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MATRIC NUMBER :18/ENG04/068

COURSE TITLE: STRUCTURED COMPUTER PROGRAMMING

APPLICATION DESIGN FOLLOWING SOFTWARE DEVELOPMENT CYCLE

THE AGRO SOFTWARE

Conceptualization:

This is a software that controls the irrigation system of the ABUAD farm. It serves as an interface between the farming operator and the irrigation system.

Specification:

Modus:

- i. Soil sampling
- ii. Temperature monitor
- iii. Moisture determination
- iv. Water supply
- v. Alarm system

Design:

i. Algorithm:

Let ABUAD farm soil=x (output is displayed on the agro software's serial monitor)

Step 1: start

Step 2: enter decryption code

Step 3: if decryption code is correctly entered

Print "input password" on serial monitor

If password is correctly inputted

Unlock agro software

Else if incorrect password is inputted

Print "access denied" on serial monitor

Else

Print "access denied" on serial monitor

Step 4: enter the code letter 'x'

Step 5: check the temperature of 'x' using the thermocouple

Step 6: if 'x' is within the range of 65-75F

Print 'proceed' on serial monitor

Else

Print "do not proceed" on serial monitor

Step 7: check for the moisture content of 'x' using the pycnometer

Step 8: If 'x' is between 80-100 percent

Print 'proceed' on serial monitor

Else

Print "do not proceed" on serial monitor

Step 9: using time synchronization program, check for suitable conditions
of temperature and moisture content of soil and relay signals from software

Step 10: If suitable conditions are met

Program allows suction of water from reservoir for a given period of time

Else

Program remains unchanged

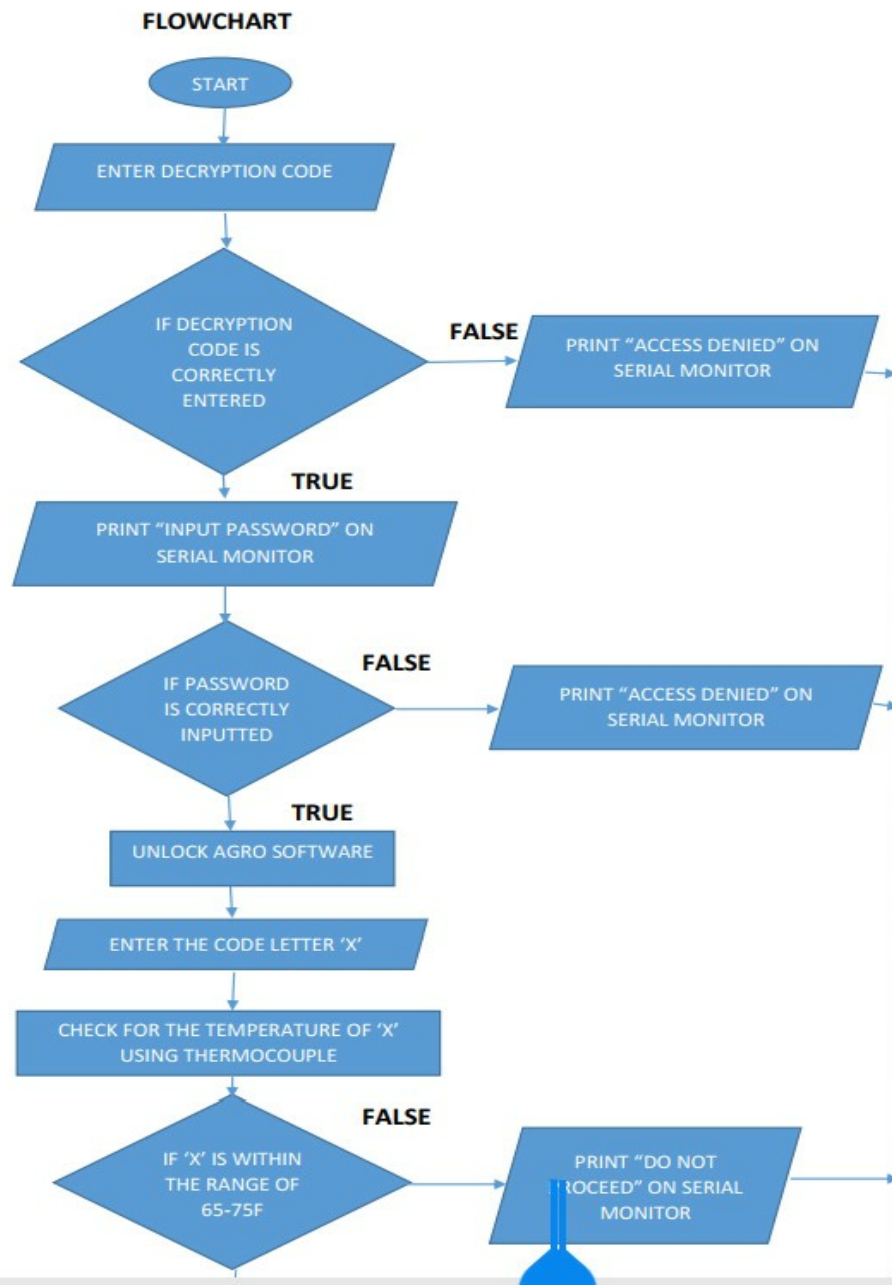
Step 11: continuous sensitivity to alarm system

