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SOFTWARE DEVELOPMENT CYCLE

This is also referred to as the application development life-cycle, is a process for planning, creating, testing, and deploying an information system.

These are the steps to take for designing software application:

- > Conceptualization
- > Specification
- > Design
- > Implementation
- > Testing and Debugging
- > Release and Update

1a)

Excessive seepage and leakage of water forms marshes and ponds all along the channels making farming hard.

The application development of software that interacts with the machine following the System Development Cycle:

- 1) **Conceptualization**: since the irrigation system is making things on the farm hard we are going to automate the irrigation system, i.e. to make a manufacturing system at greater speed and with little or no human intervention. Every irrigation system such as drip, sprinkler and surface gets automated with the help of electronic appliances and detectors such as computer timers, sensors and other mechanical devices.
- 2) **Specification**: basically dividing the application into two
 - ✓ Hardware
 - Pipe system
 - Sprinkler
 - Reservoir
 - alarm
 - Soil sensor
 - Source of water
 - Irrigation control

✓ Software

- Error detection (to know if there's a leakage in the pipe)
- Access control (Enabled password for the system)
- Soil moisture sensor (determine the moistures of the soil)
- Timer (trigger an alarm if there is no sufficient water in the tank for irrigation)
- Soil temperature sensor (to read the temperature of the soil)
- Time interval (the time it takes for the plant to be wet)
- Irrigation control (accesses local weather from the internet)
- GUI (Graphical User Interface); push button, text view, edit view, dialog box, etc.).
- Visual basis (for designing)

3) Design:

- Launch application: the opening of the application which is going to be called Frank's smart irrigation app.
- Log-in details: if it is an existing user, he/she would have to fill in their username and their password to use the application but if it is a new user he/she would have to:
 - Sign-up/create an account: if it is a new user, he/she would have to fill out a form containing their personal information and password that only they would know. This is also called the access control.
- Home screen: there is going to be an icon where you can be able to control the sprinklers etc. It is going to be connected to the particular places you want the sprinklers to open and it is mainly for you to control the amount of water you needed. It is called the accessibility button.

Although the sprinklers can only be turned on or off remotely so an irrigation controller is required- this can be purchase from your local distributor.

 - You can also find the calendar and timer in the accessibility icon, here you can be able to set the time and date you want the sprinklers to come on and when you want it to go off.
 - Another thing to find on the home screen is the weather forecast icon. Here, you can be able to:
 - View watering and rainfall reports
 - View forecast and current weather conditions
 - We can also find the settings icon. Here, you can be able to adjust the water, change the kind of weather news you'd want to see, etc.
 - Configure watering schedules and zones

- Configure flow, rain and soil moisture sensors

- Alert button: it has to be connected to the Wi-Fi for you to receive information. Alert allows you to be notified of potential issues with your controller wiring, valves, pipes or Hunter controller.

You can control your irrigation system remotely using this app or using a web browser from anywhere in the world (note: internet access is required).

4) **Implementation:**

The code for the application is then put into effect and written in c++ language for the application to work.

5) **Testing and debugging:**

Testing is a process of finding bugs or errors in a software product that is done manually by tester or can be automated.

Debugging is a process of fixing the bugs found in testing phase. Programmer or developer is responsible for debugging and it can't be automated.

The application was tested and debugged.

6) **Release and update:**

The application is then released to the public for use and whenever the app is been updated, a notification will be sent on the app.

1b)

Hardware:

A piping system is a network of pipes, fittings and valves intended to perform a specific job i.e. to carry or transfer fluids from one equipment to another.

Function:

- Designed and installed to supply water under pressure from the source of the water to the irrigable area.



Sprinkler:

Sprinkler irrigation is a method of applying irrigation water which is similar to natural rainfall. Water is distributed through a system of pipes usually by pumping. It is then sprayed into the air through sprinklers so that it breaks up into small water drops which fall to the ground.

Function:

- An irrigation sprinkler (also known as a water sprinkler or simply a sprinkler) is a device used to irrigate agricultural crops, lawns, landscapes, golf courses, and other areas. They are also used for cooling and for the control of airborne dust.



Reservoirs:

a natural or artificial place where water is collected and

stored for use, especially water for supplying a community, irrigating land, furnishing power, etc. a receptacle or chamber for holding a liquid or fluid.

Function:

- Under these conditions, more water is released from the reservoir so farmers can water their crops and homes and businesses can function normally. Reservoirs serve other purposes. They are used for boating, fishing, and other forms of recreation. Some of the dams that create reservoirs are used to generate electricity.



