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18/ENG08/009

BIOMEDICAL ENGINEERING

ENG 224

STRUCTURED PROGRAMMING LANGUAGE

A)   Conceptualization : This stage deals with brainstorming on how to solve a problem. The problem in this case is the irrigation system during dry season on ABUAD farm, and the solution is developing an automatic irrigation system.

Specification: The specifications include both hardware and software features such as the water pump, temperature sensor, moisture sensor, Arduino, ON OFF code block, Bluetooth client etc

Design: In the beginning, sketch design for the project was made, then measurements, size needed for designing the project. There were difficulties in choosing the type of pipes for this project since it should essay to connect also it should be an essay in the process of connection as well as cutting. Thus, two type of connection joint (T-joint and L – joint) has needed to simplify the installation process.
Arduino controller has been chosen as the processor since it is an open source, simple program and it combines three models at once which is Digital input, analog input, and processor. Every sensor and tools have been tested individually before connect them to a large-scale project. The last step was to assemble all parts together to finalize the project construction

Implementation: As well as the last step in the coding process was to gather all codes in one single program and run it in a large-scale project to make sure that everything working well.

Testing and debugging: Testing and Debugging, this is checking the performance of the system and checking for errors and removal of errors,
This process would be done after every step in the design and the implementation. After this has being done, the hardware would also be checked and see if it functions properly. After all this a general test would be done.

B) <u>Hardware features</u>
- Arduino

Arduino is an open-source operating system that relies on easy-to-use hardware. Arduino can read the ratio of light input to the sensor and convert it to output. For example, using Arduino we can control the room by turning on or off the light or air conditioner. This is done by sending a set of instructions to the control unit on the Arduino board

- Breadboard Definition

Breadboard is a plastic board for holding wires and electronic segments such as transistors and resistors

- Moisture Sensor

The soil moisture sensor comprises of two tests that are utilized to the degree the volumetric substance of water. The two tests permit the current to pass through the soil, which gives the resistance esteem to the degree the dampness esteem. When there is water in the soil there will be less resistance and the soil will handle more power. But if the soil is dry it conduct power weekly and needs less power and more resistance.

- Temperature Sensor

A temperature sensor is sensor to measure the ambient temperature. This sensor has three pins – a positive, a ground, and a flag

- Light Sensor

A Light Sensor is a gadget that recognizes light. It creates a yield flag that is corresponding to the escalated of light. A light sensor measures the brilliant vitality display in the wide run of frequencies in the light range. A few of the common frequencies are infrared, obvious and bright.

- Plastic Water Solenoid Valve

Is to control the flow of fluid, a valve is ordinarily closed and has a 1/2'' non-taped outlets on each conclusion. On the off chance that 12V is connected through the two terminals of the valve the solenoid will open the valve.

- Level Sensor

The water-level pointer is utilized to demonstrate the water level in the tank, by using this sensor we can control the flood of the water as well know the level of the water in the tank , and at any time we can know the water level in the tank, it has a basic circuit.

- Water pump

It is used in this project to pump the water needed for irrigation from the main water tank through pipes. This pump can be used for different applications, in household include cleaning, bathing, space heating and flower of water. This pump is selected for this project because it has good advantages. Such as, it has a lightweight. Also, it has a small size, so it is easy to install and replace it. Furthermore, it has an enough efficiency to pump water for irrigation. Since it operates in 12 volts, so it consumes lower power. In addition, this pump has a very Low of noise. Finally, the cost of this pump is very cheap.

Figure 27: Water pump

Rechargeable Battery

When selecting the appropriate battery for this project, some important points must be considered. Firstly, it should be environmentally friendly it should be sealed construction. Secondly, it should be stable quality and high reliability. Also, it must be rechargeable type, so it will not contribute to

pollution of the environment. This battery is a high-quality battery that is designed in order to give top performance, strength and long life.

