PiRover

By Christopher Albarillo, Lawrence Puig, and Patrick Ng

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Project Build Website: https://chris0707.github.io/PiRover/

Declaration of Joint Authorship

We, the PiNivea group, here by declare that the project report entitled "PiRover" confirm that this work submitted for assessment is our own and is expressed in our own words. A list of references that were used for this project is provided and can be found under Technical References section.

PiNivea: Christopher Albarillo, Lawrence Puig, and Patrick Ng.

Date: February 9, 2017

Proposal

Executive Summary

As students in the Computer Engineering Technology program, we will be integrating the knowledge and skills we have learned from our program. This proposal requests the approval to build the hardware portion, which is the PiRover, that will connect to a mobile device application using Bluetooth connection. The mobile device functionality will allow the user to register and login their information, gain access wirelessly to control the hardware(PiRover), voice commands to control the PiRover's features (lights and code execution).

Background

We believe that the most difficult part of this project is building the script that will handle the voice command functionality that will control the PiRover's pre-implemented features such as; lights and other code executions.

This prototype project that our team has constructed has been inspired by other rovers such as NASA's own rover. By utilizing all of the abilities acquired in our previous Hardware course we have gained further knowledge and become accustomed to the further advancements we are applying into the prototype. The PiRover was designed to be controlled via Bluetooth with an android application from any android device. With this feature working, we plan to implement other features such as; lights, voice activations and maybe further perfect the controller from the android application.

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 winter 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 has been completed in the fall term and will finish it with an enclosed case for protection and stability this winter 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 winter 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.

Labour Estimate	Hrs	Notes
Phase 1		
Writing Proposal	9	Tech Identification Quiz
Creating Project Schedule	9	Proposal Due
Creating Budget (Mock group setup for CENG355/Phase 2)	9	Project Schedule Due
Acquiring Components / Begin to film unboxing	9	Project Budget Due
PCB Fabrication	9	Component received for the project
Mechanincal Assembly / Status Meeting	9	Showing acquisition for the project
Finish off the PCB	9	Mechanical Assembly Due

Writing 30 second Video Script and creating Placard Design	9	PCB Due
Creating 30 second Video with the script created and Demonstration the hardware	9	Video Script and Placard Due
Writing Progress Report	9	30 second Video Due
Creating the Hardware Presentation	9	Progress Report Due
1st round of presentation and Writing build report	9	Presentation Due
2nd round of presentation	9	Build Report Due
Phase 1 Total	**117**	
Phase 2		
Recreate the Proposal	9	Form the group for the project
Meeting with collaborators (SRS)	9	Proposal Due
Status Meeting	9	SRS Due
Meeting with collaborators(Abstract, Introduction and Declaration of Authorship)	9	Family Day Holiday – No Class

Meeting with collaborators (Email Progres Report by Student A)	9	Abstract, Introduction and Declaratiob of Authorship Due
Meeting with collaborators (Merged Build Instruction ported to Technical Report and App, Web and Database Independent Demonstration)	9	Group Status Progress Report Due
Meeting with collaborators(Email Progress Report by Student B)	9	Merged Build Instruction ported to Technical Report and App, Web and Database Independent Demonstration Due
Meeting with collaborators(OACETT basic requirement report checklist)	9	Integration Progress Report Due
Meeting with collaborators(Email Progress Report by Student C)	9	OACETT basic requirement report checklist Due
Prepare for Demonstration	9	Troubleshooting Progress Report Due
Prepare for Presentation	9	Demonstration Due
Writing Technical Report	9	Presentation Due

Extra Day	N/A	Technical Report Due
Phase 2 Total	**108**	
Phase 3		
Interviews	TBD	
Phase 3 Total	**TBD**	
Material Estimate	**Cost with tax**	**Quantity**
Raspberry PI Starter Kit	$112.99	1
Electronic Learning Kit for RaspPi	$19.05	1
100000mAh Portable Power Bank	$23.72	1
Micro Servo Motor FS90R	$21.00	2
Ultrasonic Sensor HC-SR04	$5.00	1
Laserut Chasis from Humber	N/A	1
3D Printed Wheels from Humber	N/A	1
Total	$181.67	

Concluding Remarks

This proposal presents a plan for providing an IoT solution for search and rescue situations or even for historical research. This is an opportunity to integrate the knowledge and skills developed in our program to create a collaborative IoT capstone project demonstrating our ability to learn how to support projects such as the initiative described by T. Kubota, Y. Kuroda,

 We request approval of this project.

