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Computer engineering

Eng 224 assignment

APPLICATION DESIGN FOLLOWING SOFTWARE DEVELOPMENT CYCLE

1. CONCEPTUALIZATION

The purpose of this agro software is to provide sufficient irrigation in ABUAD farm, Ado Ekiti during the dry season which has resulted in the loss of crops and subsequent loss of revenue.

2. SPECIFICATION

a. **DETERMINATION(READING) OF SOIL TEMPERATURE (THERMOCOUPLE):** Due to the fact that soil temperature responds to the net effect of the daily surface energy balance, its common knowledge that soil temperature can be estimated by computing a running average of air temperature, with progressively longer integration times as soil depth increases.

Applying this piece of information, the temperature of the soil could be read using a thermocouple as it has the capacity of running average air temperature and also modifies precipitation to predict soil temperatures.

The thermocouple is preferred because of its quick response to sudden changes in temperature. In order to get an accurate result, the thermocouple is laminated and insulated by the application of calorimetry to prevent solar radiation, daily and monthly fluctuations of air temperatures, amount of precipitation etc. as these physical phenomena influence soil temperature. The suitable temperature range of the soil is between 65-75F.

The thermocouple is also adopted due to its ease of automation as the system has to be automated to meet the requirements of the board of the company. It is connected to the software and thus interaction between system and machine is made possible.

b. **DETERMINATION OF MOISTURE CONTENT OF THE ABUAD FARM SOIL (PYCNOMETER METHOD):** in order to determine the moisture content of the ABUAD farm soil by pycnometer method, the integration of a pycnometer, weighing balance, glass rod and vacuum pump. The weighing balance should have an accuracy of 1.0g.

The purpose of the pycnometer is to serve as a reservoir for the mass of soil in which the moisture content is to be determined. After determining the specific gravity of the ABUAD farm soil using the pycnometer method, it becomes easier to determine the water content of the soil.

After taking all necessary measurements, the water content of the soil could then be easily determined mathematically. in order to eliminate the possibility of errors while calculating, the pycnometer apparatus is wired to a built in mechanism which takes in all measurements and performs the necessary calculations to provide the water content of the soil. The suitable range of water content percentage of the soil is between 80-100 percent.

To ensure easy automation, the integration of the pycnometer apparatus is miniaturized and thus enabling interaction with the agro software.

C. SECURITY(PASSWORDING): in order to prevent unauthorized access, the agro software is embedded with an encryption and decryption program which manual overwrites the password every 24 hours. This password protection encryption and decryption program changes the previously inputted password every 24 hours and replaces it with a password previously embedded by an authorized individual.

Multiple passwords are embedded in sequence into the password protection encryption and decryption program. This encryption program then

arranges them with respect to the sequence in which they were inputted and encrypts each password.

In order to unlock the agro software, the decryption code has to be inputted. If correct, the decryption program decrypts the password. If the password is then inputted, the software unlocks. If the password is entered before decryption, the agro software gives an error message on the serial monitor and remains locked.

3. DESIGN

There are two ways of accomplishing software design which are algorithm and flowchart

