SMART LIGHT MANAGER

Diana GAPONCIC[1*], Mihail FILIPESCU[1],
Ecaterina COTELNIC[2], Pavel BUGAIAN[2]

[1]*Technical University of Moldova, Computers Informatics and Microelectronics Faculty, Software Engineering and Automatics, FAF-181, Chisinau, Moldova*
[2]*Technical University of Moldova, Computers Informatics and Microelectronics Faculty, Software Engineering and Automatics, FAF-182, Chisinau, Moldova*

*Corresponding author: Gaponcic Diana diana.gaponcic@isa.utm.md

Summary. *The problem we want to approach in this paper is related to window blinds. Sometimes, when forgotten open, the light can disrupt the sleep in the morning or it can burn the plants by the window. Although there are already many existent solutions for smart window blinds, we want to create a smart light manager for every house that will be able to adjust the level of light by the user's desire. In our project we are going to use light sensors(inside and outside the house) in order to open window rollers or turn on/off the leds based on the constraints set by the user in the mobile application. For the project, we use Arduino Nano, servo motors, leds and an artificial crafted environment for testing.*

Key words: *window rollers, light, microcontroller, light sensor, the Internet.*

Problem definition

In a world where all the essentials for life have already been created and are widely used, we think about creating things for our own comfort. Self-regulating blinds and light, depending on the room's lighting, should become an integral part of a smart home.

Due to the dynamics nowadays, there are countless cases when going out in a rush leaves many unchecked things behind, as for instance open jalousies in the heat of summer that would burn out the flowers from your windows.

There are a lot of people, who don't have the time and space to move out all the flowers from your windows, or that jalousie handle is too far away for them to reach. Moreover, what can be worse than the sun shining in your eyes in the morning as you get the sweetest piece of your dream? All these problems can be mitigated with our ingenious project!

Existent solutions

An already existing solution for smart blinds is for example Thermo Sunis Indoor Wirefree RTS Sun Sensor. Mounted on the inside of a window or window sill, this wireless sensor measures sunlight and temperature to determine optimal blind position. Protects furnishings from damaging UV rays automatically. Another solution is HunterDouglas PowerView Motorization [1]. Winner of the Red Dot design award, this attractive motorized blind interface focuses on the user experience. It allows programmable actions at specific times and automatic sunrise/set.

Our solution

Our solution is an autonomous light manager system that can also be controlled manually. The system main goal is to adjust the room light level to the desired one by opening/closing the window rollers or turning on/off the lights. This will be done as said with no user interaction. The user however still can control the system directly from a mobile application.

The system design

The system schema (Fig. 1) is composed of the window rollers and leds. They are connected to the light manager which decides to open/close the rollers or turn on/off the leds based on the predefined values or by the user, in the mobile app. For this, the manager is connected to the Internet.
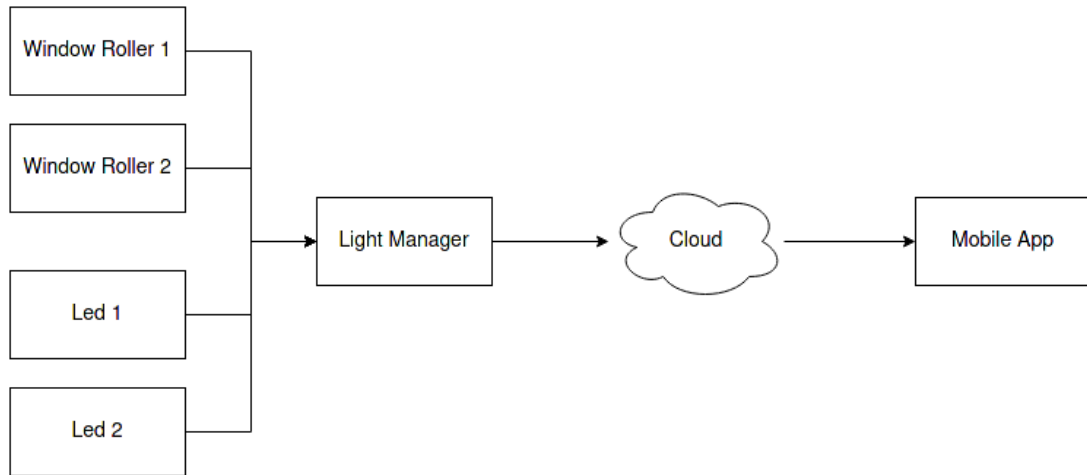