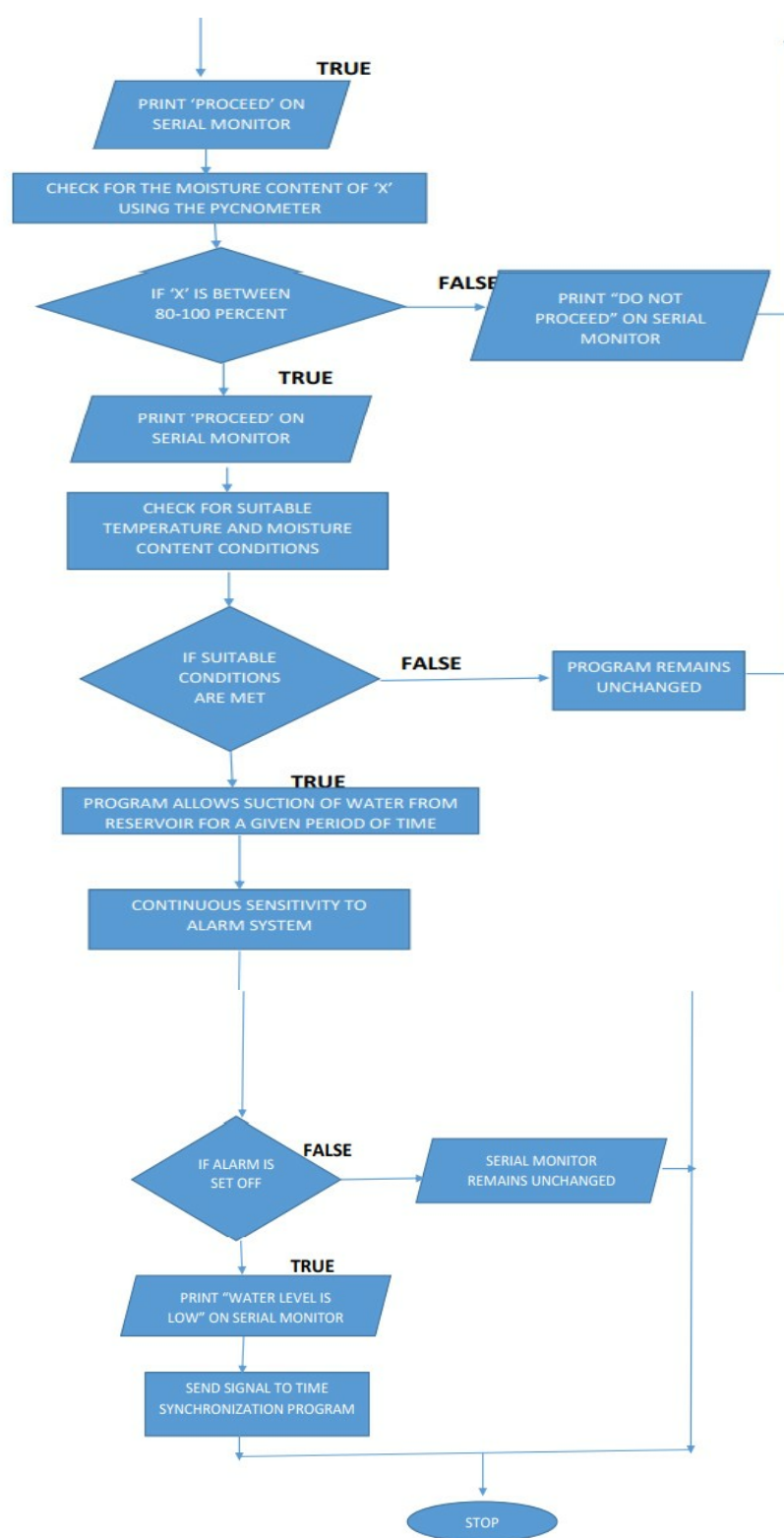
Step 12: If alarm is set off

Print "water level is low" on the serial monitor and send signal to the time synchronization program

Else

The serial monitor remains unchanged





IMPLEMENTATION

The programming language to be used in this agro software is a high level language,

preferably c++ as it's the most suitable high level language to use with respect to the software's algorithm.

TESTING AND DEBUGGING

The algorithm put forth has not been tested to run properly neither has there been logical nor semantic error noticed. Thus, it hasn't undergone testing and debugging.

RELEASE AND UPDATE

The agro software has not yet been released for use due to the absence of real time data and testing and thus, obviously hasn't undergone updating

HARDWARE AND SOFTWARE FEATURES

1. SECURITY (PASSWORDING)

SOFTWARE

PASSWORD ENCRYPTION AND DECRYPTION PROGRAM: This is the program responsible for the sequential distribution, encryption and decryption of the set of passwords manually inputted into the program's algorithm. It is done manually to reduce the risk of breach or unauthorized access by hackers or cyber criminals. This program is efficient as it encrypts the multiple passwords embedded into it and its only decrypted using the decryption code. This program manually overwrites the password previously inputted following their sequence every 24 hours. The decryption code has to be entered before being granted access to input the password of the software, thus unlocking it.

2. DETERMINATION OF SOIL TEMPERATURE

HARDWARE THERMOCOUPLE: this is an electrical device consisting of two dissimilar electrical conductors (in this case, copper and constantan) forming an electrical junction. It produces a temperature-dependent voltage as a result of the thermoelectric effect and this voltage can be interpreted to measure temperature. The thermocouple could be used to obtain either continuous or occasional measurements of soil temperature at any desired depth. The thermocouple