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

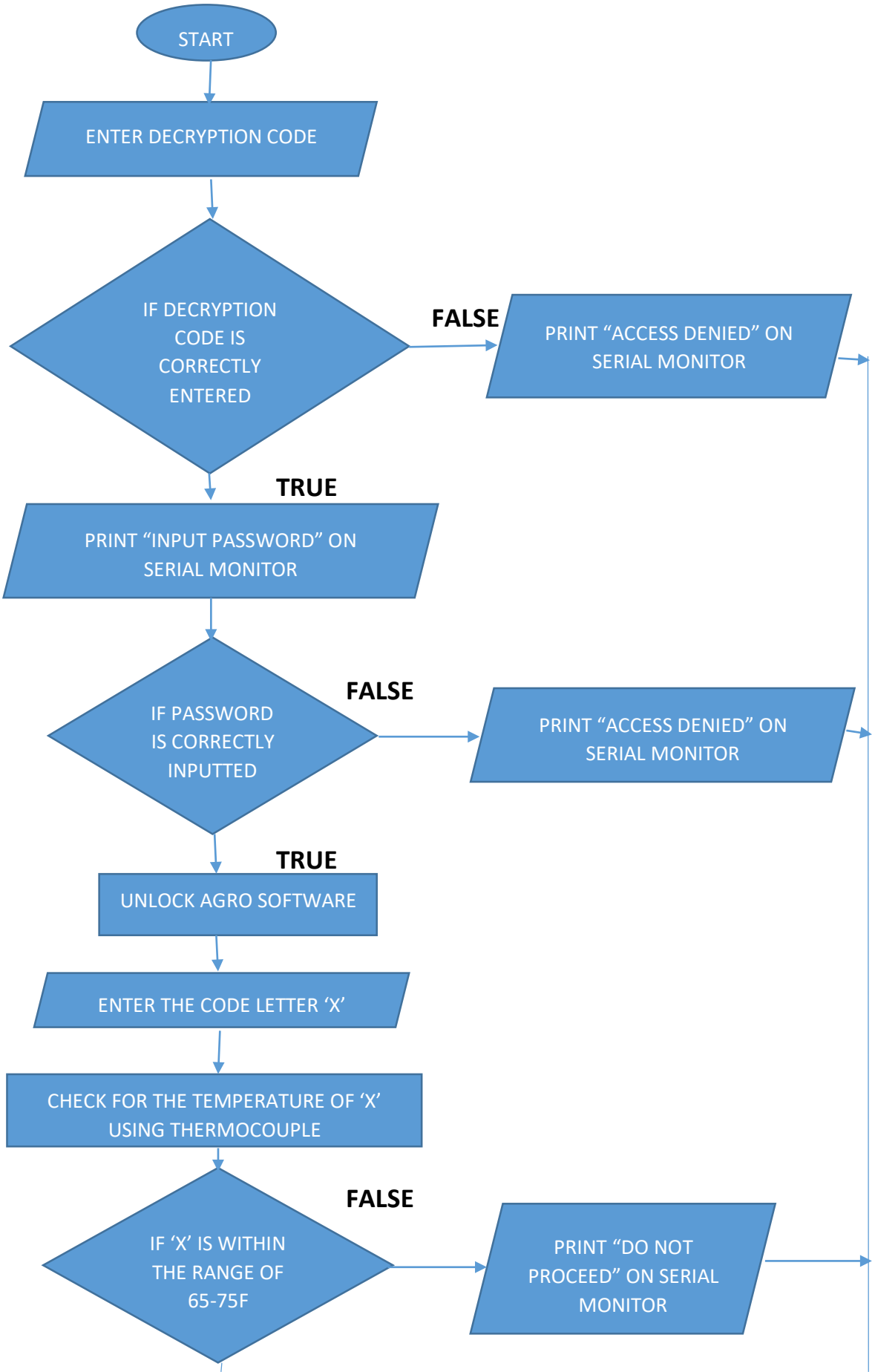
Step 12: If alarm is set off

