Embedded Management System for Mobile Robots

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Motivation

- Many robots are designed for situations that are unsafe for humans – an operator must be able to control the robot remotely, including halting the robot in case of emergency.
- Monitoring internal diagnostic information about a robot can help avoid unsafe operating conditions that could lead to damage.

GOAL: Create an embedded system that can both monitor the robot's internal status and allow a remote operator to directly control functionality designed to mitigate or avoid unsafe conditions.

Embedded System

Provides an interactive display for an operator to monitor the robot's diagnostic and control safety-oriented functions

Sensors
- Thermistors are used to measure the temperature of each of the robot's four motors
- The current, voltage, and power on three internal power buses (24V, 12V, 5V) are measured with a dedicated chip

Controls
- The robot's emergency stop functionality can be triggered by the board's electronics
- The speed of the robot's internal cooling fans can be cycled among several settings
- LEDs connected to the board indicate the status of the emergency stop and the communication link with the robot's internal computer

Interactive Display

- Sensor data is color coded:
  - Green for safe operating conditions
  - Yellow for near unsafe conditions
  - Red for unsafe conditions
- Clicking on the respective lines of text cycles through fan settings, and enables/disables the emergency stop
- Two modes:
  - 'Minimal' mode displays the control buttons, 24V bus voltage, and data not in safe conditions
  - 'All' mode displays everything

Future Work

- Fully integrate system into robot
- Minimize size of the printed circuit board
- Generalize the system design for other robotic platforms

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