LEGO elevator controlled by Arduino UNO

Ambrus Bence Tibor, D1O4NV

Automatic manufacturing systems project I.

University of Óbuda, 21/02/2016

This project is a subject in my 6th semester as an electrical engineering student. The basic concept is to design, build and control some kind of electric device. It was hard to make a choice but finally I decided to make a fully functioning mock-up elevator. I find it very interesting yet challenging to create something from scratch by myself.

In this short document I am going to represent the specification of my project based on given points of view.

Purpose, introduction:

When I did my first year at university I was told by other students that by the time I finish my studies I will be able to program the control of a lift. So I think this is the main reason I chose the elevator as my project.

The device I am going to build will be made of LEGO bricks. I chose this because it is easy to build anything from LEGO and I do not have access to DIY tools or garage and I can do it on my desk as well.

As for the programming part I have ordered an Arduino UNO from the internet because it can be easily used for controlling circuits and is widely supported by the community. I have wanted to start learning Arduino for a few months now, so this is a great „apropos” to do it.

Requirements:

By the end of the semester I would like my lift to operate on acceptable quality. It should be called from all the levels and controlled from inside, too, by an external panel.

Features:

I would like to build a 3 or 4 storey tall elevator with a cabin connected to a rope from the top. The rope will be connected to a stepper motor through a pulley, this will be responsible for the vertical moving. On each level there will be a pushbutton that can call the lift. There will be a panel connected to the cabin with buttons to each levels. Later (in Project II maybe) I would like to add more functions, buttons, sensors.

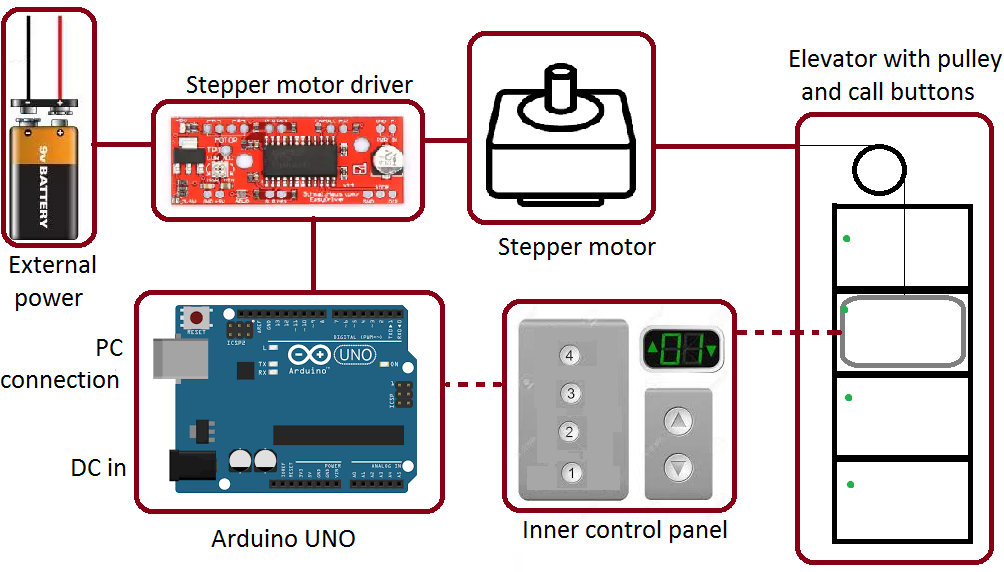
Input:

The input of the lift will be the pushbuttons on each levels and a panel responsible for the inner control.

Output:

On a 7 segment display the elevator will tell the user on which level it currently is. I will ask for response on the PC screen about the stepper motor’s actual status.

Block diagram



Implementation description:

The heart of the device is an **Arduino UNO Rev 3** microcontroller. Since it is open-source, I bought a Chinese copy for a few dollars but it has the same functionality.

There will be a **stepper motor** whose type I have not selected exactly.

The motor will be run by a circuit called **Easy Driver** which is made for controlling stepper motors.  
The stepper motor needs more voltage than the Arduino so I’ll connect an **external power source**, e.g. a 9V battery.

The **inner control panel** (as it can be seen on the figure it is connected to 2 parts with dotted lines) will be a circuit made by me. I do not know where to connect it: either to the UNO or the lift cabin. Probably I’ll use a simple breadboard for testing. It will have buttons and a 7 segment display.

The **elevator** itself will be built of LEGO bricks, I have not started to design it. It will contain a cabin and a pulley on top for the rope.

Software:

I have not received my Arduino controller so I haven’t had a chance to try out Arduino’s own programming language. I think I’ll stick to it unless I’ll find it not compatible with my project.