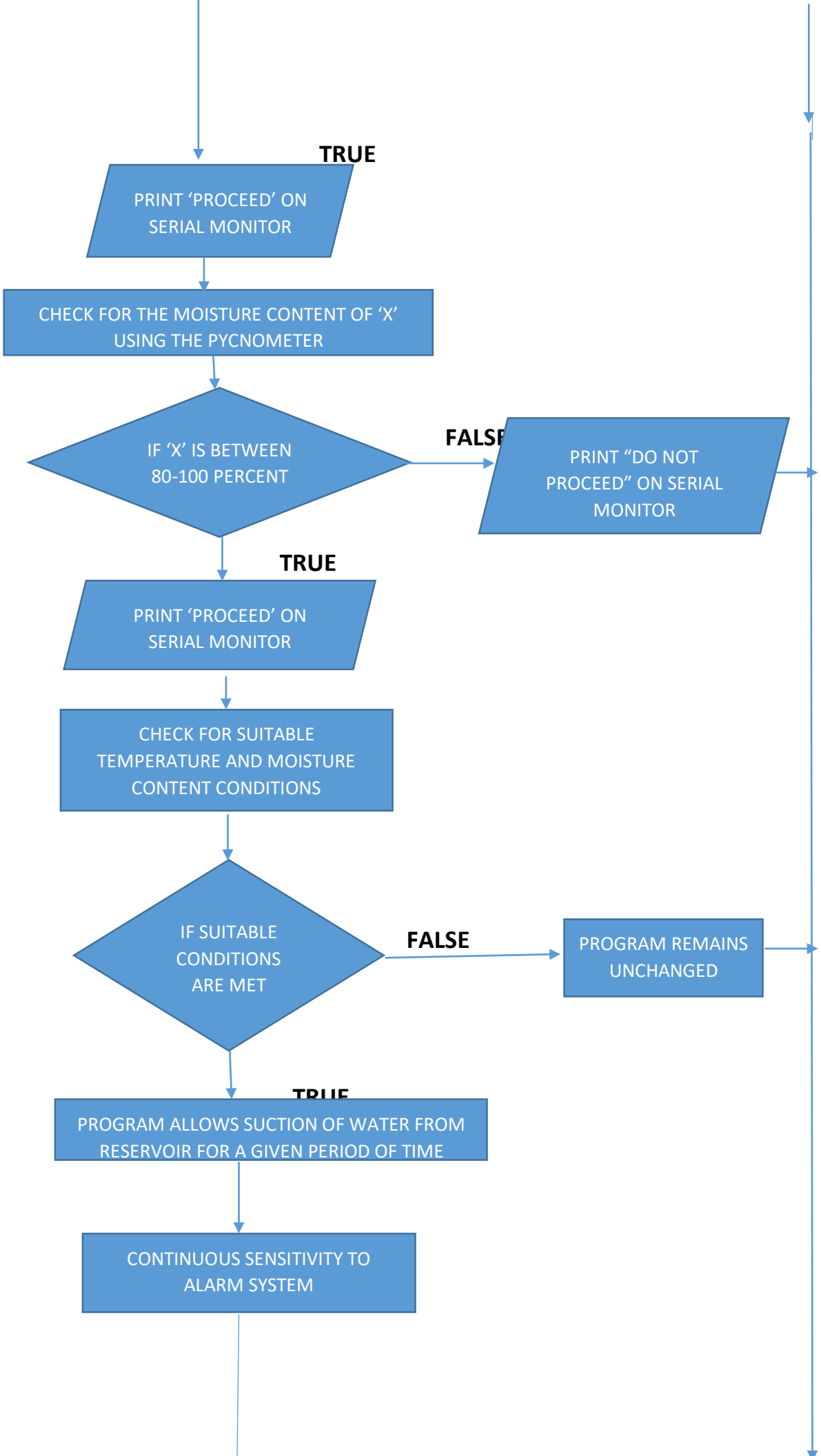
Print “water level is low” on the serial monitor and send signal to the time synchronization program

