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DESIGN AN ARDUINO-BASED VEGETABLE PLANT WATERING SYSTEM WITH SOIL MOISTURE SENSOR

Roy Harry Syidiq Pamungkas
Program Studi Teknik Komputer,
Fakultas Teknik dan Ilmu Komputer, Universitas Teknokrat Indonesia
Email: roy_hari_sidiq@teknokrat.ac.id

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ABSTRACT

The development in this era is increasing, humans expect a tool or technology that can help humans work so that technology becomes a necessity for humans. This final task is made a device that can do the work of watering tomato plants automatically. This tool aims to replace manual work be automatic. The benefit obtained from this tool is that it can facilitate human work in watering chili plants. This tool uses soil moisture sensors that serve as soil moisture detectors and sends commands to Arduino Uno to turn on the relay driver so that the wiper motor can water as needed automatically. The creation of this final task is done by designing, creating, and implementing system components that include Arduino use as a controller, relay driver to dislodge on and off the wiper motor, LCD (Liquid Crystal Display) to display the percentage value of water content.

1. INTRODUCING

The development of information technology today has had a major influence on all aspects of life[1]–[3]. Not only used in the field of education to facilitate teaching and learning activities but information technology is also used as one of the business strategies to get profits[4]–[6]. In this modern world, humans are in dire need of technology that can help humans work. With advances in the field of technology produce innovations that are heading in a better direction[7]–[9]. This can be seen in large industries, from automotive equipment to household electrical appliances[10]–[12].

Currently, the need for tomato and chili plants is increasing because the population is increasing from year to year, many people want to grow crops so that their needs are met, but often they do not have time to water their plants because they have a busy life that cannot be left behind. Therefore the use of technology needs to be made to make it easier for them to water plants, tomato plants themselves need certain moisture so that the fruit produced by both soils used to grow tomatoes must be loose/moist and there is no sand.

This tool is made to function to water tomato and chili plants automatically using soil slowness sensors and Arduino Uno. Based on soil PH that has been set according to the needs of tomato and chili plants, this tool is also equipped with LCD (Liquid Crystal Display) which can display soil conditions whether moist or dry according to the reading of the soil moisture sensor in the form of values on LCD.

This tool is also equipped with a water pump for chili watering, this tool is very useful for humans today, because with this tool humans no longer need to water chili plants manually every day, for that this tool can be applied to humans who like to grow chili in the room or plant chili in a small garden in front of the terrace of the house and elsewhere that is covered. Against this background, it will be designed a chili plant sprinkler automatically using a soil moisture sensor then processed by Arduino Uno and instructed to the LCD to display the soil moisture value under the soil pH.

Arduino is also an open hardware platform aimed at anyone who wants to create a prototype of interactive electronic equipment based on flexible and easy-to-use hardware and software. Microcontrollers are programmed using the Arduino programming language which has a syntax similarity to the C programming language. Because of its open nature, anyone can download the Arduino hardware scheme and build it. Through the system, incoming data will be processed automatically to help manage tasks to be more effective and efficient. And with the support of internet technology, you can also retrieve the required data on the system in real-time.

A microcontroller is an electronic component used to regulate a robot's motion using programmatic. This microcontroller can also be referred to as the robot brain because it is with this microcontroller that the robot can be controlled.

2. RESEARCH METHODS

Block diagrams are one of the most important parts of designing a tool. From the block diagram, it can be known the working principle of the whole circuit. So that the whole block of circuit diagram will produce a system that can be functioned how the working principle of the design of a tool, in addition to the working principle, block diagrams also help in the process of making an electronic circuit where block diagrams as a guide in the placement of an interconnected electronic circuit from the input process to the output.

