CSE2006-Microprocessors and Interfacing

J Component Project Report

TITLE

Light Animations using Arduino and MATLAB

BATCH DETAILS

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ABSTRACT

In this project, we present a MATLAB-based graphical user interface (GUI) approach to control the glowing pattern of a number of light-emitting diodes (LEDs). Use of a GUI is advantageous since the user can control illumination patterns while performing other tasks in the PC.

CHAPTER 1

AIM

In this project we aim to create different lighting patterns that are controlled by clicking appropriate pushbuttons in the GUI. The blinking speed of LEDs can also be controlled using fast, normal and slow pushbuttons in the GUI. The GUI will be coded in MATLAB and connected to the Arduino board.

OBJECTIVES

- Creating light animations which are different lighting patterns of 8 LEDs using Arduino commands
- Connecting to a MATLAB based Graphical User Interface which can perform the following:
    - Selection of animation type
    - Selection of animation blink speed

INTRODUCTION

MATLAB is one of the fastest growing fields where the applications are being developed. Light animations are one of the ways through which the advertising or marketing is done. It will help in attracting the customers with great ease. The light animations using Arduino and MATLAB application is an application that can allow the user to control the glowing patterns of a number of LEDs. This application can help in controlling LED's through the GUI that is designed using MATLAB. This will be one of the unique applications that the final year students can implement in real time world with great ease.

This application can provide the users with five lighting options. There will be push buttons that will be provided in the GUI through which the control of the glowing patterns can be got. People can rely on this application in order to get the perfect light animations without any difficulty. Ring counter and Johnson counter lighting patterns are used in order to get the perfect lighting animations without any difficulty. The blinking speed of LEDs can also be controlled using fast, normal and slow pushbuttons in the GUI.

The features that can be included in the light animations using Arduino and MATLAB application are as follows:

Control: This application can allow the user to control the glowing of the LED's with great ease in just one mouse click with great ease.

User friendly: This application will be user friendly since the user interface will be simple and easy to understand even by the common man.

Simplicity: This application can help in getting the animations with great ease in just one mouse click.

CHAPTER 2

EXISTING SYSTEM

STANDARD HOLIDAY LIGHTS

- Light animations are commercially used in lighting decorations during festivals like Christmas & Diwali.

WORKING

- The LEDs are all typically connected to the same power source.
- There are 2 ways to attach the lights which are in series or in parallel.
- As a standard, engineers decided that the best option was to connect several series of lights together in parallel.

DISADVANTAGES

- We cannot program the light animations in Standard holiday lights according to our own needs.
- For this, we have proposed our system of light animations using MATLAB.

PROPOSED SYSTEM

A programmable easy-to-use GUI that offers customization of light-based animations is what we propose.

