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SECTION: ALGORITHM

Assignment 2

CONCEPUALIZATION

An application to automate the irrigation system on ABAUD farm. With a restricted user access, it can read the temperature of the soils by means of sensors, determine the moisture content and configure a time interval for the water system. It is also designed to trigger an alarm and mobile notification for the water reservoir refill when necessary.

SPECIFICATIONS

HARDWARE FEATURES	SOFTWARE FEATURES
Sprinklers and flowmeters	Access Control
Piping system and pumps	Data Control and Analysis
Computer and mobile devices	Error Detection and Feedback Mechanism
Water reservoir	Meteorological functions
Sensors (temperature sensors, flow sensors and soil moisture sensors)	Timer
Buzzers	Graphical User Interface and Dashboard
Rechargeable Batteries/Power Supply	Mobile Enablement

Access Control: This is to enable restricted access to the automation system so that it isn't tampered with by unauthorized personnel. It would be set up by the means of a user ID; to keep track of the personnel on the system at any given time, and password.

Data Control and Analysis: This is to enable the storage of the data collected (soil temperature readings, soil type and moisture content), to study resulting trends and culminate a more effective timer to meet the moisture demands of the crops.

Meteorological Functions: This is to enable the system carry out more effective irrigation based on the weather predictions. Hence on a day with a predicted high temperature, it would tend to water the plants a bit longer in order to cushion the moisture content of the soil in the course of the day, while on a day with a more humid temperature would optimize water consumption.

Error Detection and feedback Mechanism: This is to ensure for the efficiency of the water system. It would help to ensure that every sensor and sprinkler as delivery as it ought to and would make necessary pointers in the event of any dysfunction. It also covers detection and alarm set-off for a refill of the water reservoir.

Timer: This is necessary to customize the watering schedules based on the fixed information (soil type and crop water requirement) and gathered information peculiar to the day (soil temperature, weather forecast and soil moisture content).

Graphical User Interface and Dashboard: This takes care of the interactive interface for the water system. It involves the platform for data entry, default settings of the automated system functions, necessary data analysis and display.

Mobile Enablement: This feature of the software can enable the authorized farm caretaker to check on the progress of the water system from the comfort of any enabled mobile devices. It would also support manual setting of systems functions, communication of error messages and feedback messages for tank refill.

Sprinklers: These hardware features are what release the water directly to the crops by spraying.

Piping system and pumps: There are to serve as channeling systems from the source of water to the sprinklers.

Computer and mobile devices: The computer support the system software and is the main medium via which the system is operated, while the mobile device serve as secondary devices through which the system can be operated, and messages/ alerts are sent to.

Water reservoir: This is the major supply of water for the entire irrigation process and ought to be re-filled as and when necessary.

Sensors (temperature sensors, flow sensors and soil moisture sensors): Flow sensors would help to determine how much water you are putting out at all times hence helping to easily locate a faulty pipe, while the temperature and soil moisture sensors would help to determine the soil temperature and moisture content respectively.

Buzzers: This would help to give necessary alarms in the event of any dysfunction or when there is a need for the refill of the water reservoir.

Rechargeable Batteries/Power Supply: This is used to charge the automated system; the batteries are also made available in the event of power failure.

DESIGN

The design would display the features of the automated sprinkler which include the access control, time schedule and watering and feedback (water refill) mechanism via algorithms and flow charts. It is designed in such a way that the water reservoir is checked before and after irrigation to enable refill if necessary.

Algorithms

➤ Access Control Algorithm

```
START
P = System Password, I = Stored set of User ID
Enter A
Enter B
If A= I
    While B=P
        Print "Access Granted"
        Redirect to program dashboard
    Else
        Print "Try again! Invalid User password."
Else
    Print "Invalid User ID."
STOP
```

