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Computer Engineering

Irrigation is the application of controlled amounts of water to plants at needed intervals. Irrigation helps to grow agricultural crops, maintain landscapes and revegetate disturbed soils in dry areas and during periods of less than average rainfall. Irrigation should be optimum because over irrigation can spoil the crop production. Thus the proper and most efficient method for the best cultivation is the use of the automated irrigation system.

1. The sole aim of this paper is to develop an automated irrigation system that would help improve the efficacy of the current irrigation system of the ABUAD farm, Ado Ekiti. This automated irrigation system with the help of its software would be able to read the temperature of the soil, determine the moisture content of the soil, configure the time interval for the water system using the temperature and moisture content of the soil, trigger an alarm in the case of an insufficiency of water in irrigation tank and also enable a password for the system for security.

   The automated irrigation system design is as follows:

   The temperature and soil moisture sensors are attached to the soil using probes in order to get the temperature values and the soil moisture content of the soil. The data gotten from the sensors every ten minutes is converted to signals to be sent to the microcontroller unit. The microcontroller unit collects the data sent and processes it by checking whether the obtained values are then compared with the pre-defined values that have been programmed unto the microcontroller unit. The obtained values could either be higher or lower than the pre-defined values- in the case of the former; the microcontroller unit sends signals to the relay to turn on the sprinkler system to run for five minutes after which it will be turned off, while in the case of the latter the sensors keep on reading the temperature and moisture content of the soil.
   A water level sensor is also placed in the reservoir water tank, to help determine the level of the water present in the tank. The data that is obtained from the water level sensor is also sent to the microcontroller unit. If the obtained value is less than the threshold value then an alarm system is triggered to alert the farm operator to turn on the pump in order to fill the tank.
   The automated irrigation is protected using a fence that is installed with access control. This is to ensure the security of the pumps and other equipments by allowing only authorized persons. Persons can only gain access to equipment if they key in the correct password using a keypad by the entrance of the fence.

   The design of how the system would work is then given by an algorithm and flowchart.
   Codes for the system would be written using suitable programming software.
   The system would then be tested and errors would be checked for and corrected if found.
   The system can be released and is ready for use.

2. Hardware Features:
    i) Sensors:
        - Temperature sensors: these measure the temperature of the environment and convert the input data to electronic data.
        - Soil moisture sensors: these measure the volumetric water content of the soil.
        - Water level sensor: used for point level detection of water in the reservoir tank.
    ii) Reservoir tank: this is the storage medium for the water to be used for irrigation.
    iii) Sprinklers: used for applying water in a controlled manner.
    iv) Reservoir pumps: used for moving water in order to fill up the reservoir tank.
    v) Relay: used to control the switching on and off the sprinkler and alarm system.
    vi) Microcontroller unit: receives the input from the sensors and also govern the entire irrigation process.
    vii) Buzzer: used as an audio signalling device for the alarm system.
    viii) LED: used as a visual signalling device for the alarm system.
    ix) Keypad: used to input the password that allows access to the system.
    x) Access control panel: controls the entire access control system.

Algorithm:

Step 1: Start

Step 2: Sensors read and send the data from the soil as signals

Step 3: Microcontroller collects data sent from the sensors

Step 4: Microcontroller analyses the data by comparing the values sent against the pre-defined values