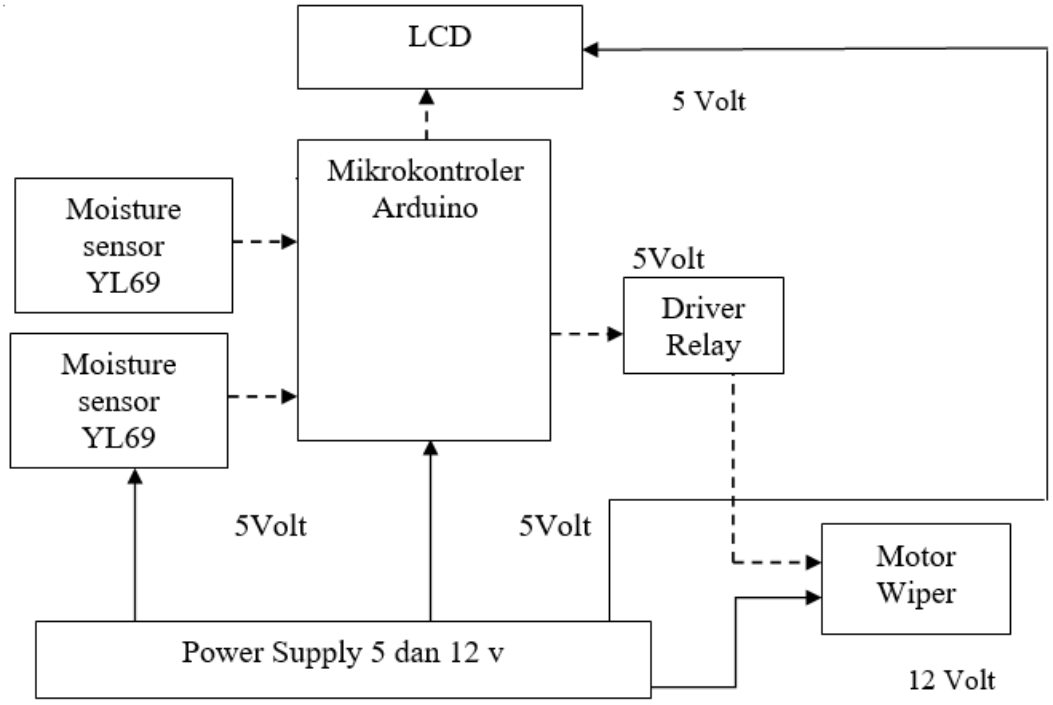

Figure 1. Network Diagram Block

From the block diagram above described and the function of each block is as follows power supply serves to power for the wiper motor and plays power for microcontrollers and the needs of other component modules[13]–[15]. Arduino Uno microcontrollers are used to control all components of both input components and output components. Soil moisture sensors are used to detect soil moisture when soil conditions are dry or wet/ moist. Wiper motors are used as a tool to pump water. Lcd is used to display soil moisture conditions. Relay is used for automatic switches to turn wiper motors on and off.

A flowchart is a type of diagram, flowchart or flowchart is a type of diagram that represents algorithms, workflow, or processes, which displays steps in the form of graphical symbols, in the flowchart diagram below explaining how the work and process tools work.