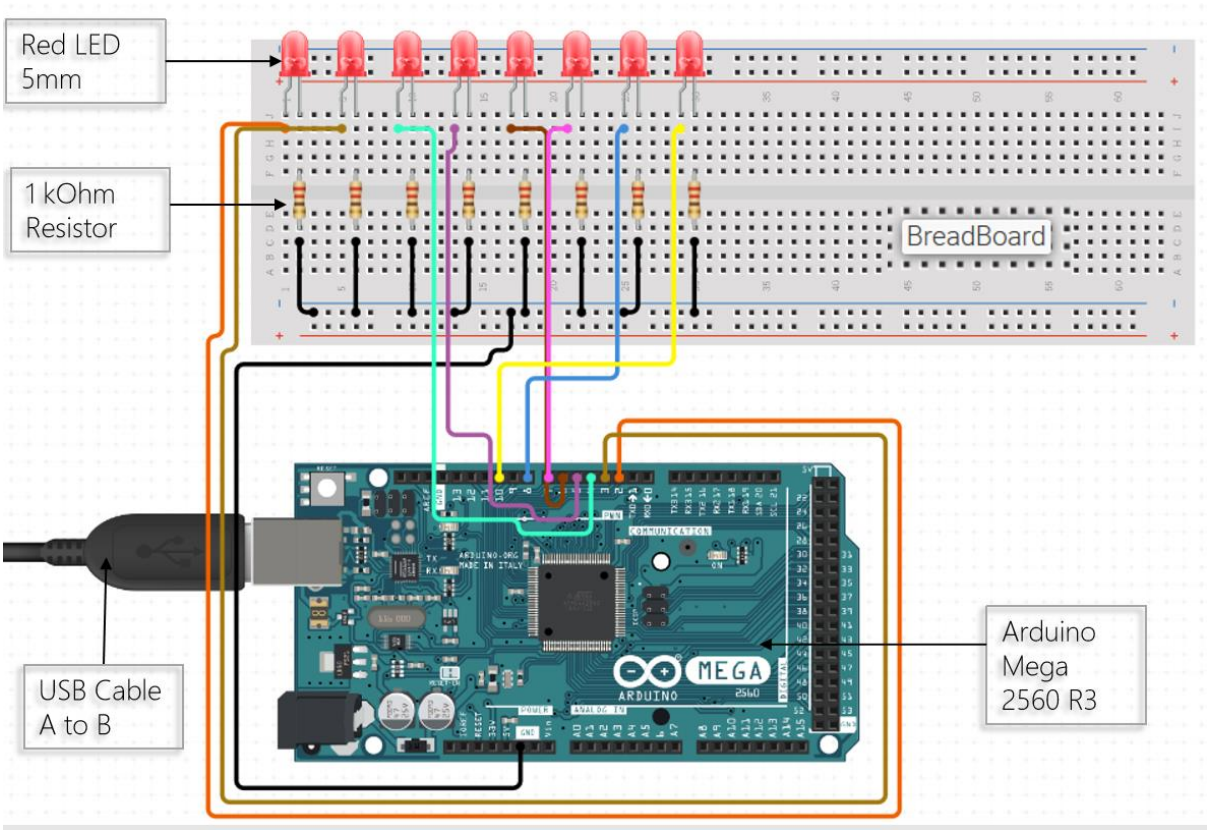
FEATURES

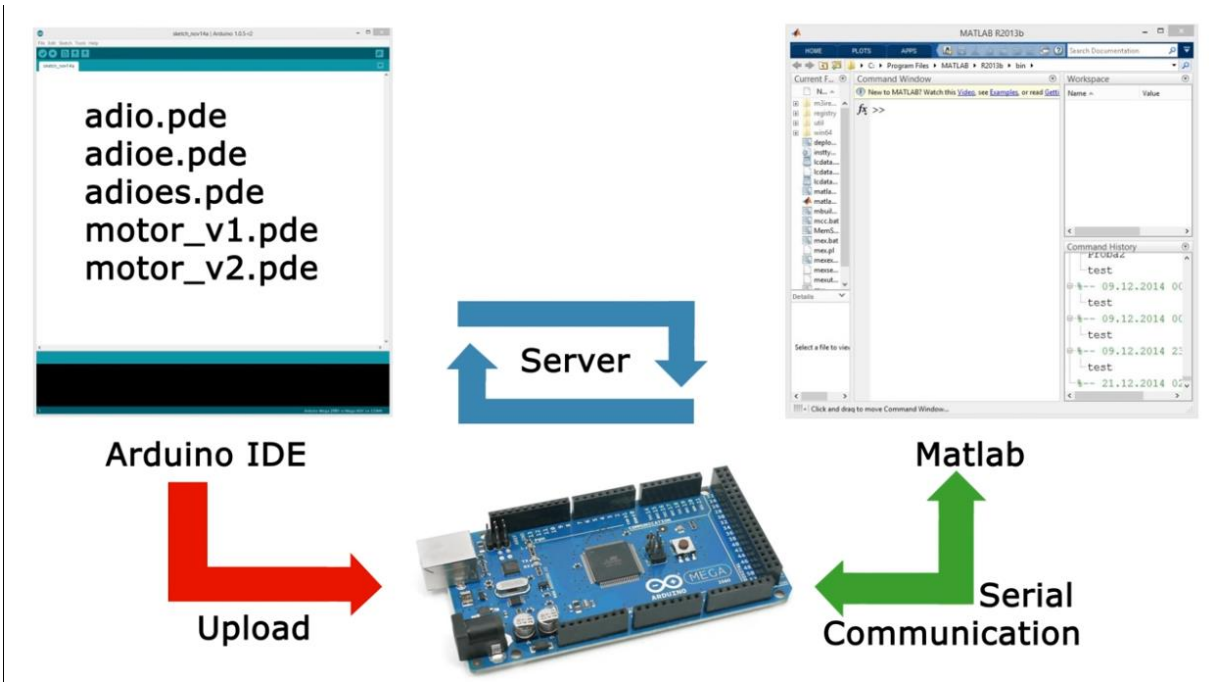
- Easy access: This application can be accessed anytime and anywhere from the world.
- Control: This application can allow the user to control the glowing of the LED's with great ease in just one mouse click with great ease.
- User friendly: This application will be user friendly since the user interface will be simple and easy to understand even by the common man.
- Click: This application can help in getting the animations with great ease in just one mouse click.
- Result: This application can help in providing the accurate result through this application.
- Useful: This application can be useful since the user can control the lighting patterns through GUI

CHAPTER 3

PROPOSED SYSTEM DESIGN ARCHITECTURE

The circuit for controlling light animations consists of an Arduino Mega board, eight LEDs and eight 1-kilo-ohm resistors on a breadboard connected with wires.





