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Proposal for the development of Lumi Monitor

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<https://github.com/gseridon/LumiMonitor>

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 Motion Detector, Light Sensor, Microphone, LED Lights, Audio Speakers. The database will store Information about active/inactive times and duration, user login to account for personal customization of Lumi, audio recordings and music storage. The mobile device functionality will include Ability to adjust and customize the monitor's lights, activation based on surroundings (motion/light/sound detection), viewing data infant data on times of sleep (and duration), as well as the played audio (lullabies) and its volume. and will be further detailed in the mobile application proposal. I will be collaborating with the following company/department Humber College School of Media Studies and Information Technology. 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 Kyle Voduris, Harsimran Saini. 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 Designing a baby monitor with a working lamp and audio input and output system with respective sensors. This device should allow the newborn's parents to better monitor their child, and alert the parents during the child's times of need via an associated mobile device.. A bit of background about this topic is With baby surveillance in mind, Lumi is designed to provide a customizable nightlight using an adjustable LED, as well as a working audio feed to input the surrounding sounds and output lullabies. The device can play music or an audio feed directly from a mobile device. The volume and audio type can be adjusted. This device will be able to record times when the child is awake, as well as times of sleep..

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.

Raspberry Pi, Speakers, Microphone, RGB LED Strip, Motion/Light Detector

Concluding remarks

This proposal presents a plan for providing an IoT solution for The raspberry pi will have the processor. The LED and speakers will be activated by both the motion sensors and the light sensors. The presence of motion, light and sound near the monitor will determine the activity of the LED and the speakers. The LED will act as a customizable baby lamp that will adjust based on motions near the monitor. A microphone is used to pick up sounds near the baby and can activate the speaker to play music or play audio feed from a connected mobile device. We plan to improve on the design and allow more freedom with customization and convenience for new parents.. 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] Pampers. (n.d.). Lumi by Pampers. Retrieved from https://www.pampers.com/lumibypampers?gclid=EAlaIQobChMIy-7Mypa65AIVFLbICh3S-A2PEAAYASAAEgJy4vD_BwE

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

[3] Jabbar, W., Hamid, S., Almohammed, A., Ramli, R., & Ali, M. (2019). IoT-BBMS: Internet of things-based baby monitoring system for smart cradle. IEEE, 7, 1-15. doi: 10.1109/ACCESS.2019.2928481