MECH 430 Spring 2010
Instrumentation and Measurements
Final Project
Elevator Instrumentation

Project Description

Design an instrumentation system for a three story elevator. The elevator should contain at least the following features:

a) Calling mechanism: There should be a button on each of the three floors to allow users to call the elevator. There should also be three buttons inside the elevator labeled: '1', '2', and '3' for the corresponding floors. The software should show the chronological sequence of calls and should also indicate the current position, and destination of the elevator.

b) Fire detection: The elevator should be able to detect the existence of a fire inside it. If a fire should occur the elevator must stop at the nearest floor and open its door to allow for an easy evacuation. In addition, a fire alarm must sound.

c) Lighting mechanism: The elevator should contain a smart lighting mechanism. When the elevator is being used, the light should be on; and when it is not being used, the lights are turned off to save power. On the other hand, the intensity of this lighting should vary according to the time of the day. During night time, the light intensity must be at its maximum, while during day the intensity must be half that of night time.

d) Ventilation control: The elevator should contain a main fan that circulates the air inside it. The fan should be on when the elevator is being used and off when it is not. If a fire is detected, and the fan is on, it should be turned off immediately. Here you should have a table of three values of Duty Cycle according to the ambient temperature outside (too hot implies the highest DC, cool temperature a medium DC and too cold implies the lowest DC).

e) Use a load cell or strain gauge to detect if the elevator becomes overloaded. It this situation occurs, the elevator should not be allowed to move.

f) Include a smart mechanism that makes the elevator go to the lowest floor and open its door when it is not being used or called for.

Project Deliverables

1) The elevator structure with the sensors installed. The structure will be built by the shop staff.
2) The LabVIEW software that controls and coordinates all the elevator features described above.
3) A report detailing the design and construction of the entire system including the onboard sensors and actuators, the signal processing and control.

Project Bonus

The above description is the minimum features that should be included in the system. Any additional ideas that make the elevator smarter are strongly encouraged. Some exemplary ideas include (but are not limited to):

- Use a camera to count the number of users inside the elevator. If the number exceeds a certain limit, then an ‘overload’ condition is detected.
- Include a safety feature that detects the presence of a person standing in front of a closing door. The closing of the door should immediately stop in that case and the door must re-open, after that the elevator should continue normal operation.

Maximum of three students are allowed in each group.