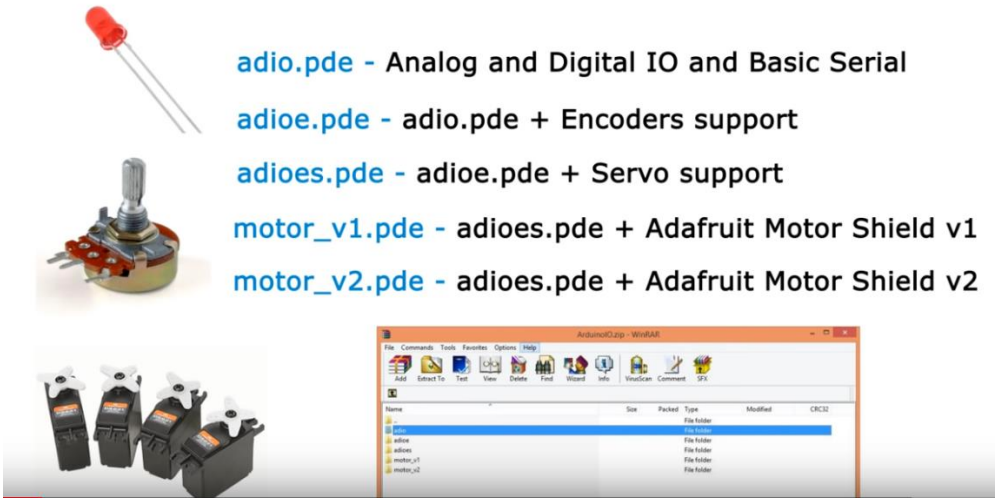
ARCHITECTURE EXPLAINATION

The circuit for controlling light animations using Arduino is shown in above figure. It consists of an Arduino Uno board, eight LEDs and eight 1-kilo-ohm resistors. Arduino Uno is an AVR ATmega328P microcontroller-based development board with six analogue input pins and 14 digital input/output (I/O) pins.

The microcontroller has 32kB of ISP flash memory, 2kB RAM and 1kB EEPROM. The board provides serial communication via UART, SPI and I2C. The microcontroller can operate at a clock frequency of 16MHz. In this project, digital I/O pins 3 through 10 of the Arduino are configured as output pins and used to control the illumination of eight LEDs.

When a pushbutton corresponding to a particular pattern is pressed in the GUI, it executes the corresponding callback function in the source program (The callback function executes program statements corresponding to that pattern and sends High or Low control signals to appropriate pins of the Arduino in order to create the desired glowing pattern). Eight series-connected 1-kilo-ohm resistors limit current flow through LEDs.

The GUI is coded in MATLAB, which is serially connected to the Arduino board. The Arduino board is uploaded with one of the following legacy support packages for MATLAB –



In our case, we are using adioes.pde which provides IO, Basic Serial, Encoders and Servo support.

ALGORITHMS AND PSEUDOCODE

A callback function is the function which is linked to the GUI. The interface has pushbuttons, which when clicked call these functions.

