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MAT NO: 18/ENG06/053

DEPARTMENT: MECHANICAL ENGINEERING

COURSE: Structured Computer Programming (ENG234)

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ASSIGNMENT: One of the major challenges of ABUAD farm, Ado Ekiti during the dry season is the irrigation system of the farm. The board of the company decided the best way to resolve the problem is to automate the system, as a software developer for ABUAD farm, you are mandated to develop software that interacts with the machine. The software through the machine must be able to:

- Read the temperature of the soil.
- Determine the moisture content of the soil.
- Configure time interval for the water system based on the above.
- Triggered an alarm if there is no sufficient water in the tank for the irrigation.
- Enabled password for the system.

A. Discuss the application development following the software development cycle.
B. Critically discuss the hardware and software features.
C. Support your answer with a flowchart and an algorithm.
D. Draw the Top-down or Bottom-up design approach of the application.

Software development life cycle processes includes:

1. Requirement analysis
2. Planning
3. Design
4. System development
5. Testing
6. Deployment

Requirement analysis

The software to be designed is expected to work hand-in-hand with the Farms irrigation system in order to prevent drying up of the crops and to successfully accomplish this, the machine would need to take samples of the soil and determine the:

1. Temperature of the soil which would be done with a thermometer.
2. Moisture content of the soil.
3. Accurate time interval for the water system to activate the irrigation system.
4. Timing for alarm in case of insufficient water in the tank by checking level of water left.
5. Also, would be protected by password for security purposes.

Planning

In the design of the system, we adopted a platform-independent offline based system for its easy use. Then we considered security and a provision for password was put in place to protect user settings and prevent unauthorized access. Moreover, we considered that the users would be able to get alerts by an alarm system put in place as the water level drops and incase service or a refill is required.

Design

The software is constructed with the sole purpose of tackling the dry season and managing productivity in the farm by determining the temperature of the soil along with other necessary variables then timing the irrigation system to provide adequate water to the plants and give alerts when water level is low. This is

done generally by Irrigation scheduling, the process by which an irrigator determines the timing and quantity of water to be applied to the crop/pasture.

Hardware Features

The system would contain a number of different features consisting both hard ware and software:

1. Water pump: to draw water from a water source to be used to water the crops.
2. Scoop: for the collection of the soil samples to be studied.
3. Thermometer: for measuring the temperature of the soil and the surrounding environment.
4. Led display: to diplay the various outputs coming from the device.
5. Water gauge: to measure and keep track of the level of water left
6. Alarm system: to alert personnel on site in case of low water level.
7. Sprinkler: would be used to spread water across the crops.

Software Features

This deal with defining the software resource requirements and perequisites that need to be installed on the irrigation system to provide optimal functioning of the device.

Algorithm for determining the temperature of the soil

START
GET SAMPLE OF THE SOIL
READ THE TEMPERATURE OF THE SOIL
PRINT TEMPERATURE VALUE
END

Algorithm for determining the moisture content of the soil

START
GET SOIL SAMPLE
ADD WATER TO THE SOIL
ADD RED LITMUS PAPER TO THE MIXTURE
IF RED LITMUS PAPER TURNS BLUE
PRINT ALKALINE
ELSE
PRINT ACIDIC
END

Algorithm for determining the time interval for the water system

START
READ TIME A,B
TIME = A ACTIVATE WATER SYSTEM
TIME = B DE-ACTIVATE WATER SYSTEM
END

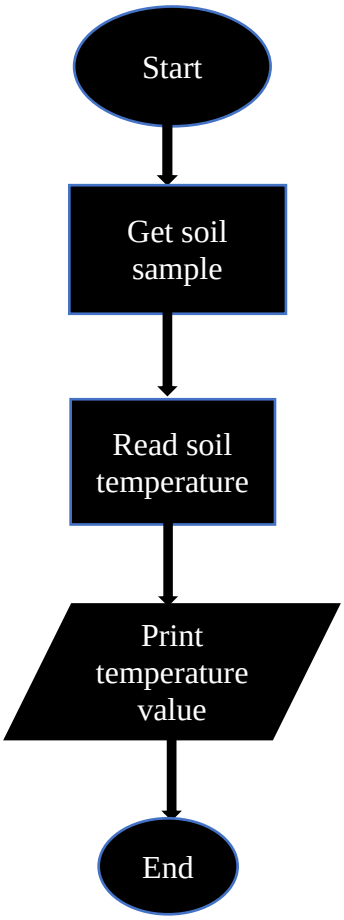
Algorithm for alarm in case of Insufficient water

START
READ A LITRES
IF WATER IS ABOVE A LITRES
INDICATOR TURNS GREEN
ELSE, INDICATOR TURNS RED
ALARM IS ACTIVATED
IF WATER IS ABOVE A LITRES ALARM IS DE-ACTIVATED
END