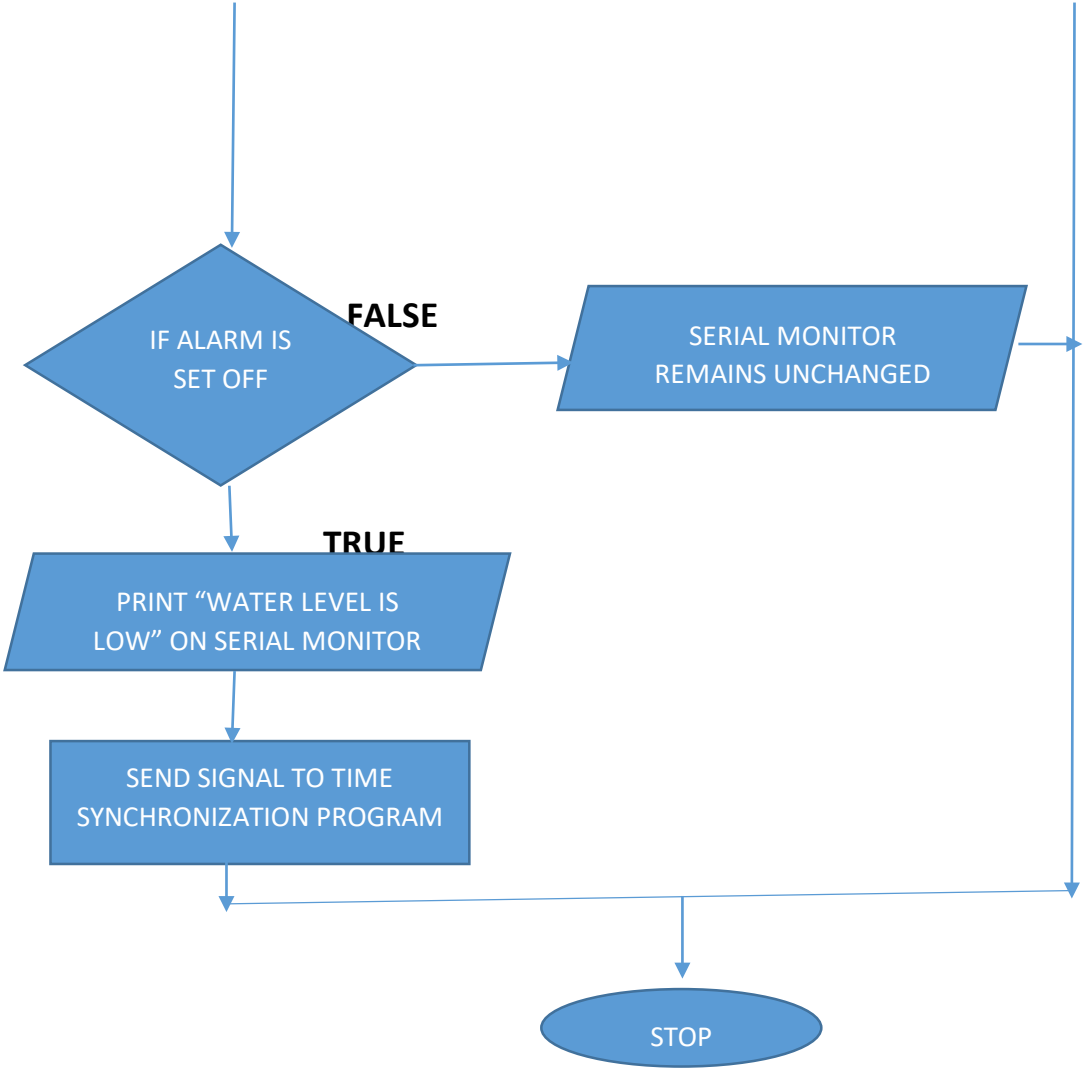
Else

The serial monitor remains unchanged

FLOWCHART


START
ENTER DECRYPTION CODE
IF DECRYPTION CODE IS CORRECTLY ENTERED
FALSE
PRINT "ACCESS DENIED" ON SERIAL MONITOR
TRUE
PRINT "INPUT PASSWORD" ON SERIAL MONITOR
IF PASSWORD IS CORRECTLY INPUTTED
FALSE
PRINT "ACCESS DENIED" ON SERIAL MONITOR
TRUE
UNLOCK AGRO SOFTWARE
ENTER THE CODE LETTER 'X'
CHECK FOR THE TEMPERATURE OF 'X' USING THERMOCOUPLE
IF 'X' IS WITHIN THE RANGE OF 65-75F
FALSE
PRINT "DO NOT PROCEED" ON SERIAL MONITOR


TRUE
PRINT 'PROCEED' ON SERIAL MONITOR
CHECK FOR THE MOISTURE CONTENT OF 'X' USING THE PYCNOMETER
IF 'X' IS BETWEEN 80-100 PERCENT
FALSE
PRINT "DO NOT PROCEED" ON SERIAL MONITOR
TRUE
PRINT 'PROCEED' ON SERIAL MONITOR
CHECK FOR SUITABLE TEMPERATURE AND MOISTURE CONTENT CONDITIONS
IF SUITABLE CONDITIONS ARE MET
FALSE
PROGRAM REMAINS UNCHANGED
TRUE
PROGRAM ALLOWS SUCTION OF WATER FROM RESERVOIR FOR A GIVEN PERIOD OF TIME
CONTINUOUS SENSITIVITY TO ALARM SYSTEM



4. 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.

5.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.

6.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=[(((m2-m1) *(G-1/G))/(m3-m4))-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.

TOP DOWN APPROACH OF SOFTWARE