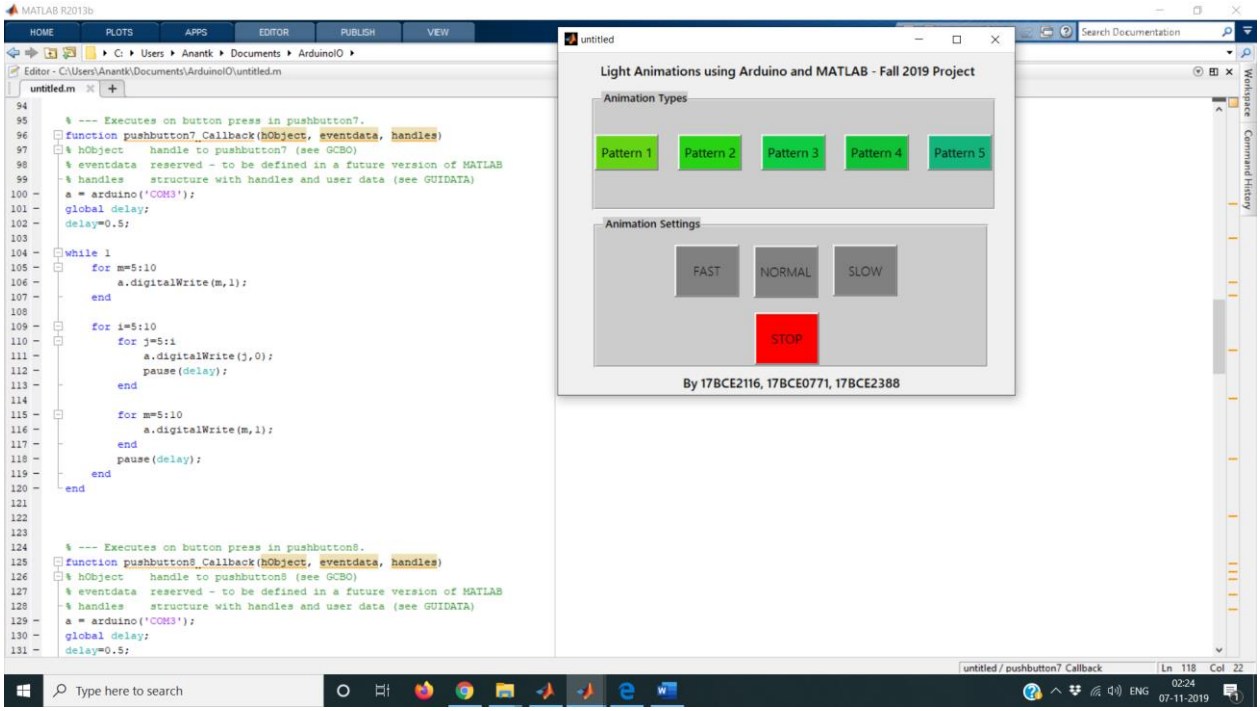
Pseudocode for a light animation callback function –

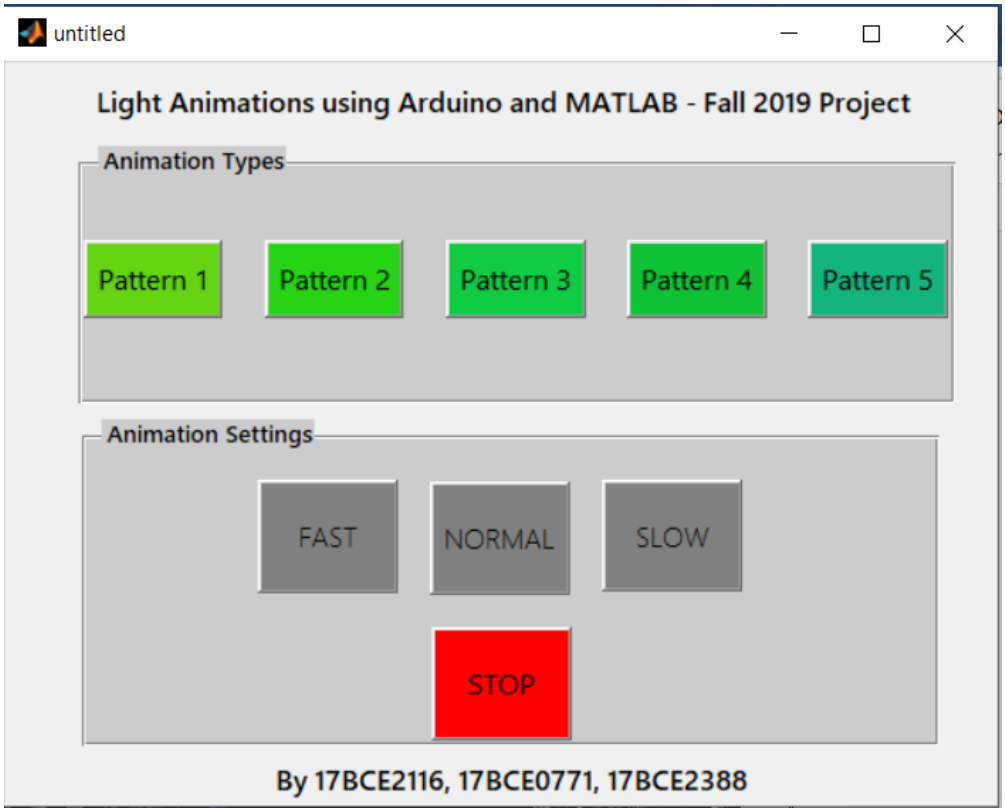
```
function Callback()
% multiple loop structures which tell pin numbers to be high (1) and low(0)
% according to animation style/speed
high = 1
low = 0
delay = value %in milliseconds
while flag is true
    for pin m in certain range
        setPinToValue(high);
    end

    for pin i in certain range
        for j in certain range
            setPinToValue(low);
            pause(delay);
        end

        for pin m in certain range
            setPinToValue(high);
        end
        pause(delay);
    end
end
```