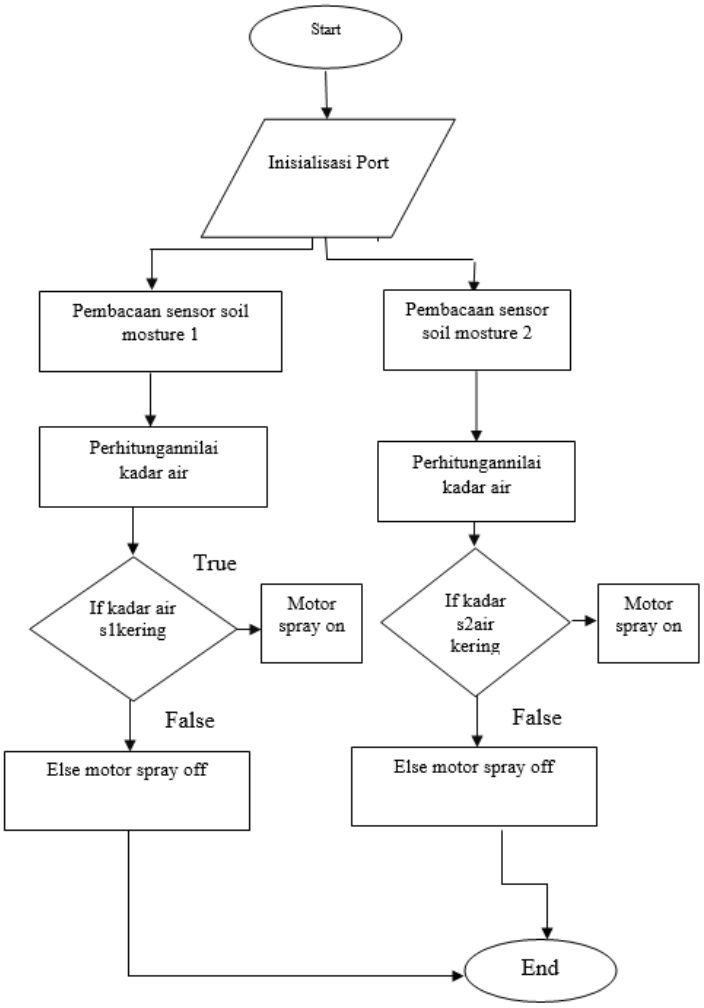

Figure 2. Flowchart Diagram Block

3. RESULTS AND ANALYSIS

Design is a stage that needs to be done in the manufacture of a tool, by designing the components that we will use in the tool that we will make it is expected that the tool can work following the desired results[16]–[19]. To obtain good results, a good design is needed by paying attention to the nature and characteristics of each component used in the device series, so that errors and component damage can be avoided[20].

3.1. Overall Tool Planning

The overall design of the tool consists of four important elements that are mutually indigestible. These important elements are input circuits, controller circuits, output sets, and also integrated program software. A series consisting of electronic components in the form of inputs and outputs needed by microcontrollers to function properly. The entire range of tools can be covered in the following images:

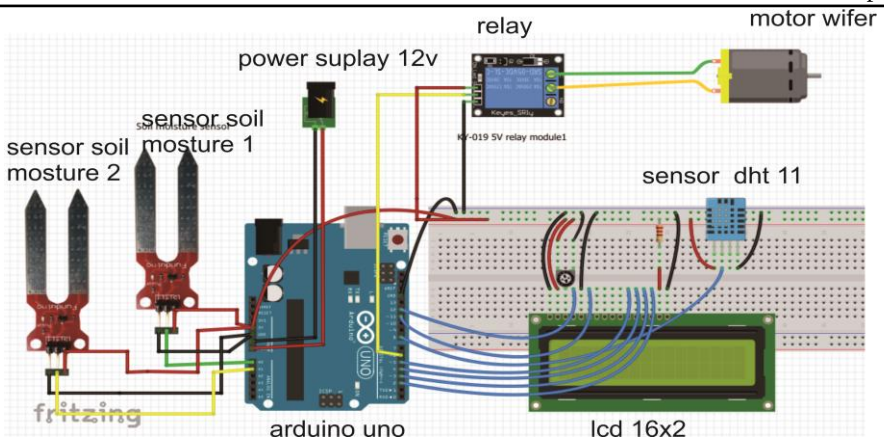

Figure 3. Overall Tool Planning

3.2. Moisture Sensor Design

When the process of assembly pin A0 on Arduino Uno will be connected to pin A0 on the soil inertia sensor so that Arduino Uno can receive soil moisture data from the sensor can instruct the driver relay to activate and disable the water pump according to soil conditions.

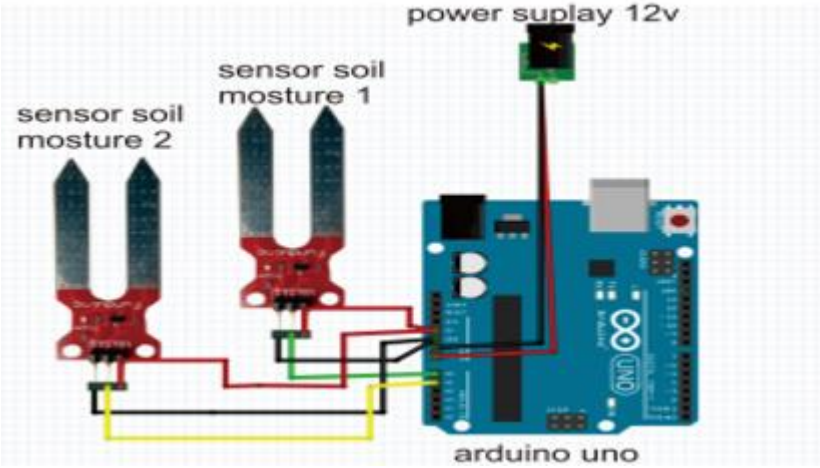

Figure 4. Moisture Sensor Design

3.3. Power Supplay Network Planning

A system that uses electronic components certainly requires an electric current for the system to work, the electric current referred to here is different from the use of simple electric current such as turning on a lamp. In this system, several main components require an electricity supply with a large need for different currents. Based on this, the author created a small system in a large system that serves as a power supplier for components that require electric current such as, Arduino microcontroller, Driver Relay, and of course the output used in the system.