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Software features

App inventor is an open source tool provided by google. This program allows beginners to create programs that can run on Android. It uses graphical interface such as Scratch
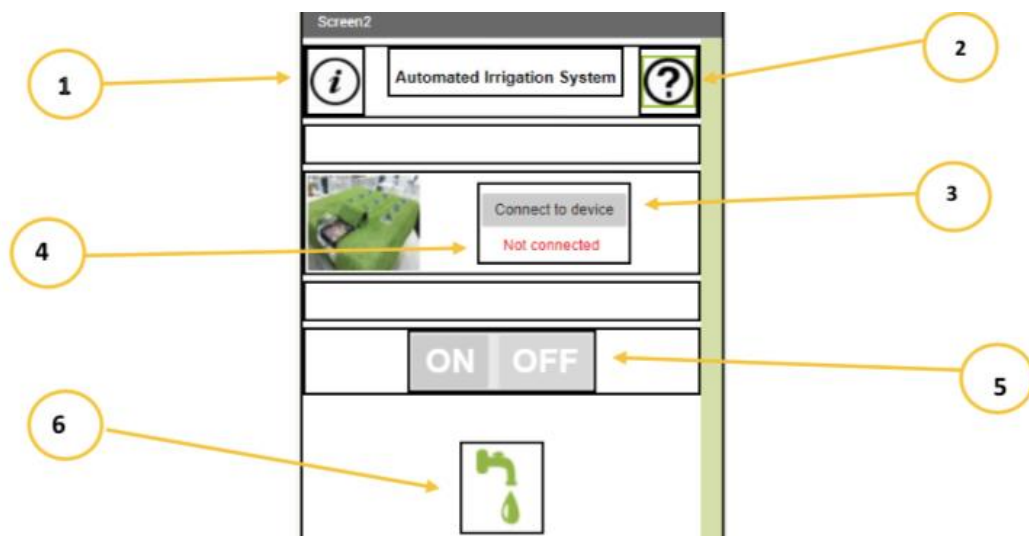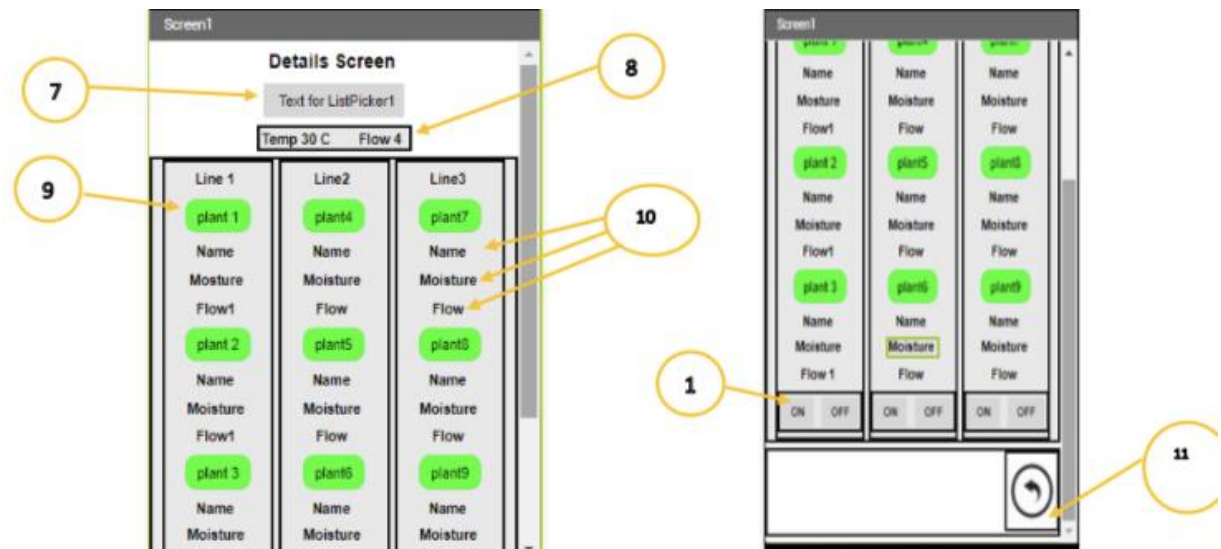
1- Button. If it is clicked, it goes to the user to About Page, which have information about the app.

2- Button. If it is clicked, it goes to Help Page, which have information about the app.

3- List Picker. When it is clicked, it shows a list of all connected Bluetooth devices When a Bluetooth device is clicked.

4- Connection. If the device is connected, the text color change to green for feedback and says 'Connected'.

5- ON /OFF buttons allow the user to switch on or off the system.

6- Details button. When clicked take the user to a details page which shows all the information and let user control system line by line.

7- List Picker. When it is clicked, it shows a list of all connected Bluetooth devices When a Bluetooth device is clicked.

