BCA
Bay Computer
Associates

Three Phase Motor Controller
An ELE480 Capstone Design Project with BCA

Company

Bay Computer Associates, Inc. (BCA) is a full-service software and electronics contract design firm. Our permanent staff of over 24 engineers has been designing products for our customers for 25 years. While we currently have no products of our own, we have significant design experience from websites to electron beam microscopes. It is our hope that a relationship with students will allow us to move closer to having some products of our own.

We are located in Cranston, RI. We anticipate a number of face to face meetings but we suspect due to the distance to campus that we will skype and will allow VPN access to our facilities for some of the required activities as long as a non-disclosure is signed.

Introduction

BCA has invested a significant amount of design time into a three phase AC motor controller. In addition, we have had students from last year's capstone class work on this project. All three found it quite interesting and they felt that they learned a lot. (Also they enjoyed the ride on the power assisted bicycle that was driven by the controller at the end of the project.)

The problem that they solved last year was that device only operated quite well for relatively low motor currents. The isolated the rood cause of the flaw in the design that, at high motor currents, noise caused the output driver chip to disable itself resulting in reduced current output.

We would like to further this project by correcting this problem. This would require designing and testing a new controller board that would be appropriate for sale as a subsystem in mobility devices. This would include increased output current capabilities so that this controller might be used for a significantly sized vehicle.

An additional issue is that the software is that it is not "friendly" enough to allow us to sell this as an "off the shelf" product. The user cannot easily configure the device to operate with the user's motor.

Tasks to be completed

Hardware
- Review and understand last year's team's evaluation of present hardware and their suggestions for improvement.
- Design a solution to the "noise' problem described above

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software development & electronics design

- Increase the output drive capability
- Redesign the circuit board
- Test the above.

Software
- Firmware changes to the motor drive
- PC software to configure the system from a user point of view.

Minimum System Specifications
- An updated electronics system that provides twice the current drive of the present system. (testing will likely be done on power assisted bike motor).
- A software system that allows easy modification of parameters for use with other motors.

Stretch goals
NOTE that we consider this design to require significant skill to make good progress. It is likely that the above system will be challenging by itself. If the above can be achieved, a vehicle system using three or four coordinated motor controllers would be exciting to see.

Engineering Skills required
Schematic capture
Digital Design
Analog design
Embedded systems programming ("C" language)
Windows programming

Engineering Skills to be learned
Motor control methods
Schematic capture
Circuit board layout
Debugging techniques
Interfacing with mechanical systems
Documentation

Preferred Team Composition
1**CPE** major and 2 **ELE** majors

Technical Contact
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