PiHue Project

Projects website: https://bigbosstony.github.io/

Declaration of Sole Authorship

I conform that that this work submitted for assessment is my own and is expressed in my own words. Any uses that was used in this documents that came from any other authors were acknowledged where their works were used. A list of references are included in this document.

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Proposal

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Proposal for the PiHue Project

Prepared by Yan Yu

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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. This project mainly focus on the connection between raspberry pi and Philips Hue. I will be collaborating with the following company/department Humber Department of Public Safety. In the winter semester I have no 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. 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

By using this project, you can automatically turn on your lamp when you get home.

I have searched for prior art via Humber's IEEE subscription selecting "My Subscribed Content" and have found and read which provides insight into similar efforts.

The first article I found discusses how to set up your own database by using PHP & MySQL.(Veglis, Leclercq, Quema, & Stefani, 2005)

The second journal talks about GPS-Based Tracking Control for a Car-Like Wheeled Mobile.(Low & Wang, 2008)

The third article gives the information about how to merge GPS information to a real map.(Catalao, Nico, Hanssen, & Catita, 2011)

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		
Writing proposal.	9	Tech identification quiz.
Creating project schedule. Initial project team meeting.	9	Proposal due.
Creating budget. Status Meeting.	9	Project Schedule due.
Acquiring components and writing progress report.	9	Budget due.
Mechanical assembly and writing progress report. Status Meeting.	9	Progress Report due (components acquired milestone).
PCB fabrication.	9	Progress Report due (Mechanical Assembly milestone).
Interface wiring, Placard design, Status Meeting.	9	PCB Due (power up milestone).
Preparing for demonstration.	9	Placard due.
Writing progress report and demonstrating project.	9	Progress Report due (Demonstrations at Open House Saturday, November 12th, 2016 from 10 a.m. - 2 p.m.).
Editing build video.	9	Peer grading of demonstrations due.
Incorporation of feedback from demonstration and writing progress report. Status Meeting.	9	30 second build video due.
Practice presentations	9	Progress Report due.

1st round of Presentations, Collaborators present.	9	Presentation PowerPoint file due.
2nd round of Presentations	9	Build instructions up due.
Project videos, Status Meeting.	9	30 second script due.
Phase 1 Total	**135**	
Phase 2		
Meet with collaborators	9	Status Meeting
Initial integration.	9	Progress Report
Meet with collaborators	9	Status Meeting
Testing.	9	Progress Report
Meet with collaborators	9	Status Meeting
Meet with collaborators	9	Status Meeting
Incorporation of feedback.	9	Progress Report
Meet with collaborators	9	Status Meeting
Testing.	9	Progress Report
Meet with collaborators	9	Status Meeting
Prepare for demonstration.	9	Progress Report
Complete presentation.	9	Demonstration at Open House Saturday, April 8th, 2017 10 a.m. to 2 p.m.
Complete final report. 1st round of Presentations.	9	Presentation PowerPoint file due.
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.
Project videos.	9	Video script due
Phase 2 Total	**135**	
Phase 3		
Interviews	TBD	
Phase 3 Total	**TBD**	
Material Estimates	**Cost**	**Notes**
Phase 1		
RaspBerry Pi 3 Starter Kit	$89.99	https://www.amazon.com/Vilros-Raspberry-Ultimate-Starter-Kit-Clear/dp/B01CYWE20U
Pi Camera Module with Case	$38.79	https://www.amazon.com/Raspberry-Pi-Camera-Module-Megapixel/dp/B01ER2SKFS/ref=sr_1_2?s=pc&ie=UTF8&q 2&keywords=raspberry+pi+camera
Piezo Buzzer Element (Vibration Sensor)	$5.19	Canada Robotix
LED	$0.50	Canada Robotix
USB GPS Dongle.	$50	Amazon
Phase 1 Total	**>$200.00**	
Phase 2		
Materials to improve functionality, fit, and finish of project.		
Phase 2 Total	**TBD**	
Phase 3		
Off campus colocation	<$100.00	An example: [4].
Shipping	*TBD*	
Tax	*TBD*	
Duty	*TBD*	
Phase 3 Total	**TBD**	

Concluding remarks

This proposal presents a plan for providing a smart home accessories. 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 . I request approval of this project.

Abstract (Executive Summary)

Philips Hue starter kit is a great product. I want to discover the possibilities.