used is made from neoprene insulation over the pair of copper-constantan calibrated thermocouple wire. In order to enable the agro software to interact with the thermocouple properly, the individual copper-constantan calibrated thermocouple wires are scraped to remove any insulating varnish and arc welded to form the actual thermocouple sensor.

3. DETERMINATION OF MOISTURE CONTENT OF THE SOIL

HARDWARE PYCNOMETER: The pycnometer serves as a reservoir for the mass of soil to be considered. Initially, the pycnometer is washed, dried and measured. Soil of 200 to 400g is placed in the pycnometer and measured, after which water is added to the soil in the pycnometer to make it about half full. After prolonged stirring, more water is added and the mass of the pycnometer is measured. The pycnometer is emptied and filled with water before being measured. The recorded values are inputted in the formula $W = \frac{((m_2 - m_1) * (G - 1/G))}{(m_3 - m_4) - 1} * 100$. The built-in mechanism is programmed to read 'm1' as mass of the empty pycnometer, 'm2' as mass of the pycnometer with wet soil, 'm3' as mass of pycnometer and soil filled with water, 'm4' as pycnometer fills with water only, 'G' as the specific gravity of the soil and 'W', the moisture content of soil. After reading and finding the value of W, the mechanism relays the value of 'W' to the software and that value which is in percentage is the moisture content of ABUAD farm soil.

4. CONFIGURATION OF TIME INTERVAL FOR THE WATER SYSTEM

SOFTWARE

TIME SYNCHRONIZATION PROGRAM: This program monitors both the temperature and the moisture content of the soil. Provided the temperature of the soil is between 65-75F, it proceeds to check for moisture content of the soil. If the moisture content falls within the range of 80-100 percent, then program proceeds to give a time limit within which suction of water from the reservoir to the tank occurs. Provided any of these conditions are not met, the program ensures water is not released from the reservoir.