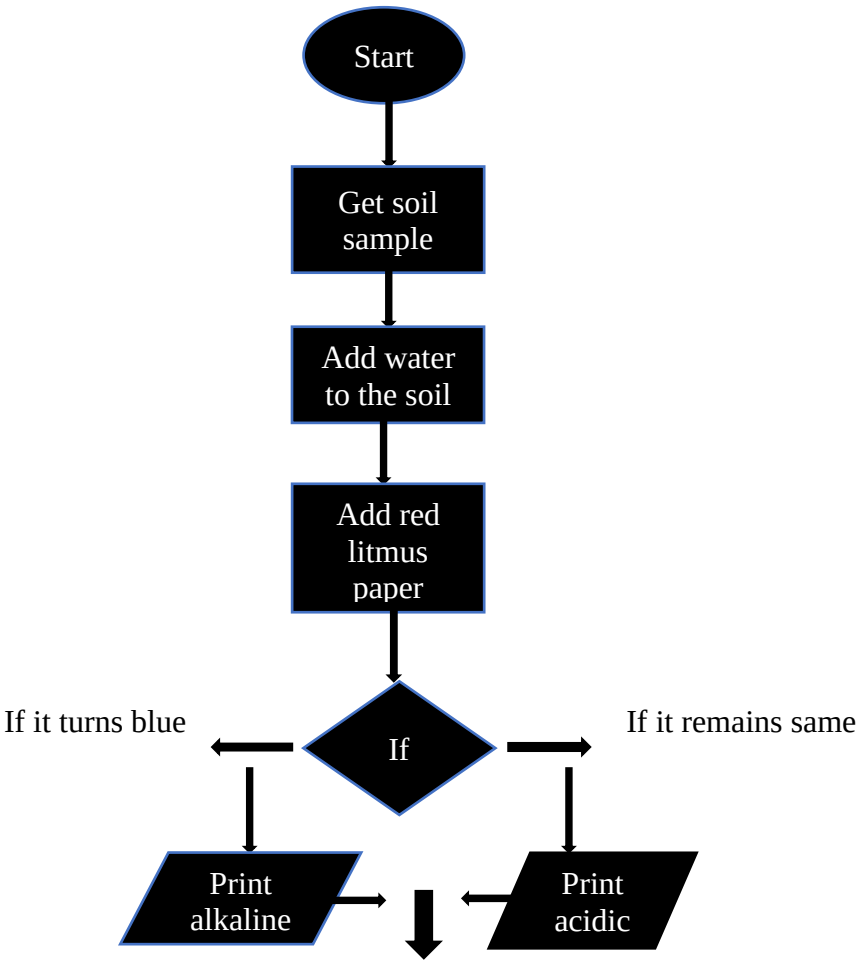
Algorithm for password of the system

START
PRINT INPUT PASSWORD
READ INPUT
IF INCORRECT
PRINT ACCESS DENIED
ELSE
PRINT ACCESS GRANTED
END

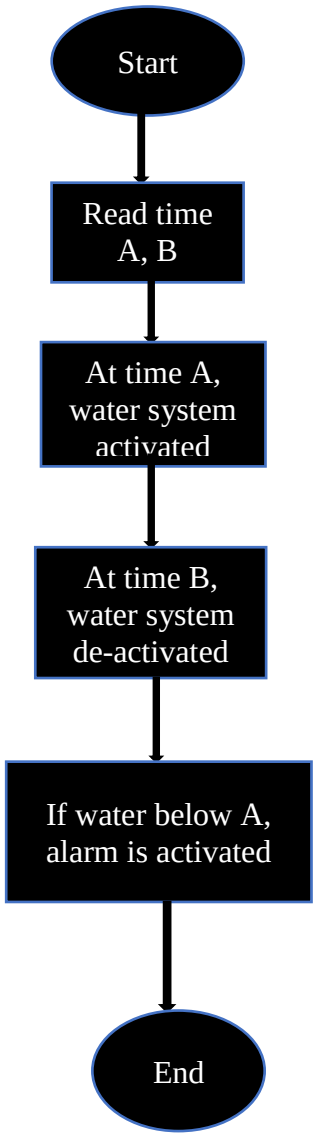
FLOW CHART FOR DETERMINING SOIL TEMPERATURE



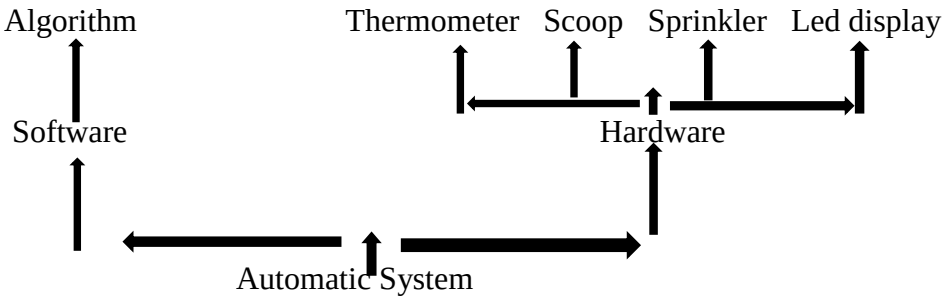
FLOW CHART FOR DETERMINING MOISTURE CONTENT



FLOW CHART FOR DETERMINING THE TIME INTERVAL FOR WATER SYSTEM



BOTTOM UP DESIGN OF THE APPLICATION



Testing

The Irrigation system needs to be fool-proof in other to avoid disastrous wastage of crops which is why the device and all it's functionalities would be tested first before use. Right from testing the security and compliances to the workability and the integration of the device, all external hardware would be tested as well.

Deployment

This device is being released to aid watering of plants systematically to avoid wastage from drying up and reduce labor.