Abstract

Table of Contents

Illustration List

1. Introduction

2. Software Requirement Specifications (SRS)

2.1   Purpose

The purpose of our software is to provide full control of the PiRover(Hardware). Using the mobile application, it enables the user to control the PiRover manually and automatically and have his/her own account to simply store the PiRover's collected data in the database.

2.2 Overall Description

2.2.1 System Interface

The system interface for our project consists of the following: PiRover hardware, mobile application, and a database server. The user will have full control of the PiRover using the mobile application. When the user chooses the option to control the PiRover automatically, it will run autonomously while recording data and having an option to review and store the information in the database.

2.3 Hardware

Our hardware is called PiRover. Once the PiRover has booted up, it will automatically open a Bluetooth server connection. It should be able to receive the connection from the mobile device that the hardware is currently paired with. Once the connected is established, the user is can now control the PiRover manually and automatically.

2.3.1   Components

PiRover Components:

- Raspberry Pi 3

- UltraSonic Sensor HC-SR04

- 100000mAh Portable Power Bank

- Micro Servo Motor FS90R (x2)

- Laser cut Chasis from Humber College

- 3D Printed wheels from Humber College

- PCB Printed from Humber College

- USB Microphone

2.3.2 Chasis Specifications

Chasis Size:

Width – 8.99cm

Height – 5.99cm

2.3.3 Motor and PCB(Optional) Specifications

Motor Specifications:

Size:

23.2mm x 12.5mm x 22mm

General Specifications (at 6V):

Free-run current: 120 mA

Stall current: 800 mA

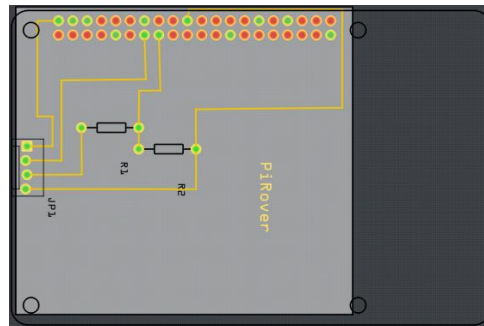Speed: 130 rpm

Stall Torque: 21 oz-in

General Specifications (at 4.8V):

Speed: 100 rpm

Stall torque 18 oz-in

Lead Length: 10 in

PCB Specifications:

PCB Size:

Width – 55mm

Height – 60mm

2.4 Mobile Application

Our mobile application is called PiRover controller. The mobile application is only available for android users only. Once the app is opened, it will give the user options to – login, register, and proceed in offline mode. After the user has logged in, there will be two control options provided for the user: manual and automatic. If the user selected manual, he/she will have the ability to control the PiRover using the manual controls provided. And if the user selected automatic, he/she will only have one option to control the PiRover, and that is by selecting or clicking the button "start automap".

2.4.1 Database

The database server that is being used in this project is the Hostinger's database. Using the database, it enables us to store user's information, as well as the data that will be gathered by the PiRover. This will give the user comfortability to review their gathered data as long as the user has access to the internet and currently logged on to the mobile application.

2.4.2 Connectivity

The mobile application allows the user to graphically control the PiRover via Bluetooth integration to the Raspberry Pi 3. The Android device and Raspberry Pi 3 should be paired in order to control the PiRover. For further details refer to the Mobile application's "Help" section.

2.5 External Interface Requirements

In order to run the android application, an Android device that is above API 21 (Android 5.0) is required. Any device under this API will not be able to run the application. For the voice activation control, it will require an external microphone as the PI doesn't have an integrated microphone. This can be a USB webcam with a microphone, USB microphone or 3.5mm microphone. To use the 3.5mm microphone, a USB sound card is needed as the PI 3.5mm jack is an output and not an input. The USB ones are plug and play.

2.6 System Features

The PiRover has multiple features and still going through multiple updates for further implementations. Up to date features include;

- Full Manual Control of the PiRover
- Automatic Sensor Mode

System Features in the process of being implemented;

- Voice Activation Control System *Patrick*

- Lights (May be Voice controlled) *Chris*

- Movement (Possibly voice controlled) *Lawrence*

2.7 Work Distribution

Christopher Albarilo – Database for storing user's information and gathered data.

Lawrence Puig – Software for allowing users to have a Graphical User Interface for a much more user friendly use.

Patrick Ng – Hardware for allowing users to use the integrated software with the PiRover.

Certain work will be determined as the project proceed. Certain things could change.

3 Progress Report

4 Conclusion

5 Recommendations

6   Technical References

7 Appendices