EECE 200 DESIGN PROJECT

PROPOSAL GRADE SHEET

TEAM NUMBER 13

Percent of Effort Distribution and Team Approval

Team Member 1

Name Ali Naji Percent Effort 25 % Signature ______

Team Member 2

Name Amal Hneini Percent Effort 25 % Signature ______

Team Member 3

Name Carine Atie Percent Effort 25 % Signature ______

Team Member 4

Name Houssam Bajouk Percent Effort 25 % Signature ______

Expected Features	
This grading sheet as the front page of the report.	/15
Title Page: everything centered including title, names, course, and date.	/15
Professionalism: double spacing, 11- or 12-point font, grammar, spelling, punctuation, language, consistency, writing tips followed.	/25
Introduction: Problem statement and objectives; specifications and constraints; report organization.	/20
Methodology: Brainstorming methods and results; discussion and illustration of design alternatives.	/35
Schedule: Timeline.	/15
Anticipated cost summary in the form of a table or chart.	/20
Anticipated results.	/20
Name and qualifications of each team member; what and how each team member can contribute to this project.	/20
References	/15
Total Score	/200

Design Project Proposal

Three Floor Elevator

Team number: 13

Ali Naji (section 2)

Amal Hneini (section 2)

Carine Atie (section 7)

Houssam Bajouk (section 6)

EECE 200

Monday, November 28, 2011

Introduction:

Problem Statement:

In this project, we are going to build a prototype of a three floor elevator controlled by a program designed using NI LABVIEW software, interconnected with the NI SPEEDY 33 DSP controller and an interface board.

Objectives:

This project will help us:

- Experience coordinated teamwork and overcome its difficulties.
- Enhance our problem solving abilities and comprehend its process.
- See the theoretical subjects we are studying come to life, and experience them ourselves.
- Pass through all the stages of critical thinking and design.
- Reach a preset goal in a well thought-out manner.
- Develop our ability to professionally use NI SPEEDY 33.
- Add to our experience in programming using LABVIEW.

Specifications:

Digital inputs (8):

1. Three digital inputs at each of the three floors to know the position of the elevator cabin.
2. Three digital inputs at each of the three floors to call the elevator.
3. One digital input for the sensor installed at the door of the cabin.
4. One digital input for the temperature sensor.

Analogue input:

Voice sensor (microphone) in the cabin to indicate the choice of floor.

Digital outputs (8):

1. Two digital output signals to display the floor number on a 7-segment display.
2. One digital output to turn on/off the motor that lifts the elevator cabin.
3. One digital output to select the motor direction (cabin moving up/down).
4. One digital output to turn on/off the DC fan installed in the elevator.
5. Three digital outputs to open/close the three doors on the floors.

Software:

NI LABVIEW

Hardware:

1. NI SPEEDY-33
2. A special interface board

Constraints:

- The four members should be registered in EECE200.
- Usage of NI SPEEDY-33 and a special interface board is mandatory.
- The design team should build and/or buy all necessary hardware.
- The SPEEDY-33, the interface board and all wirings should be incorporated and hidden in the model.
- A total of eight digital inputs, one analog input, and eight digital outputs must be used.

Organization Page

Methodology

Brainstorming methods, discussion and results

The approach we took thinking about this project was simply to classify the conflicts, taking each separately and thinking logically and critically to solve it. The elevator should have two properties: practical, but creative at the same time. First we considered how the basic functions of the elevator should work. Later, each one came up with ideas about the secondary functions like those of the sensors and some alternative and creative ways to proceed with them.

In terms of program logic: the role that the elevator performs in real life: it is a platform that either moves up or down. Hence, the elevator has two outputs: one signaling if it should be turned on and off, the other if ascending or descending when turned on, depending on the call.

The problem resides in making the design consider or read the inputs coming from the elevator, and then apply the appropriate function depending on the task to be performed, which is controlled by the movement of the motor (either ascending or descending). Logically, the main inputs should be the one that determines the current position of the elevator (say X), and the one that determines the wanted destination (say Y). Since there are no digital inputs that allow the user to specify the destination floor, an analog input should be used, a microphone. Once the input is converted to a digital signal, the design could compare the two inputs X and Y, and according to the comparison it could perform the appropriate task. For example:

If X> Y, the cabin should go up

If X<Y, the cabin should go down

If X=Y, the cabin should stay still.

When more than one call is made, another problem resides. How will the elevator function?

The elevator stops when X=Y opens the door for seven seconds, closes it, then continues traveling in the same direction while there are remaining requests in that same direction.
If there are no further requests in that direction, the cabin stops and becomes idle, or changes direction if there are requests in the opposite direction. In other words, it "disk schedules" the requests: it stores the data while minimizing the time waste, respecting priorities of requests, and guaranteeing that the tasks are done logically and efficiently.

