Project IV

Digital Systems and Microprocessors

Degree in Biomedical Engineering

Objetive

The general objective of this project is to demonstrate the use and skill using the Arduino System, and the handling of different types of sensors, actuators and generation of PWM signals.

Description:

Connect the LDR and LM35 temperature sensor to the A0 and A1 analog inputs of the Arduino development board, respectively. An RGB LED is used, as well as a LED of another color. Also, a buzzer must be connected to pin 23 of the Arduino development board.

Exercise 1.

Write a code in which light incident on the LDR is measured and displayed on an LED as the luminous intensity of the measured amount of light. The measured incident light will be divided into 6 ranges from 0 to 5, and each range will be divided into 171 units (ADC conversion intervals)

To control the intensity of the light generated by the LED, it must be controlled by a PWM signal generator, so the LED must be connected to one of the 12 pins that generate a PWM signal on the Arduino development board.

When the sensor's output voltage (code generated by the ADC) is between 0 and 171, the LED should be lighting up according to the amount of light the sensor measures, and so on for each range. The minimum value, range 0, is when the incident light on the LDR is maximum and the LED must be lighting at maximum. In the interval of range 5, maximum value, is when the incident light is minimal, that is, there is little or no light, and the LED will light very little or will be off.

The range of the light detected by the LDR should also be displayed on the serial monitor. Therefore, the following message "Measured light range:" should be displayed, after this message the numerical value of the range should be displayed.

Exercise 2.

Write a code where the temperature detected by the LM35 is measured and that temperature is displayed on the serial monitor. Two temperature ranges are selected, 25ºC and 30ºC, to establish a minimum and maximum working limit of the system.

When the temperature sensor detects a temperature below the minimum limit, the following message, "Temperature below minimum limit" appears on the serial monitor. In addition, the RGB LED will turn on the red LED and the buzzer will generate a sound corresponding to a musical note chosen by the programmer. While the system is in this state, both the LED and the buzzer should remain on.

When the temperature sensor detects a temperature above the maximum limit, the following message, "Temperature above maximum limit" will be displayed on the serial monitor. In addition, the RGB LED will turn on the blue led and the buzzer will generate a sound corresponding to a different musical note than the one chosen in the previous item. While the system is in this state, both the LED and the buzzer should remain on.

When the temperature sensor detects a temperature between the minimum and maximum limit, the following message, "Temperature normal" appears on the serial monitor. Also, the RGB LED will turn on the green LED and the buzzer will go off. While the system is in this state, the buzzer should remain off.

- **The project has a maximum score of 10. 10% of the course grade**
- **The project must be developed by 2 students**
- **For the delivery of the project, a document. ZIP must be done and it should contain:**
  - ✓ **Files .ino with each corresponding code.**
  - ✓ **A pdf document for each program and it must contain:**
    - **Justifications and conclusions of the written code.**
    - **Representative flowchart of the program.**
- **The name of the file will be surname_name**