➤ Water refill and Irrigation Algorithm

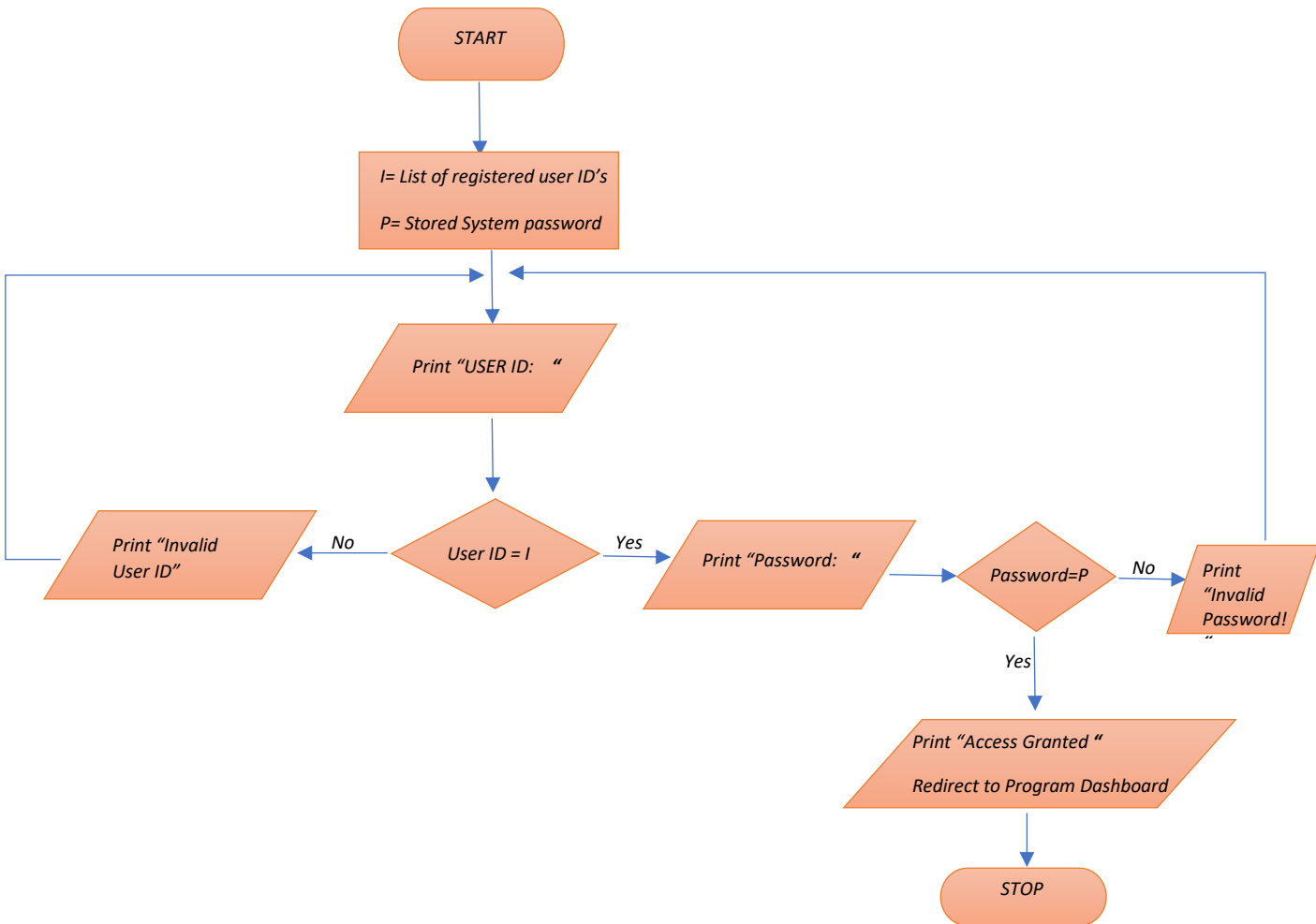
```
START
Wc=Critical water level for a refill
Read Wa // Wa is the water level in the water reservoir at the given moment
If Wa > Wc
// Step 2 and 3 runs concurrently
    Step 2
    Mi= Ideal moisture content of the soil for crop
    Read Ma // Ma is the actual moisture content of the soil at the given moment
    If Ma < Mi
        Print "Irrigation in progress"
        Flows sensors come on
        Sprinklers come on for 15 minutes
    Else
        Go back to start of program

    Step 3
```