- Signaling to indicate the position of the elevator: we found that a bumper sensor would be quite functional; depending on the floor, a decimal is scent to the SPEEDY board.

- Signaling an obstruction: infrared sensors would be the most efficient to indicate if an object or a person is within the door frame. When an obstruction is signaled, the SPEEDY board and the interface board stop the door from closing until the obstruction no longer exists.

- 7-segment display function: using logical algorithms, we will get from the each bump sensor a decimal that enters the SPEEDY which gives two signals entering the interface board which in turn is prepared in a way to transform binary to decimal. 00 would signal: 1, for the first floor, 01 would signal 2, for the second and 11 would signal 3 for the third. Like in most elevators, two displays are installed, one at the first floor and one inside the cabin.

- The same sensors would trigger the three motors responsible for the door to open. When a bump sensor is on for more than a specific time, about 5 seconds the door of the corresponding floor will open. As we can see the problems started to lead to one another sequentially. The motor should be set in such a way that it would function in two directions. The motor would functions on 3 stages: a speed of 0, the door stops, of -1: the door opens (first direction) and of 1: the door closes (second direction). This will be done using relays.

- Audio control: the audio controlled elevator from inside the cabin would not be practical to function on human voice: it is difficult to find three specific frequencies transmitted by a human voice without capturing other noises and letting the voices mixed up. Another obstacle for using human voice is the possibility of a mute person entering. Thus a solution would be to install a three tone musical instrument such that the speedy would be configured in a way that each frequency would trigger the same function as one of the push buttons on each floor. This sound would reach the speedy through the microphone installed in the cabin and connected to the analog audio input of the speedy.

- The temperature sensor would trigger the fan to function after the temperature exceeds the threshold temperature, usually a temperature of 27˚C is considered a hot temperature for which the DC fan should be activated. They would be interconnected through the speedy.

- Push buttons will be used for calls form each floor because they are the most practical and efficient inputs for such a task.

In terms of hardware: The most practical materials of construction are wood and steel, while being easy on the eyes.

- The best position for the SPEEDY, in which the program was downloaded using LABVIEW, and the interface board, connected, would be at the base of the structure. The wires leaving them will be put in way not to hinder the movement of the cabin.

- To aid the motor of the elevator, a counter weight would be put on the opposing side of the cabin.

In terms of additions: a speaker would be installed on the third floor and would be connected to the temperature sensor. When the temperature reaches an abnormally high value, the speaker would signal an alarm tone, acting as a fire alarm.

- After testing, a "weight overload" sign will be put inside the cabin to show what weight should not be exceeded for the motor of the elevator to function properly.

- We were thinking about the problem we face in Lebanon and that is the frequent cutoff of electric power. As a solution we are going to develop a secondary support power source connected in parallel with the main electric source. That secondary source would be based on solar panels, installed at the top of the structure, connected to a 12v rechargeable battery that would produce power identical to that of the main source. The solar panels would charge the battery and the battery would function as an electric generator

We will try to find an automatic switch that would switch automatically from the main source to the secondary source as soon as the main source is off. And it would switch back as soon as the main source. This switch might be an algorithm that would be developed by us using LABVIEW or an external hardware already functional if we find it.

This way, when the electricity is cut, the elevator will not stop immediately at a random point, the secondary power supply fed by the solar power, although not as powerful as the primary source, will have enough energy to give time for the elevator to stop at a specified floor.

Design alternatives and illustration

I) First Design Alternative: Selected Design:

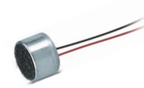
The selected design was described and discussed in the previous section. Resuming the main characteristics:

-1 12V Motor: 

- 3 9V Motors: 

- 1 Temperature Sensor: 

- 3 Push Buttons: 

- 1 Microphone: 

- 2 7-Segment Displays: 

- 1 DC Fan: 

- 1 3-Key Tone musical instrument: 

- 1 Speaker: 

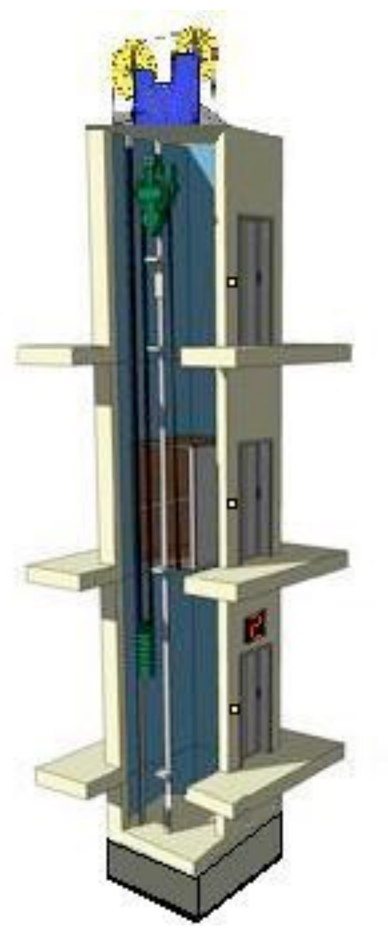
- 3 Bump Sensors: 

