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CONCEPTUALIZATION

It is a notable fact that most farms have the problem of irrigation during dry season likewise is the case of Afe Babalola University. The idea of carrying out the irrigation process manually is very stressful, this is why I put together a software that will be able to intricate with the irrigation machine and make irrigation much easier and more effective.

The software that will be built is an automated system of irrigation. This system will help the farmers in ABUAD farm and make help eradicate the problem of irrigation during dry season. The system will able to read the temperature of the soil, determine the moisture content of the soil, determine the relative humidity of the environment in the farm, configure a time interval for the water system based on the information of the temperature and moisture content of the soil, trigger an alarm if there is no sufficient water in the tank for the irrigation, an enabled password so as not just anybody will have access to the app (for security reasons).

SPECIFICATION

Here the system will be divided into modulus, which are hardware and software

HARDWARE

- Soil temperature sensor
- Soil moisture sensor
- Tank
- Sprinklers
- Water source
- Discrete sensors
- Pump
- Pipes system

- Solenoid valve
- ATmega32U4 microcontroller
- 24VAC Power supply
- Relay
- Computer
- Humidity sensors
- Liquid Crystal Display
- Timer

SOFWARE

- Mobile Roadie
- **Soil Temperature sensor (ST01):** temperature sensor is a device, typically, a thermocouple or RTD, that provides for temperature measurement through an electrical signal. A thermocouple is made from two dissimilar metals that generate electrical voltage in direct proportion to change in temperature. An RTD (Resistance Temperature Detector) is an variable resistor that will change in temperature in a precise, repeatable and nearly linear manner. A soil temperature sensor (ST01) is a high quality temperature sensor that is specifically designed for soil temperature measurement in extreme environments.
- **Soil moisture sensor:** it is typically refers to a sensor that measures the volumetric water content in the soil. It measures the volumetric water content indirectly by using some other property of the soil such as electrical resistance, dielectric constant, or interaction with neutron, as a proxy for the moisture content.
- **Tank:** it is an artificial reservoir of varying sizes. They are constructed across a depression or valley behind which rain water collects. The tank is linked to a source so as to refill when the water is finished.

- **Sprinklers:** it is a device used to irrigate agricultural crops. The perpendicular pipes, having rotating nozzles on top are joined to the main pipeline at regular intervals. When water is pressurized through the main pipe it escapes from the rotating nozzles. It gets sprinkled on the crop. Water is piped to one more central locations within the field and distributed by overhead high pressure sprinklers.
- **Water source:** this is the most important thing for the irrigation. There are various water sources but in this case we will be using municipal water. Municipal water includes water supplied by the city (ABUAD).
- **Discrete sensors:** the function of a discrete sensors is to send high/low, on/off or yes/no signals to the controller regarding the quantity of a physical parameter. They also indicate the opening/closing state of valves, alarms
- **Pump:** it is a device that moves fluids by mechanical actions, typically converted from electrical energy into hydraulic energy. Irrigation pumps are used to pump water from a lower to a higher level from which the water then flows through channels to the fields.
- **Pipes system:** a pipe can be defined as a tube made of plastic, wood, concrete, metals or fiberglass (but for the purpose of irrigation we will be using plastic). Pipes are used to carry liquids, gases, slurries, or fine particles (but in this case we are using the pipe to carry liquid; that is water). A pipe system is generally considered to include the complete interconnection of pipes, including in-line components such as pipe fitting and flanges.
- **ATmega32U4 microcontroller:** it is a compressed programmable microcomputer manufactured to control the function of embedded system in office machines, robots, home appliances, motor vehicles, and a number of other gadgets. The microcontroller is programmed in such a way that it receives the input signals from a sensing materials. Once the microcontroller gets the data from the sensing materials, it compares the data as programmed in a way, which generates output signals and activities the relays for operating the submersible pumps.

This microcontroller has internal-external interrupts and serial programmable USART.

- **24VAC Power supply:** a power supply is a component that supplies power to at least one electrical load. What a power supply does is that it converts different types of energy into electrical energy. For the purpose of irrigation we will be using a 24VAC power supply.
- **Relay:** a relay is an electrical switch that opens and closes under the control of another electrical circuits. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contact internally. A relay is able to control an output circuit of higher power than the input circuit.
- **Solenoid valve:** this is an electromechanical valve for use with liquid or gas. The valve is controlled by an electric through a solenoid: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlets ports.
- **Liquid Crystal Display:** the LCD will display the alphabets, numbers, characters and symbols. The LCD used here is eight bit parallel type and the display size is 16*2. LCD is used for displaying the moisture valve. LCD consists of three control pins and eight data pins.
- **Computer:** the computer will be used to implement the decisions, monitor the performance of the irrigation system, adjust the irrigation applications as climatic or other conditions change during irrigation, process feedback data to evaluate the irrigation process.
- **Humidity sensors:** a humidity sensor is an electronic device that measures the humidity in its environment and converts its findings into electrical signal.

SOFTWARE

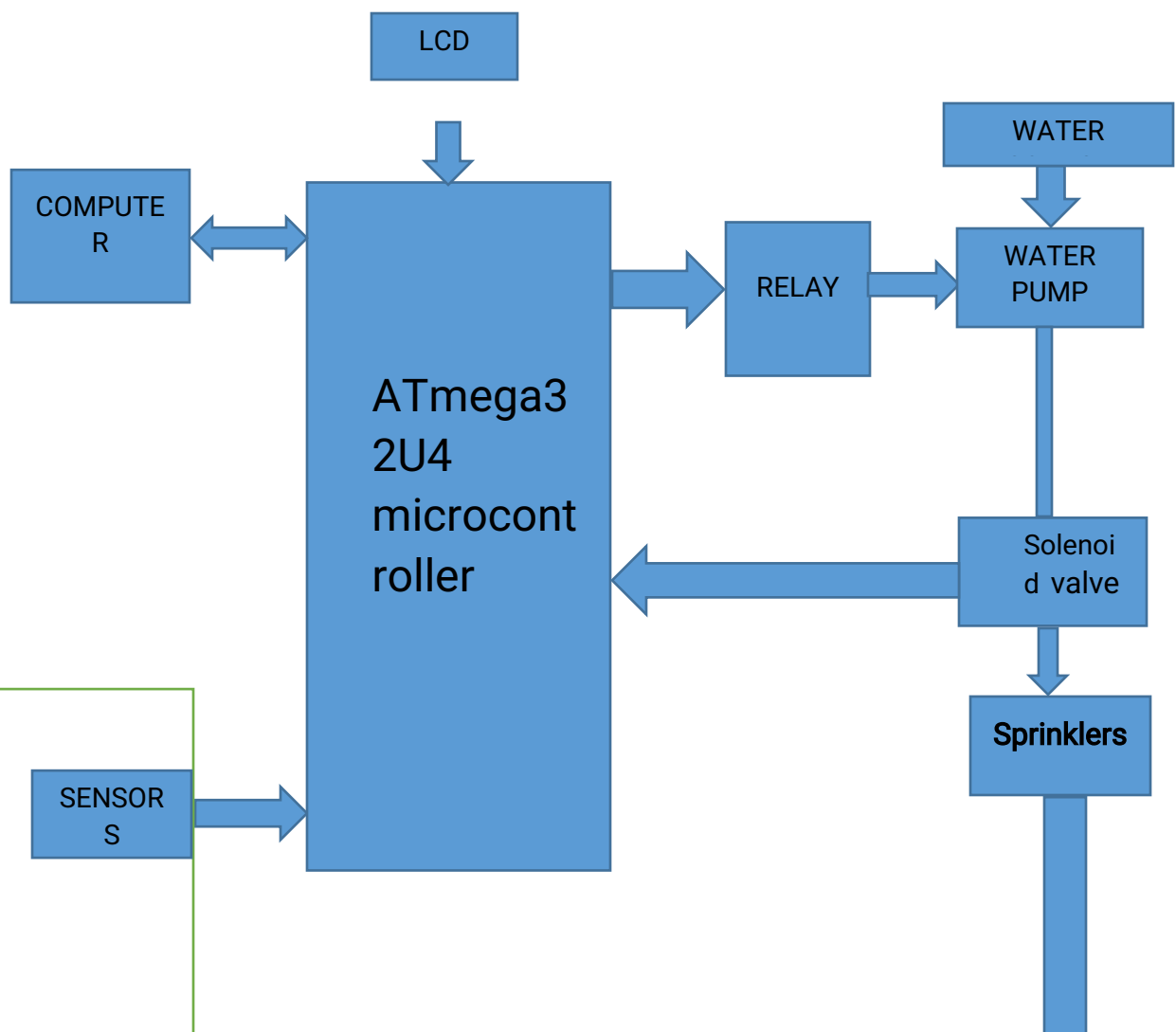
- **Mobile Roadie:** this is an app creator that allows anyone to create and manage their own IOS or Android app. The building happens in a very visual way. This will help to build the app used for the automated irrigation system and also because we are using this app creator

software we do not need any other software

DESIGN

The automated irrigation system has a lot of features as it is computer based. This automated system will be able to read the temperature of the soil, determine the moisture content of the soil, determine the relative humidity of the environment in the farm, configure a time interval for the water system based on the information of the temperature and moisture content of the soil, trigger an alarm if there is no sufficient water in the tank for the irrigation, an enabled password so as not just anybody will have access to the app (for security reasons). Because of this features the system will have the above specifications will be required.