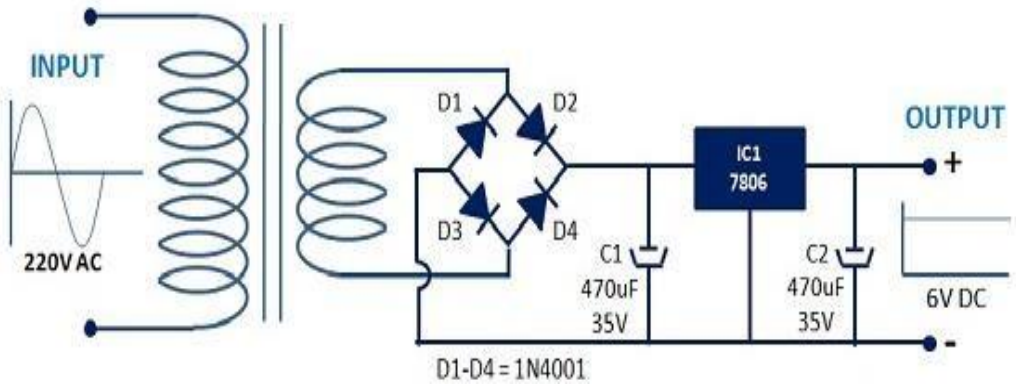

Figure 5. Power Supplay Network Planning

3.4. Overall Tool Planning Testing

Arduino circuits usepowersupply12volt to produce a 12volt voltage output connected to the Arduino microcontroller as a power supply. While LCD output voltage uses a 5volt power supply that is regulated using IC 7805 to produce a voltage output of 5volt connected to the Arduino microcontroller as a power supply, while the wiper motor uses a voltage of 220Volt. The system is designed using Arduino microcontrollers, moisture sensors YL-69, and relay modules 5volt as the source of the controlling tool. The 5volt relay module is used to control the voltage given the 12volt power supply. How the work of the Arduino-based automatic watering tool with wiper motors Instead of water pumps is the YL 69 soil moisture sensor is processed by microcontrollers, where the soil-moisture sensor YL-69 determines the soil moisture level there are 3 conditions that percentage specified in moisture sensor YL-69 that is moist, wet, dry. When the moisture sensor YL-69 detects dry soil that ranges from 0 to 300driver relays connected to wiper motors that are given a voltage of 220volt.

3.5. Moisture Sensor Design Testing

The Moisture sensor YL-69 circuit plays an important role because the moisture sensor is an indicator of moisture content in rice whether the rice is dry or wet, the Moisture sensor circuit consists of two probes that have a 5volt VCC voltage pin, GND, and data pin connected to Arduino, make sure the connection on the moisture sensor is well connected between VCC, GND and data pin, The data pin is connected to pin A0 on Arduino Uno, this is due to the data issued on the sensor in the form of analog data whose value is 1023.

Table 1. Moisture Sensor Design Testing

Soil moisture	Percentage of Water Content	Information	Motor
290	29%	Dry	On
560	56%	Humid	Off
540	54%	Humid	Off
126	12.6%	Dry	On
707	70.7%	Wet	Off

From the results of the system testing table above can be concluded that when the soil is dry the sensor will detect the percentage of moisture and the system will turn on the motor to water the plant. When the soil is moist the sensor will detect the percentage of moisture but the system will not turn the motor off. When the soil is moist the sensor will detect the percentage of moisture but the system will not turn the motor off. When the soil is dry the sensor will detect the percentage of moisture and the system will turn on the motor to water the plant. When the soil is dry the sensor will detect the percentage of moisture and the system will turn on the motor to water the plant.

3.6. Supply Power Series Testing

For initial simulations, before the power supply circuit either a 12volt power supply circuit for DC motor voltage or a circuit that provides a 5-volt voltage supply on the Arduino circuit, this circuit test is intended to provide voltage to components that have a certain voltage-current such as a 12-volt power supply to give current to 2 DC motors. To reduce errors in testing and measuring the power supply circuit block, it is necessary to perform the following steps:

1. