Eagle Electrical Engineering Enterprise
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Automated Temperature Sampler

Overview:

Eagle Electrical Engineering Enterprise (4E) is a Hopkinton based Industrial controls and Electrical Engineering Design Company specializing in PLC systems design and PLC programming. 4E would like to work with URI engineering students to develop an automated temperature sampler that will move automatously around the interior ribs of a submarines hull. Prior to welding the ribs in place the hull and ribs must be heated to proper temperature. The sampler will stop, extend a temp probe and record a temperature. The data will be wirelessly transmitted to a tablet and the probe will move to a new position to take a new reading.

The sampler will consist of two major components: a motor driven platform that can carry the thermocouple probes and a HMI and software to display data. The platform must be able to keep track of its position along the hulls rib and will need to have obstacle avoidance sensors to steer clear of the welding equipment. To simplify, platform design Arduino controllers could be used and a Windows tablet could be used for the HMI.

Team Description:

Two electrical engineers and one computer engineer.
Ability to work as a team and initiative are a must.
Knowledge of amplifiers, motor drives, ADCs, DACs, battery charging circuits, digital logic circuits,
Ultrasonic sensors, blue tooth, wireless Ethernet, voltage regulators.
PCB layout experience is a plus.
C, C++, Java programming experience.

Deliverables:

Detailed electrical and mechanical specification (developed interactively with 4E engineers).
HMI specifications, layout of data displayed.
System test procedure.
Bill of materials for any “off the self” components, motors, encoders, ICs, batteries, etc.

Detailed circuit design & schematics.
Functional sampler platform programmed HMI.
Final report including block diagrams, theory of operation, material cost and results of early test.

Division of Labor:

Electrical Engineer 1 (Motor drive, probe control):

This engineer's primary responsibility will be to design the sampler platform's motor drive with encoder feedback, and retractable sampler code. This engineer will be responsible for the selection of motor, motor drive, determining power requirements of motor, motor drives, battery requirements as well as mechanical layout for the platform. Once the components have been chosen and the circuits designed, this engineer will work with the group's second electrical engineer to integrate his or her electronics into the overall design. Once the integration is complete, the two engineers will work together to design, create and test the drive PCB.

Electrical Engineer 2 (Control microprocessor, thermocouple acquisition circuit)

This engineer's primary responsibility will be to design the overall system PC board with microprocessor, thermocouple A to D circuit, the collision avoidance circuit, power supply for the control circuit, and also design the interconnection between the drive and battery circuits. This engineer will work with other team engineers, integrating circuit requirements. Once the integration is complete, the two engineers will work together to design, create and test the sampler control PCB. When a design has been selected, this engineer will be required to formulate a bill of materials.

Computer Engineer 1 (Overall sampler control and HMI display software):

This engineer's primary responsibility is to write the overall control software for the sampler. The engineer will work with engineer 1 and 2, assessing their requirements, and then write software allowing the sampler to move, and send collected data to the HMI. This engineer will also be required to write the HMI display software. The responsibilities of the team are also to assist any other team members with their work.

If you have any questions about the project, its objectives, or any of the roles described before our presentation, please do not hesitate to contact David Grande: dgrande@eagleelectric.com