- 1 Infrared Sensor: 

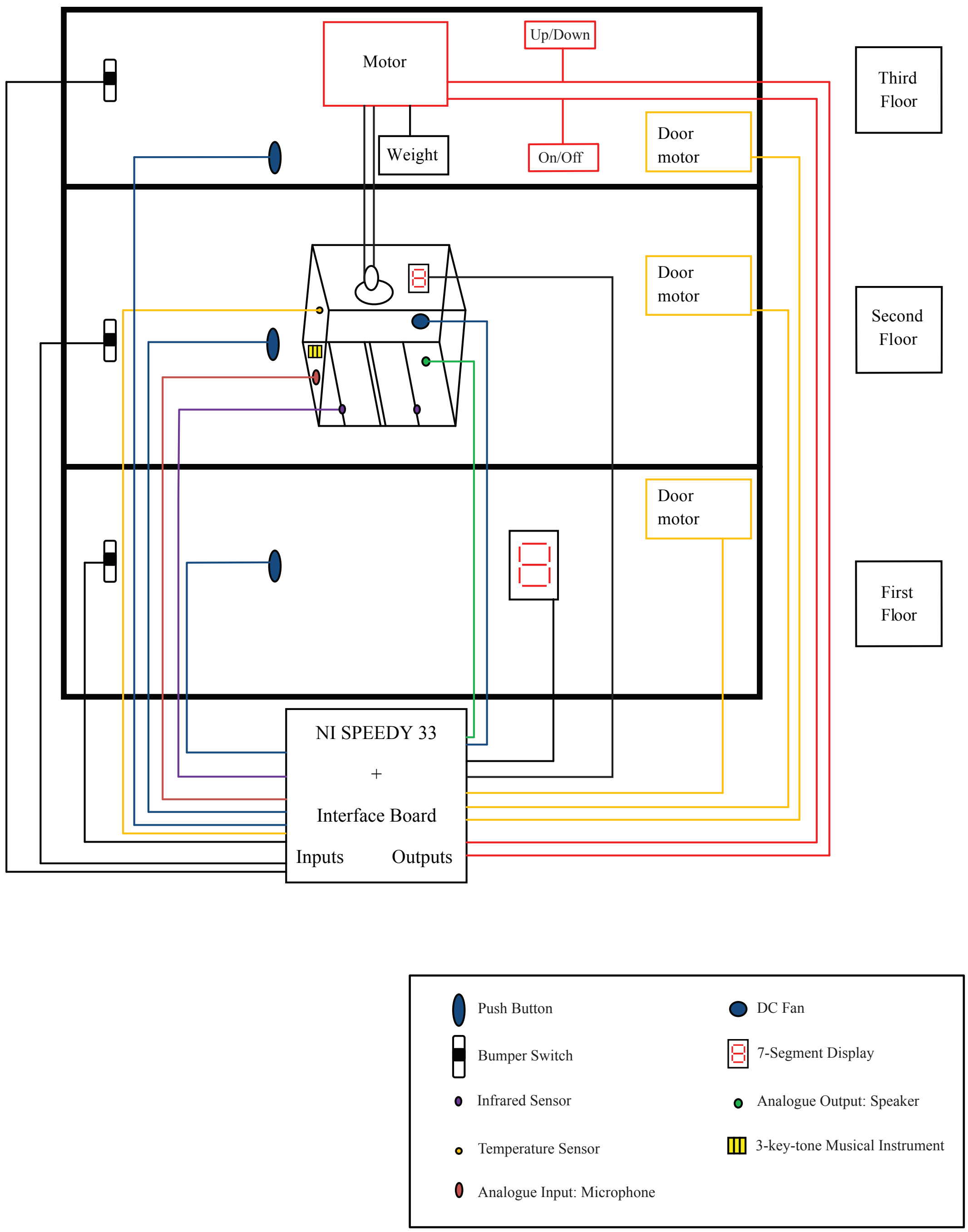
- Relays: 

- Wood: 

3D Sketch



Elevator Schematic



II) Other Design Alternatives:

Not much modifications can be done in terms of software and program logic, contrary to the hardware:

- 1 12V Motor, 3 9V Motors, 1 Temperature Sensor, 3 Push Buttons, 1 Microphone, 1 DC Fan, 2 7-Segment Displays. Stated items cannot be changed.