8- These two labels, shows the temperature and amount of water go from tank flow4 is the main one.

9- Plant button. When clicked it shows user list of details about plant such as (Name of the plant, humidity and amount of water).

10- Thesethreelabels,itisnotvisibleunlesstheuserclicksonplantbutton,whenuserclickonplant1 all these labels become visible.

11- Responsive button, when it is clicked, it takes a user to the Home page.

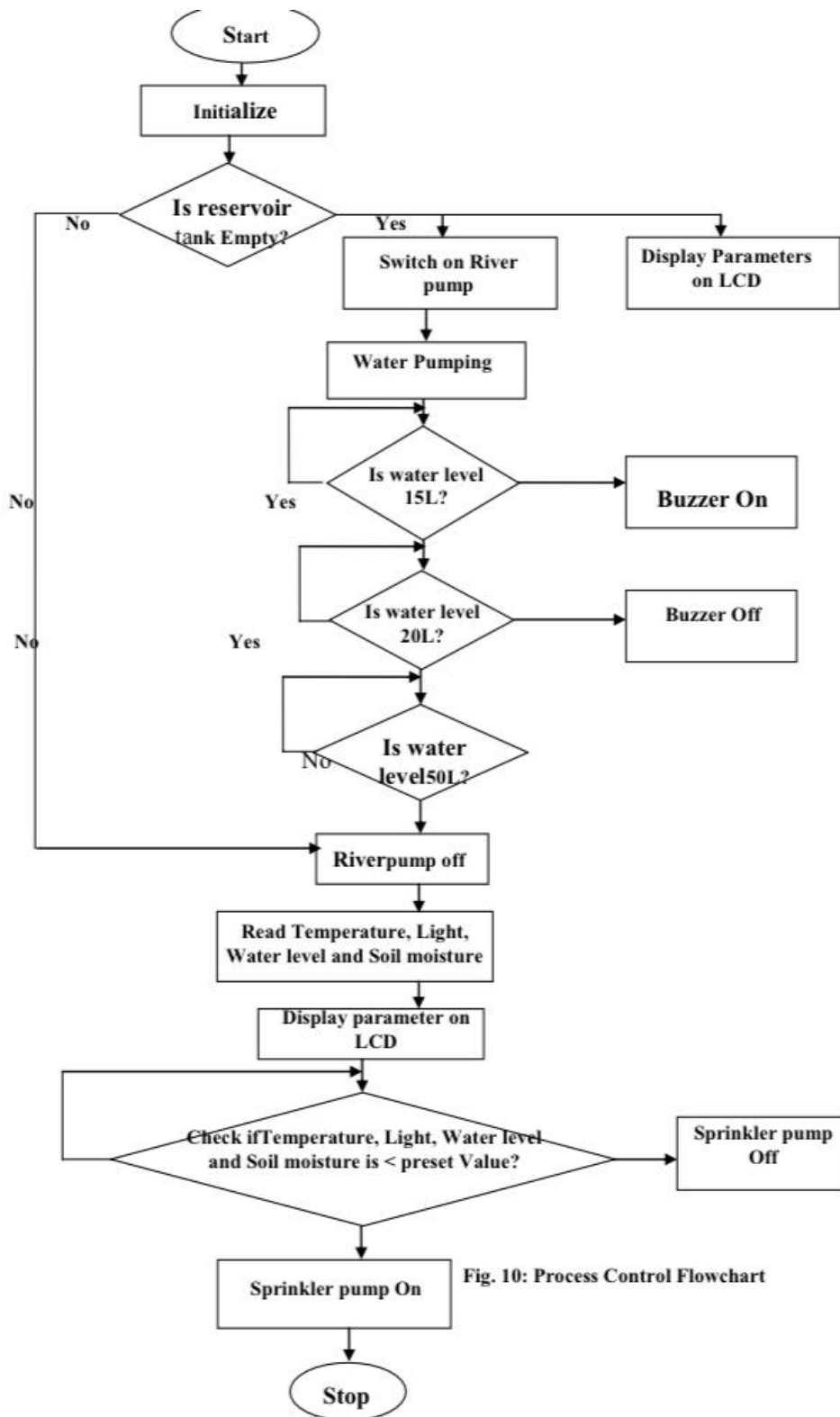12- ON/OFF button in each line allow a user to switch on or off each line individually.

C) The flowchart

Fig. 10: Process Control Flowchart