Table of Contents

1. Introductionn

1.1 Purpose

The purpose of this documentation is to give a description of the “PiHue” in both hardware requirements and software side. It will also contain a explaination of the application.

1.2 Scope

The main use of PiHue is to help you control your lights in your home.

In beta phase, after set up the system, you can easily control your Hue through raspberry pi.

In final phase of PiHue, not only raspberry pi can control Hue, but also your smartphone.

1.3 Definitions, acronyms, and abbreviations

Phillips Hue: Smart connected lighting

2. Software Requirements Specifications (SRS)

2.1 Product Description

2.1.1 Goal

This project will combine Raspberry Pi, Philips Hue and the bridge, connect all the device by internet. Control lights using smartphone.

2.1.2 Targeted Users

Tech-fans, with modern technology to build smart home accessories.

2.1.3 Overview Of Product

PiHue includes a Raspberry 2 Model B, Philips Hue bulbs, bridge, an android or iOS device and a router.

2.2 System Perspective

2.2.1 Product Perspective

The product will be written by Python on the Raspberry Pi side, for the mobile application, It will support android and ios platform.

2.2.2 Product Functionality

Tha main functionality of my product is to provide user to control lights in your own home.

2.2.3 Requirements

Internet connection is needed to send command and script to bridge to turn on or off the lights. A router will be needed to build a secure line for the bridge.

2.3 Overall Description

2.3.1 System Interface

System Interface for my project includes raspberry pi and a smartphone. A web based database is for mobile connection. GPS module will be simulated by the smartphone.

2.3.2 Database

Website using JSON.

2.3.3 Hardware

The main process of this project is to understand communication of Hue bridge.

2.3.4 Software

User will use raspberry pi and smartphone to integrate with the bridge.

2.4 Build Instruction

2.4.1 Introduction

Understanding how Philips Hue works, and hack Hue bridge with raspberry pi then set up connection with smartphone. This build instruction adopted from Randy Reed from hackster.

2.4.2 Preparation

Start up with Philips Hue API, you can check out the API from Philips. Also a hue library for raspberry pi is needed. phue and pyhue.

2.4.3 System Diagram

INPUT —> Raspberry Pi —> Action —>Philips Hue API —> Hue Bridge

2.4.4 Cost of Material

Raspberry pi 2 Model B	$49.99
Philips Hue White A19 Starter Kit	$69.99

2.4.5 Time Commitment

Todo	**Time Required**
Hue library and other software installation	(1 hr) I take this amount of time to find out the proper library for the system.
Hue bridge connection	(1 hr) I using meethue.com to find out the unique ID for the bridge and testing the command with the bridge.
Sample code testing	(30 mins) Error fixing.

2.4.6 Software Installation

Two kinds of libraries for pi I found is pyhue and phue.

pyhue: `pip install pyhue`

phue: `sudo easy_install phue` or `pip install phue`

2.4.7 System Setup

Using www.meethue.com/api/nupnp to discover the IP address and ID of the bridge.

Go to http://ip_address_you_found/debug/clip.html.

Address `http://<bridge ip address>/api`

URL `/api`

Body `{"devicetype":"my_hue_app#pi tony"}`

Press the button on the bridge and then press **POST** button to generate the unique ID.

Address `http://<bridge ip address>/api/unique_id/lights`

Body

GET

Address `http://<bridge ip address>/api/unique_id/lights/1` \

Body

GET

Address `http://<bridge ip address>/api/unique_id/lights/1/state`

Body `{"on":false}`

PUT

2.4.8 Program Testing

3. Conclusion

4. Recommendation

5. Reference

References (Generated in pdf)

Catalao, J., Nico, G., Hanssen, R., & Catita, C. (2011). Merging gps and atmospherically corrected insar data to map 3-d terrain displacement velocity. *IEEE Transactions on Geoscience and Remote Sensing*, *49*(6), 2354–2360. https://doi.org/10.1109/TGRS.2010.2091963

Low, C. B., & Wang, D. (2008). GPS-based tracking control for a car-like wheeled mobile robot with skidding and slipping. *IEEE/ASME Transactions on Mechatronics*, *13*(4), 480–484. https://doi.org/10.1109/TMECH.2008.2000827

Veglis, A., Leclercq, M., Quema, V., & Stefani, J. B. (2005). PHP and sql made simple. *IEEE Distributed Systems Online*, *6*(8). https://doi.org/10.1109/MDSO.2005.42