MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH

MOHAMED BOUDIAF M'SILA UNIVERSITY

FACULTY OF TECHNOLOGY

ELECTRONICS DEPARTMENT **ENSEIGNANT : M.GARAH**

level: 1st year Master(ESE) Academic year: 2023-2024

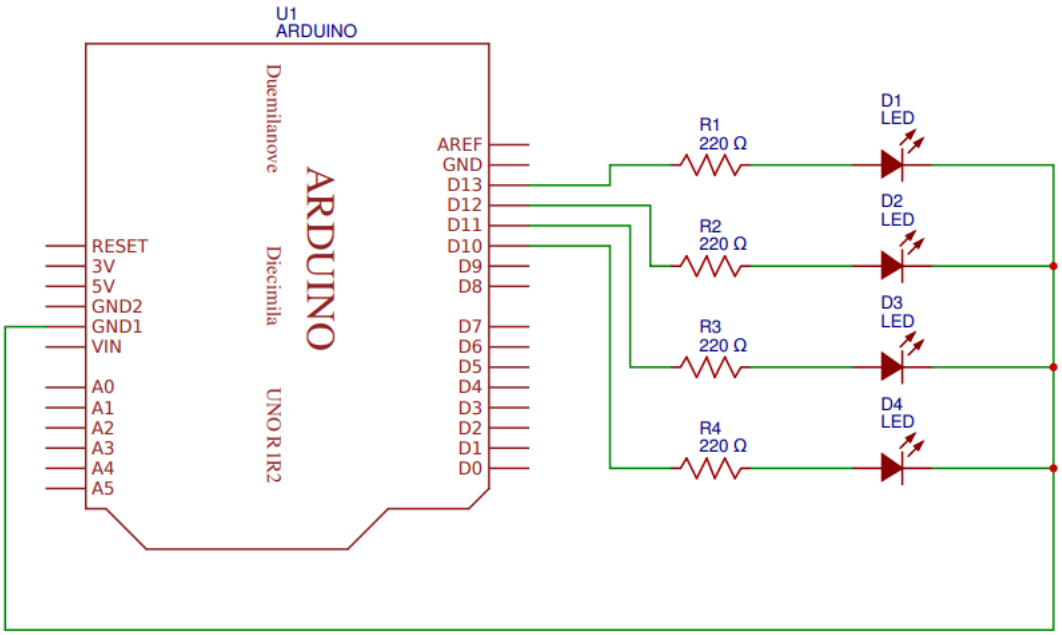
Module : systèmes à microcontrôleur

TP 1 : Getting started with the IDE and proteus environment

Objectives of the TP:

The objective of this first part is to write Arduino programs that utilize LEDs, to implement these programs, and to conduct relevant investigations

Manipulation1 We want to create a 4-LED chaser (chenillard)



List of components

4 Leds

4 resistances of 220 to 470Ω

Software:

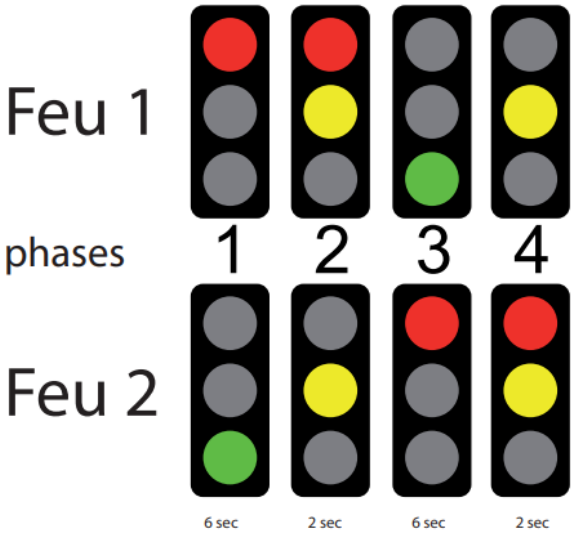
Proteus

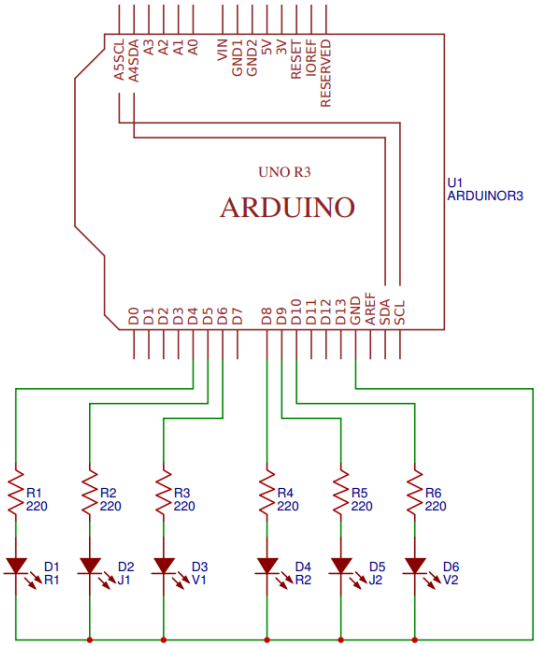
Arduino IDE

- Start by creating the circuit as indicated in Proteus.
- Propose an Arduino program that meets this specification.
- Then, simulate and test the program.

Manipulation 2 :

The objective of this manipulation is to create two traffic lights and make them work synchronously. Here are the phases of two traffic lights that you need to recreate:





- **List of components**
- 2 LEDs red
- 2 LEDs YELLOW
- 2 LEDs green
- 6 resistances of 220 to 470Ω

To make it easier to identify each LED, we will rename the pins as follows:

Traffic Light 1:

Red LED connected to pin 4 and renamed R1

Yellow LED connected to pin 5 and renamed J1

Green LED connected to pin 6 and renamed V1

Traffic Light 2:

Red LED connected to pin 8 and renamed R2

Yellow LED connected to pin 9 and renamed J2

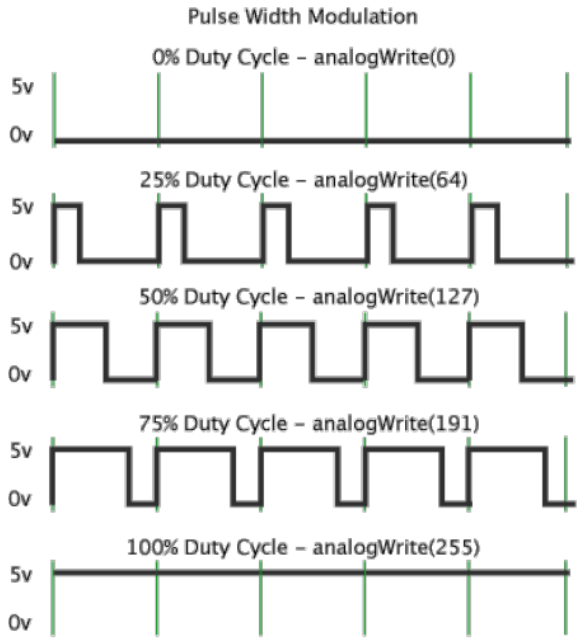
Green LED connected to pin 10 and renamed V2

Finally, we will use two variables, timer1 and timer2, to set the lighting times.

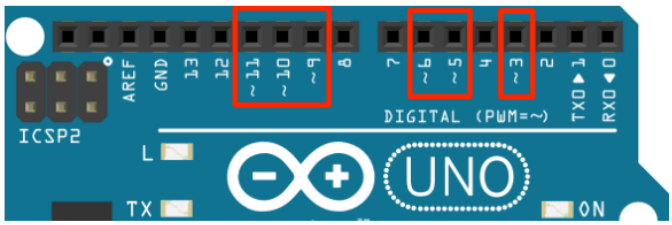
- Begin by creating the circuit as indicated in Proteus..
- Propose an Arduino program that meets this specification.
- Then, simulate and test the program.

Manipulation 3 : vary the brightness of an LED by changing the PWM value

The simplest way to vary the brightness of an LED is to vary the current flowing through it. However, when it's connected to an Arduino pin, this isn't possible because pins 1 to 13 are, in fact, digital. That means they only have two states: 0 or 1; on or off. So, to adjust the brightness of an LED, we'll use a function called PWM: Pulse Width Modulation. This involves varying the high (on) and low (off) periods of the pins at a high frequency. Thus, during a cycle of 25% in the high position and 75% in the low position, the LED will be less bright than during a 50%/50% cycle.



The pins capable of supporting PWM are identified by a "~". These are pins 3, 5, 6, 9, 10, and 11.



Instead of using the DigitalWrite instruction, we use AnalogWrite to implement PWM. The PWM value spans 256 levels, from 0 (=0%) to 255 (=100%). You can define the desired PWM value using the following formula.

$$Valeur\ PWM = \frac{Pourcentage\ souhaité}{100} \cdot 255 \qquad Valeur\ en\ \% = \frac{Valeur\ PWM}{255} \cdot 100$$

- Begin by creating the circuit as indicated in Proteus.
- Propose an Arduino program that meets this specification.
- Then, simulate and test the program.