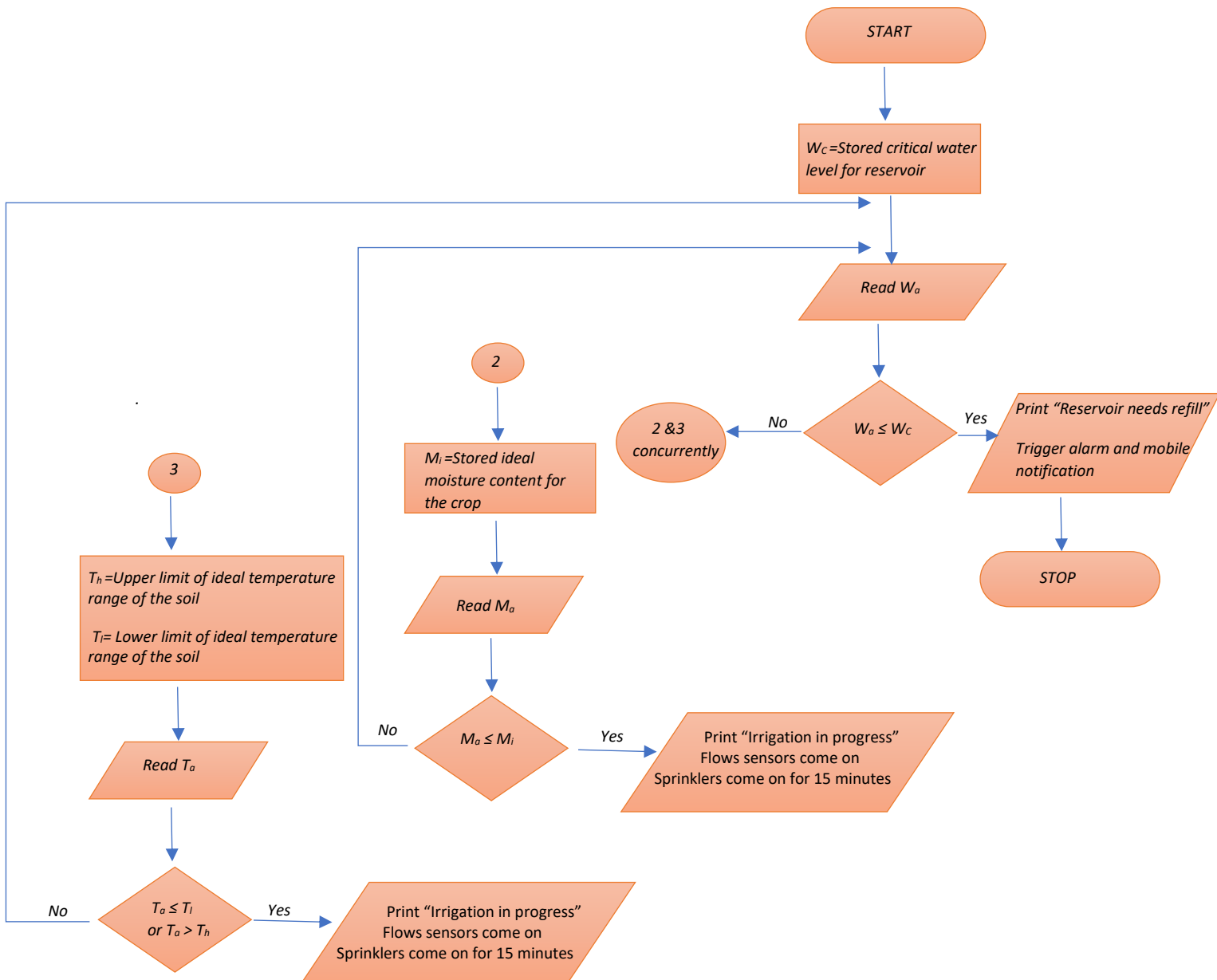
T_h = Upper limit of ideal temperature range of the soil
 T_l = Lower limit of ideal temperature range of the soil
 Read T_a // T_a is the actual temperature of the soil at the given moment
 If $T_l \geq T_a$ or $T_a \geq T_h$
 Print "Irrigation in progress"
 Flow sensors come on
 Sprinklers come on for 15 minutes
 Else
 Go back to the start of program
 Else
 Trigger alarm for water tank refill and mobile notification.
 Stop

Flow charts

➤ Access Control Flow chart



➤ Water refill and Irrigation Flow chart



TOP-DOWN DESIGN APPROACH