Step 5: If the values obtained are less than the pre-defined values

-Go back to step 2

Else

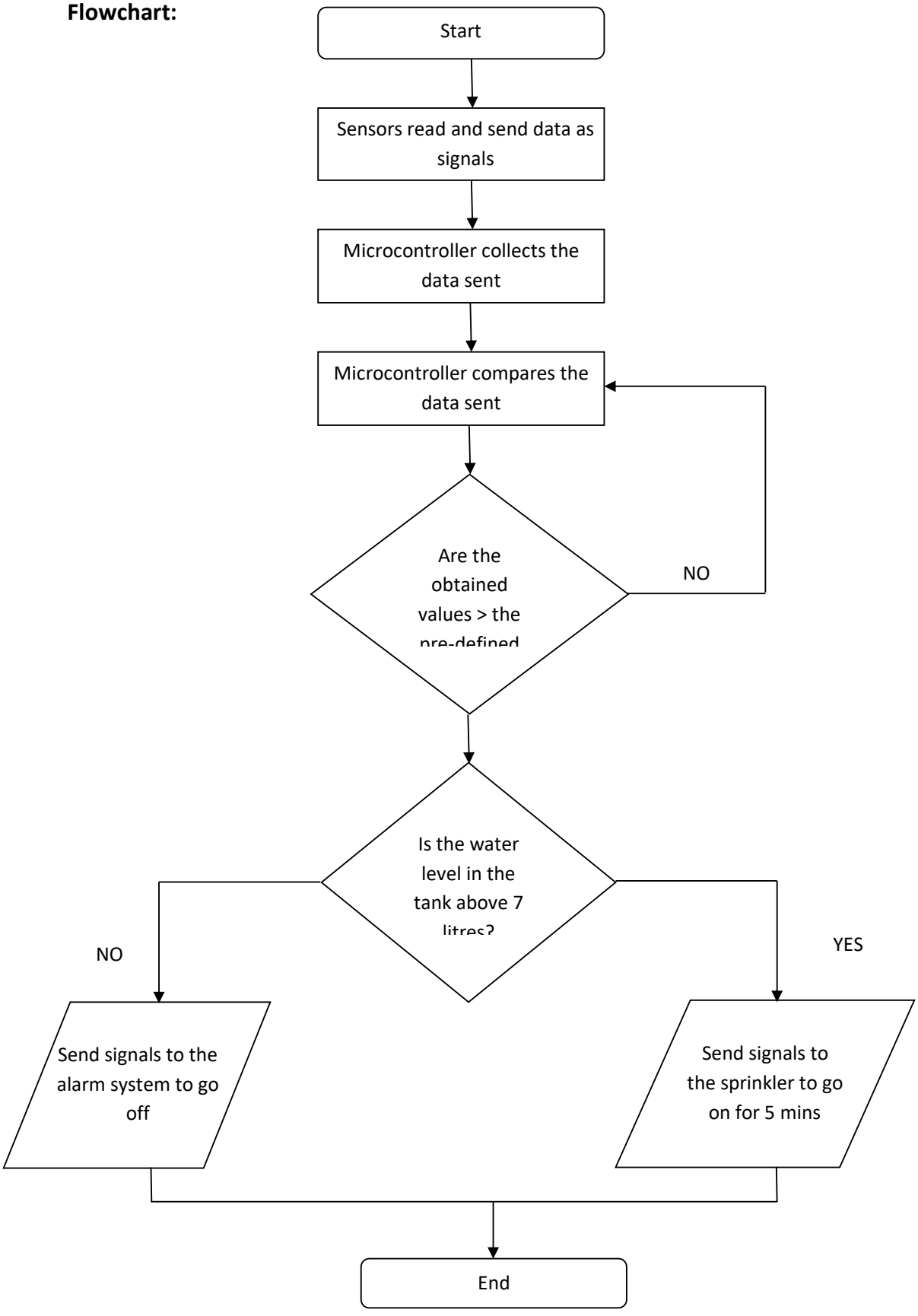
-If the water level in the reservoir tank is above 7 litres send signals to alarm to go off

Else

-Send signals to the sprinklers to be turned on

Step 6: End

Flowchart:


Start
Sensors read and send data as signals
Microcontroller collects the data sent
Microcontroller compares the data sent
Are the obtained values > the pre-defined
NO
Is the water level in the tank above 7 litres?
NO
YES
Send signals to the alarm system to go off
Send signals to the sprinkler to go on for 5 mins
End