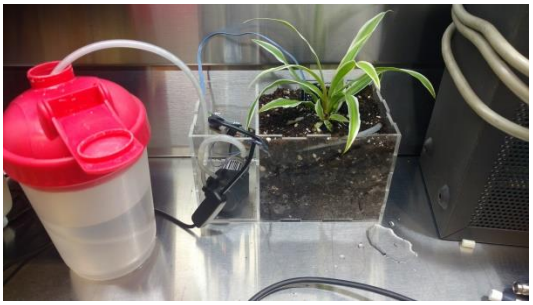

Executive Summary

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 sensors and actuators for the measuring of humidity, moisture, light, and temperature and a watering pump. The database will store the data gathered from the previously mentioned sensors and actuators. The mobile device functionality will include will include the ability to see the current data and will be further detailed in the mobile application proposal. I will be collaborating with Valeria Wuschnakowski, the greenhouse technician of the Humber College Greenhouse. The hardware and the application will be completed by and integrated together in CENG 355 Computer Systems Project.

Background

The problem solved by this project is that small-scale farms, gardens, and greenhouses need accurate ways of measuring the humidity, moisture, light, temperature, and water level of their plants. My project will help the users of the system to determine which circumstances the plant germination process (the process where plants are starting and growing from seeds) will occur the best. By having a smart plant monitoring system in place, plants can have their needs taken care of easily.

I have searched for prior art via Humber's IEEE subscription selecting "My Subscribed Content"[1] and have found and read [2] 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 tables below provide 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.

Labour Estimates	**Hrs**	**Notes**
Phase 1		
a) Writing proposal.	3	Tech identification quiz.
b) Creating project schedule. Initial project team meeting.	3	Proposal due.
c) Creating budget. Status Meeting.	3	Project Schedule due.
d) Acquiring components and writing progress report.	3	Budget due.
e) Mechanical assembly and writing progress report. Status Meeting.	3	Progress Report due (components acquired milestone).
f) PCB fabrication.	3	Progress Report due (Mechanical Assembly milestone).
g) Interface wiring, Placard design, Status Meeting.	3	PCB Due (power up milestone).
h) Preparing for	3	Placard due.

demonstration.		
i) Writing progress report and demonstrating project.	3	Progress Report due
j) Editing build video.	3	Peer grading of demonstrations due.
k) Incorporation of feedback from demonstration and writing progress report. Status Meeting.	3	30 second build video due.
l) Practice presentations	3	Progress Report due.
m) 1st round of Presentations, Collaborators present.	3	Presentation PowerPoint file due.
n) 2nd round of Presentations	3	Build instructions up due.
o) Project videos, Status Meeting.	3	30 second script due.
Phase 1 Total	**45**	
Phase 2		
a) Meet with collaborators	9	Status Meeting
b) Initial integration.	9	Progress Report
c) Meet with collaborators	9	Status Meeting
d) Testing.	9	Progress Report
e) Meet with collaborators	9	Status Meeting
f) Meet with collaborators	9	Status Meeting
g) Incorporation of feedback.	9	Progress Report
h) Meet with collaborators	9	Status Meeting
i) Testing.	9	Progress Report
j) Meet with collaborators	9	Status Meeting
k) Prepare for demonstration.	9	Progress Report
l) Complete presentation.	9	Demonstration at Open House Saturday, April 8th, 2017 10 a.m. to 2 p.m.
m) Complete final report. 1st round of Presentations.	9	Presentation PowerPoint file due.
n) Write video script. 2nd round of Presentations, delivery of project.	9	Final written report including final budget and record of expenditures, covering both this semester and the previous semester.
o) Project videos.	9	Video script due
Phase 2 Total	**135**	

Phase 3		
a) Interviews	TBD	
Phase 3 Total	**TBD**	

Material Estimates	**Cost**	**Notes**
Phase 1		
a) A microcomputer composed of a quad-core Windows 10 IoT core compatible Broadcom BCM2836 SoC with a 900MHz Application ARM Cortex-A7 32 bit RISC v7-A processor core stacked under 1GB of 450MHz SDRAM, 10/100 Mbit/s Ethernet, GPIO, UART, I^2C bus, SPI bus, 8 GB of Secure Digital storage, a power supply, and a USB Wi-Fi adaptor.	>$45.99	An example of a retailer: [3].
b) Peripherals with cables		
c) Sensors	15.00	
d) Hardware, etc.		
Phase 1 Total	**>$60.00**	
Phase 2		
a) Materials to improve functionality, fit, and finish of project.		
Phase 2 Total	**TBD**	
Phase 3		
Shipping	*free*	
Tax	*TBD*	
Duty	*TBD*	
Phase 3 Total	**TBD**	

Concluding remarks

This proposal presents a plan for providing an IoT solution for the accurate plant monitoring and germination. 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 [2]. I request approval of this project.

References

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

[2] Segura-Garcia, J.; Felici-Castell, S.; Perez-Solano, J.J.; Cobos, M.; Navarro, J.M., "Low-Cost Alternatives for Urban Noise Nuisance Monitoring Using Wireless Sensor Networks," *Sensors Journal, IEEE*, vol.15, no.2, pp.836,844, Feb. 2015 doi: 10.1109/JSEN.2014.2356342

[3] Creatron. (2015, August 28). Part Number: RASPI-004499 [Online]. Available: https://www.creatroninc.com/product/raspberry-pi-2-media-starter-kit/

[4] Upton, Liz. (2015, August 28). Raspberry Pi colocation [Online]. Available: http://raspberrycolocation.com/