Alarms:

Alarms alert building occupants and emergency forces when a sprinkler water flow occurs. The simplest alarms are water driven gongs supplied by the sprinkler system. Electrical flow and pressure switches, connected to a building fire alarm system, are more common in large buildings.

Function:

- An alarm valve prevents a reverse flow of water from the installation into the fire-pump room, but in case a fire sprinkler is activated (opened) due to fire, the alarm valve will open and permit water flow into the system.

Soil moisture sensor:

The soil moisture sensor (SMS) is a sensor connected to an irrigation system controller that measures soil moisture content in the active root zone before each scheduled irrigation event and bypasses the cycle if soil moisture is above a user- defined set point.

Function:

- The Soil Moisture Sensor is used to measure the volumetric water content of soil. This makes it ideal for performing experiments in courses such as soil science, agricultural science, environmental science, horticulture, botany, and

biology.



Source of water:

There are two main sources of water: surface water and groundwater. Surface Water is found in lakes, rivers, and reservoirs. Groundwater lies under the surface of the land, where it travels through and fills openings in the rocks. The rocks that store and transmit groundwater are called aquifers.

The main sources for irrigation water are groundwater from wells, surface water, drainage ponds, rain and municipal water. Drilled wells are a clean source of water for many greenhouse operations however; the water yield from drilled wells is usually limited.



Irrigation control:

Connected to your home's Wi-Fi network, this device accesses local weather data from the internet and adjusts the watering schedule according to upcoming conditions: rain, high heat, humidity, or freezing

temperatures. Some devices employ soil monitors (usually a spike that you push into the ground) to check existing moisture levels. And many of the devices will send you messages to alert you of any changes—say, that the day’s watering is cancelled due to upcoming showers.



➤ Software

Error detection:

Error detection and correction or error controls are techniques that enable reliable delivery of digital data over unreliable communication channels. Therefore, it helps to show if there is a leakage in a pipe.

Lowering the data rate also helps reduce transfer *errors* and increase range, both of which our system can benefit from sensor Readings.

Access control:

Access control is a security technique that regulates who or what can view or use resources in a computing environment which allow for multiple time zones to be watered. With this kind of system, you can set different irrigation programmes for lawns and borders, or for different crops.

It is just like having a password

Soil moisture sensor:

Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential; these sensors are usually referred to as soil water potential sensors and include tensiometers and gypsum blocks.



Timer:

A timer will turn your system on and off at designated times so plants get the steady, consistent watering they need for optimum health and production. Battery Timers are hose-threaded, easy to install and program, and are typically limited to one valve.

Soil Temperature Sensors:

This is a high quality temperature sensor that is specifically designed for soil temperature measurement in extreme environments. Using top quality materials it is suitable for hostile conditions as encountered in outdoor installation (temperature, radiation, chemicals).

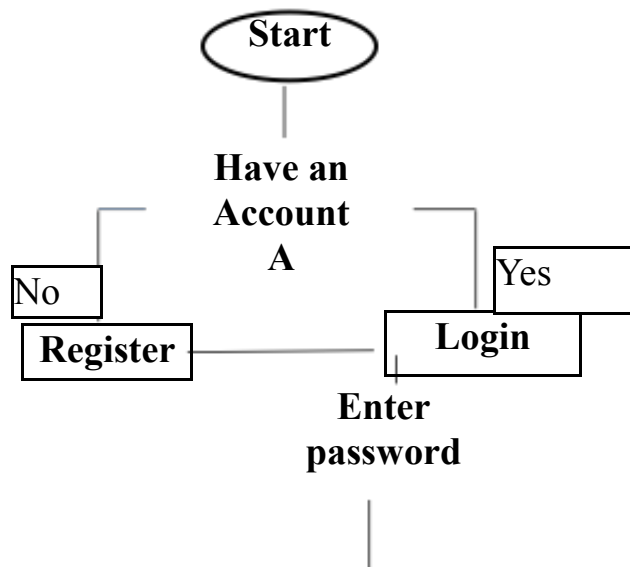


Time interval:

Irrigation interval refers to the time interval between two successive irrigation. ... The interval between irrigation and the amount of water to apply at each irrigation depend on how much water is held in the root zone and how fast it is used by the crop.

1c)

- Step 1: Start application
- 2: Open account
 - If new user
 - Else
 - Register
- 3: Read Temperature of soil
 - If above 65 degrees
 - Open sprinkler
 - Else
 - Sprinkler remains closed
- 4: Read soil moisture
 - Below 10 percentage
 - Open sprinkler
 - Else
 - Sprinkler remains closed
- 5: Enter time interval
- 6: Read water supply
 - If water is sufficient
 - Trigger alarm
 - Else
 - Leave pump on



1d)