Ministère de l'Enseignement
Supérieur et de la Recherche
Scientifique
Université de Carthage
École Polytechnique de Tunisie

وزارة التعليـم العالي و البحث
العلمي
جامعـة قرطاج
المدرسـة التونسية للتقنيات

Applications based on embedded systems

Smart Irrigation System

Elaborated by: **Marwen KRAIEM**

Mohamed Amine LAHMERI

Mohamed Habib LOUKIL

Supervised by: **Riadh BEN ABDALLAH**

Mohamed MASMOUDI

Younes LAHBIB

Année universitaire
2018-2019

Rue Elkhawarezmi BP 743 La Marsa 2078
Tel: 71 774 611 – 71 774 699 Fax: 71 748 843
Site Web: www.ept.rnu.tn

نهج الخوارزمي ص . ب 743 المرسى 2078
الهاتف: 71 774 611 - 71 774 699 الفاكس: 71 748 843
موقع الواب: www.ept.rnu.tn

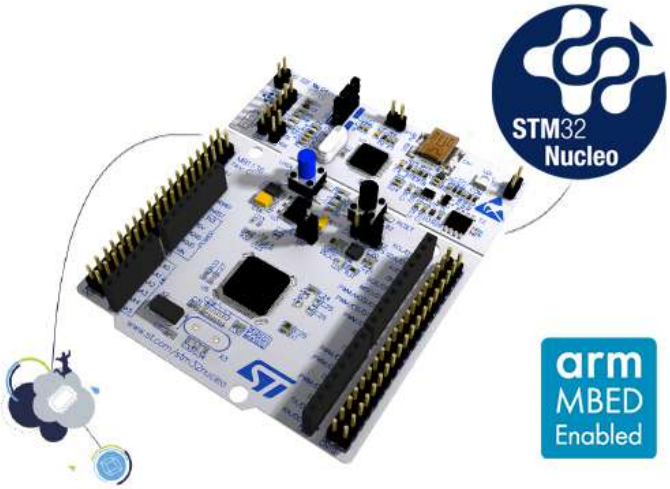
1 General overview

This project aims to build a Smart Irrigation System using information about temperature, level of humidity, level of luminosity, level of water in the reservoir... The desired embedded system should be able to take correct decisions about planning irrigation's slot times.

2 Used tools

Development board:

STM32F302R8 NUCLEO

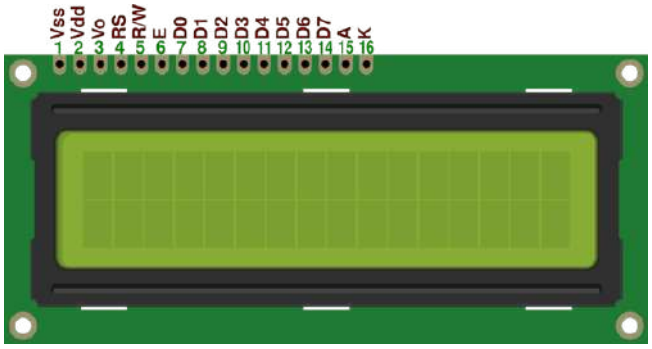


Servo motor SG90

This servo motor is a rotary actuator that allows for precise control of angular position, velocity and acceleration. It has three wires (power, ground & control). It works on PWM (Pulse width modulation) principle, means its angle of rotation is controlled by the duration of applied pulse to its Control PIN.

Display:

16X2 LCD module



It can display 16 characters per line and there are 2 such lines. It has 16 pins (8-bit data pins and 8 pins for power and configuration).

Potentiometer:

Instead of Temperature sensor, it sends a variable which is used to decide the state of the servo motor.

3 Algorithm

Define threshold
Infinite loop{
    Display in 1st line ("temperature")
    Read temperature
    Display in 2nd (temperature)
    If (temperature < threshold) {
        Turn the motor to the open position
    }
    else {
        Turn the motor to the close position
    }
}

4 Software environment

CubeMX

STM32 CUBE or more precisely CUBE-MX is a graphical tool that allows configuring the STM32 microcontrollers very easily (set up the inputs, outputs, PWM controls...) and generate a complete C project for: IAR, KEIL...
We installed STM32 Cube MCU Package for STM32F3 series and X-Cube Mems.

Keil uVision5

It is an integrated development environment that combines project management, run-time environment, build facilities, source code editing, and program debugging. It is a software development solution for STM32 boards.

5 Future improvements

We can add new parts to the project such as:

- Different sensors: humidity, pressure... in order to have a better idea about the environment conditions.
- GSM module: in order to connect the board to the user via a smartphone application.