- Instead of the 3-key-tone musical instrument the voice for the microphone would be a human voice: cheaper but less practical.

- The speaker would be put inside the cabin, when the cabin stops at a certain floor, the bump sensor will trigger in the SPEEDY a recording that announces the corresponding floor: an additional luxury, but not as important as a fire alarm.

- Using photoresistors instead of the bump sensors and a light bulb on the cabin for signaling the cabin's position: putting a light inside the cabin, but less efficient.

- Using a photoresistor at one side of the elevator near the door and a laser emitter at the other for indicating obstruction instead of the infrared sensor: more innovative, but less efficient.

- Removing the counter weight and the solar plate with the secondary power source: cheaper, but more power will be consumed.

- Using Plexiglas instead of wood and steel: visually attractive, but less practical.

Schedule: Timeline

Tasks and Group Meetings	**Date**
Group Forming and Naming	Friday, November 18, 2011. Due Date: Monday, November 21, 2011.
1st Meeting: Discussion and brainstorming to know more about the project as well as each team member. Starting with the proposal.	Wednesday, November 23, 2011.
2nd Meeting: More brainstorming. Collecting and organizing parts written by each member for finishing the proposal.	Friday, November 25, 2011.
Proposal Report	Sunday, November 27, 2011. Due Date: Monday, November 28, 2011
Next Meetings: Starting on the project and testing. Emphasis on the software part.	Tuesday, November 29, 2011. Thursday, December 3, 2011 .
Project Software Demonstration	Due Date: Friday, December 16, 2011
Project Deadline Software and Hardware	Due Date: Wednesday, January 11, 2012.
Projects Presentation and Demo	Due Date: Thursday and Friday, January 12 and 13, 2012.

Anticipated cost summary

Item	Price	Quantity	Total cost
NI SPEEDY-33	600$	1	600$
Interface board	N/A	1	N/A
NI LABVIEW	120$	1	120$
Wires	6$	1 (10m)	6$
Wood	15$	N/A	15$
Motor (12V)	4$	1	4$
Motor (9V)	3$	3	9$
Bump Sensor	2$	3	6$
Temperature Sensor	2$	1	2$
Infrared Sensor	2$	1	2$
Push Button	3$	3	9$
Microphone	4$	1	4$

7-Segment Display	2$	2	4$
DC Fan	4$	1	4$
3-key Tone Instrument	3$	1	3$
Speaker	10$	1	10$
Total (approximation)			**798$**

Anticipated results

- The elevator should work like a real-life elevator: calls made from inside the cabin and from each floor should be served logically, hence in the order of the floors depending on the position of the cabin.
- The process in which the elevator stops at a certain destination, opens the door of the corresponding floor for seven seconds (if no obstruction exists) then closing is considered as a served call.
- The position of the cabin decides, when a call is made or served, if the motor should be turned on/off and, if on, up or down.
- If the temperature exceeds a certain threshold, 27˚C, the temperature sensor will activate the DC fan in order to achieve a proper ventilation.

- Calls from inside the cabin should be made using the microphone. Calls from each floor are made using the push buttons.
- If someone is obstructing the door, the infrared sensor will stop the door from closing.
- Two 7-segment displays installed, one on the first floor and the other inside the cabin, will show at which floor the cabin is.
- The position of the cabin will be known through bump sensors installed on the inside of the elevator walls at each floor.

Team members' qualifications

It is necessary to mention that the project is distributed equally among all the members of the group, but each member, according to his/her qualifications, will make a specific addition in his/her areas of interest. Furthermore, the creativity of each member will be employed to come up with original and innovative ideas.

Name	Qualifications	Field of addition
Ali Naji	Good sense of logic, comfortable with the theoretical part of the project. A good English level.	Software (LABVIEW) and planning of the model. An important part of writing the proposal and reports.

Amal Hneini	A good leader, well organized, knows how to divide the work and channel each member's potential.	Work management: dividing the tasks and setting the dates.
Carine Atie	Knows what resources to use and has good relations in the field of engineering and electronics.	Library/Internet research and purchasing items (price was divided among members).
Houssam Bajouk	Good experience in projects, excels in the practical part of the project. Of wide English background.	Hardware: a big part of the construction of the elevator.

AUB American University of Beirut

References

Information about the project:

- The Project Description file posted on Moodle.

Items and their cost:

- Katranji electronics: Jnah
- www.amazon.com

Information about using LABVIEW:

- www.ni.com/labview/applications/
- www.ni.com/pdf/manuals/320999e.pdf

Information about using SPEEDY-33:

- www.ni.com/pdf/manuals/371577b.pdf