



STAGE 2

FINAL PROJECT

Objectives:

- Practice coding on AVR controller.
- Get used to dealing with different types of peripherals.
- Practice writing and using your own drivers.
- Implement a system that is useful in real life.

Problem Statement:

It is required to design a smart house system which monitors the temperature in order to control a fan, has an automatic lightening system and an automatic door control.

The system should consist of:

1. Two microcontrollers.
2. Temperature sensor.
3. LDR (Light Dependent Resistor).
4. PIR (Passive Infrared).
5. 2x16 LCD (Liquid Crystal Display).

6. 4x4 Keypad.
7. Motor driver (to control Fan).
8. Motor driver (to Open/Close the smart house door).
9. LEDs.

The 1st microcontroller is connected to:

1. Temperature sensor:

To control the speed of the fan.

BOUNDS: the higher the temperature the faster the fan rotates.

2. PIR:

To control the smart house door state. This door is connected to a motor and motor driver. In case any person passes by the sensor, the door will open automatically.

When no one is there, the door will close. (You may simulate the PIR in Proteus as a push button)

3. LDR:

To control the inner illuminance of the smart house. If it is dark outside, the LEDs inside turns on and vice versa.

(You may simulate the LDR in Proteus as a potentiometer.) **Hint:** threshold =1.25v

4. 2nd microcontroller:

Using UART protocol, to send all the reading of the above sensors and the states of the actuators and LEDs.

The 2nd microcontroller is connected to:

1. LCD:

To display the data received from the UART.

2. Keypad:

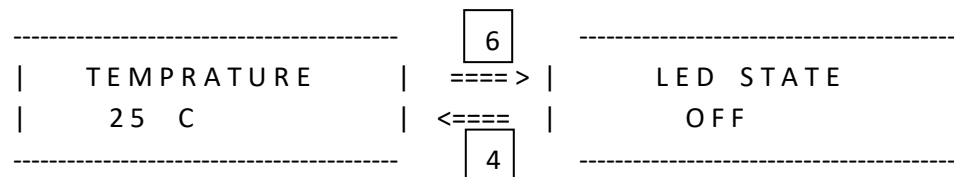
Where '6' and '4' are used to cycle between different sensors reading, LEDs and actuators state.

Example:

If the LCD was displaying the temperature reading and the user pressed on '6', the displayed reading will change to LED state.

If the user pressed on '4' after that, the temperature reading will appear again and so on for the rest of sensors reading and actuator states.

This can be cleared through the following figure:



Note that:

- When the power turns on, the temperature reading is initially displayed on the screen.
- If '1' was pressed, the settings should be shown. However, before showing the setting options, you must ask him/her for a predefined password, any password you choose before building the project.
- A warning message should be displayed on the LCD when the user enters the password wrong.

- If the password was wrong for more than three times, the system shouldn't respond to the keypad anymore until a push button connected to the other microcontroller is hit.
- After entering the right password, the user will be able to control the smart house actuators and LEDs manually. By entering any of the options shown of actuators, the automatic control of that actuator will be blocked until we turn it back.
- The specified options are:
 - ✓ Button '+' for raising the current fan speed.
 - ✓ Button '-' for reducing the current fan speed.
 - ✓ Button '5' for toggling the current LEDs state.
 - ✓ Button '2' for closing the door.
 - ✓ Button '3' for opening the door.
 - ✓ Button '*' to turn back automatic control to all sensors.

Submission:

- Only one zipped folder should be sent.
- For challengers: The folder should be named Project2_ID, where ID is your new ID. Ex: Project2_01.
For Newcomers: The folder should be named Project2_Name.
- The folder should contain:
 - i. All the C and hex files you used including your drivers.
 - ii. The Proteus simulation project.
 - iii. A video of your working hardware project.
 - iv. The project should be sent to: microcoders.alex@gmail.com

- v. The subject of the e-mail should be “Project2: Smart garden”.
For newcomers, please write your full name and mobile phone in the mail.
- vi. The deadline is Thursday 20/12 at 23:59.
- vii. On the discussion day, you will be asked to run your code, Hardware, and explain any part of it.

HINT: Creative ideas/implementations will be rewarded bonus points.