The diagram below is the block diagram of the automated irrigation system for Afe Babalola University Ado Ekiti Farm. **NOTE THAT**, the sensors are all over the farm



SENSOR

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SENSORS



There will also be an app that will be able to will help the farmer be able to manage things, also the app will be able to keep record of the daily temperature, humidity of the farm. The app will also have a homepage that will be able to direct people around the farm so that they won't get lost. The app will tell you what type of crops are being grown in the farm and also tell the system the amount of water a specific crops needs daily.

ALGORITHM

Start

Read (temperature, moisture content, humidity)

If (temperature is high or moisture content low)

{set a long time interval for sprinklers}

Else {set a short time interval}

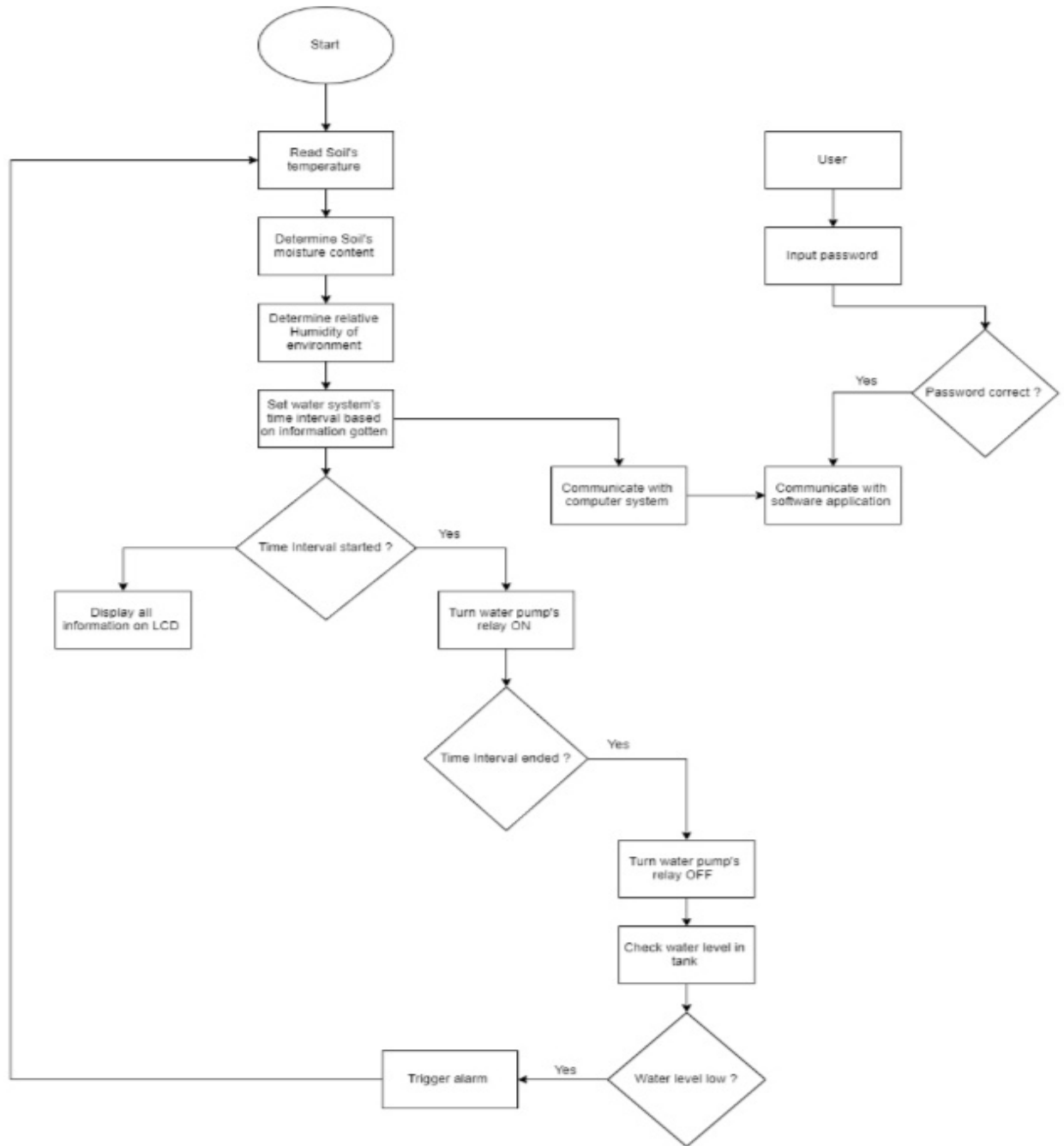
Write (relay, HIGH)

If (time interval over)

{write (relay,LOW)}

Else {do nothing}
Print to LCD
Send to computer
End

The diagram below is the flowchart for the application



TOP to bottom design