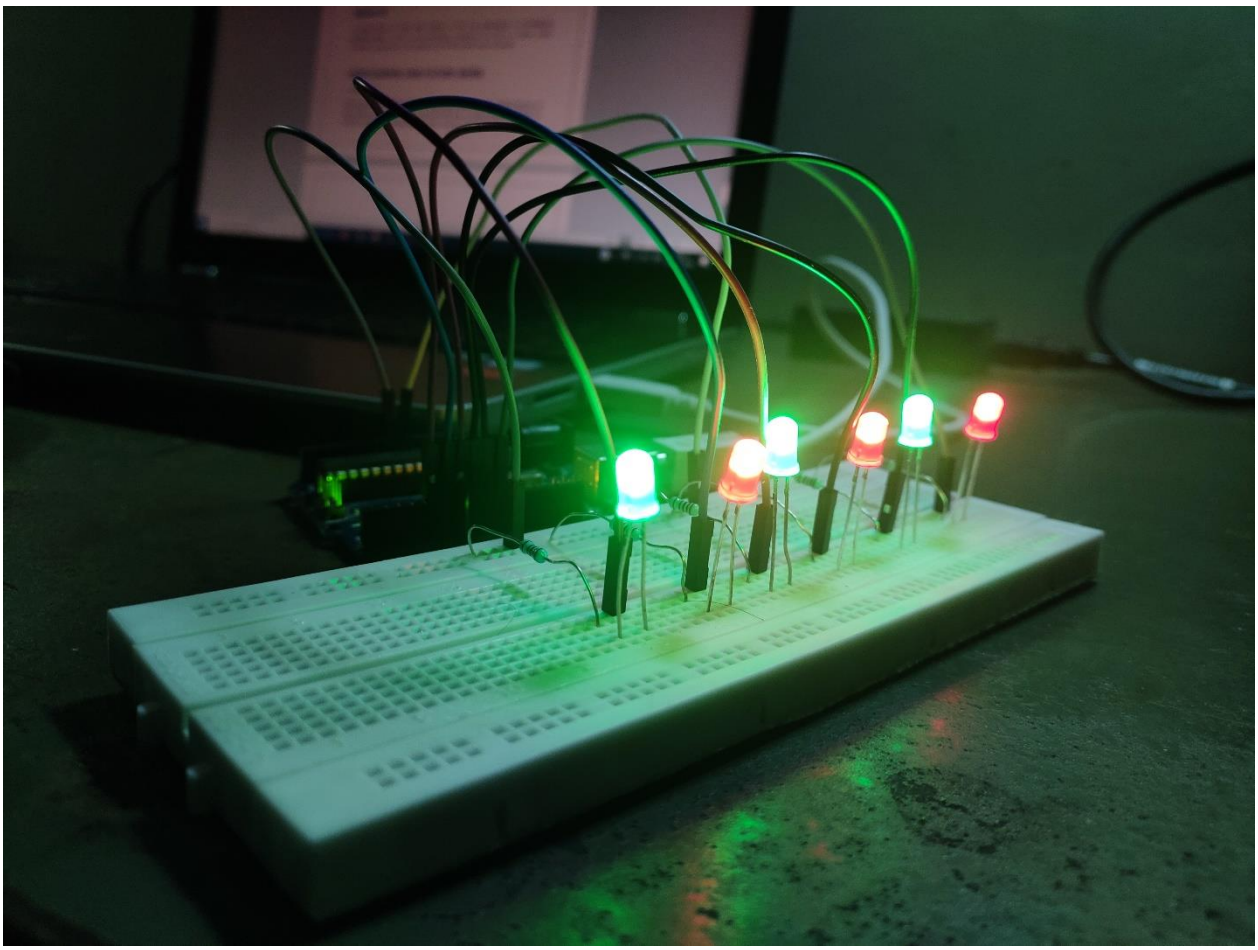
CHAPTER 4

RESULTS

Here is the GUI implemented using MATLAB R2013b –







CONCLUSIONS AND FUTURE WORK

In conclusion, we used MATLAB to write Arduino methods through an easy to use GUI for creating different lighting patterns.

We would like to mention that there is a scope of updating our implementation of the project as the newer versions of MATLAB have a newer support package for Arduino connectivity. There are also newer ways to create a GUI using MATLAB.