Figure 1. System Schema

In the window roller schema (Fig. 2) and led schema (Fig. 3) we have 2 light sensors. The inside sensor is measuring the light in the room and the other one is measuring the light outside, so that it does not open the rollers if it needs light at night. The information from the sensors is aggregated in the microcontroller, that decides whether to open the rollers (with the servo motors) or turn on the leds.
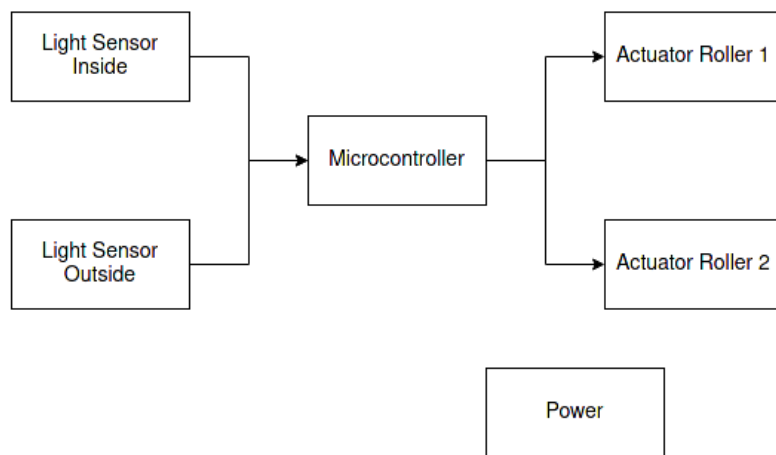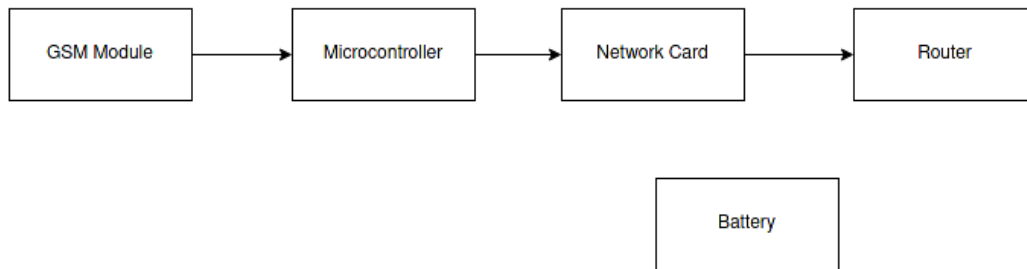

Figure 2. Window Roller Schema
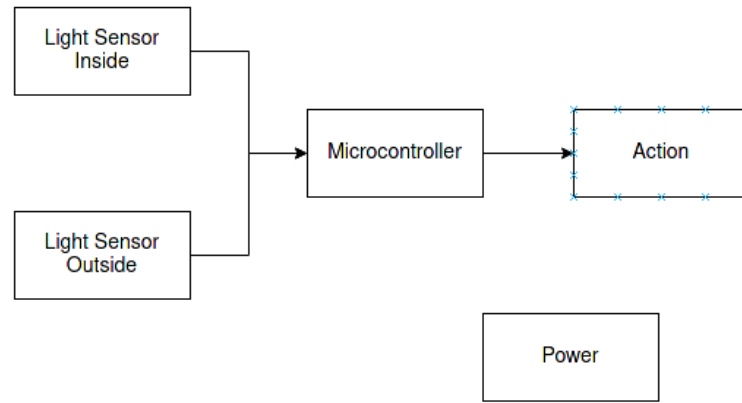
Figure 3. Led Schema

The light manager schema (Fig. 4) is composed of a GSM Module, network card and a router in order to connect our microcontroller to the Internet. In order to power servo motors the system needs a power supply from a lithium battery.

Figure 4. Light Manager Schema

Hardware
Hardware used in this project:

● Arduino Nano and USB cable
One of the smallest boards to build your projects with. It has all the functionality needed for the project and is friendly to use [2].
● Servo Motor MG966R
Servo Motor MG966R is a servo motor with a maximum stall torque of 11 kg/cm. Like other RC servos the motor rotates from 0 to 180 degree. Operating Voltage is +5V typically. The Stall Torque is 9.4 kg/cm (at 4.8V) [3].
● Servo Motor MG90S
Servo Motor MG90S is a micro servo motor. It is small and lightweight but comes with high output power. Operating Voltage is typically 5V and the Stall Torque is 1.8 kg/cm [3].
● Jumper Wires female-female, Jumper Wires male-male 20 cm, 40 pieces
● Breadboard MB102, 830 Tie Point
● Resistances of 1k, 10k and 220 ohm
● Analog Light sensors
● Wifi module esp8266
● Multicolor Leds
● Relay
● Lithium Battery

Conclusion

The goal of this project is to design a smart blinds system that will run autonomously in order to maintain the constant (if desired) light level. Therefore, we decided that it will take advantage of natural lighting when it is available or generate artificial elsewise. This goal will be achieved using mainly a blinds system that incorporates an Arduino, two light sensors, two motors, leds and pulley system to open and close the blinds. Currently, it is partially implemented, and we need more research to further develop this project.

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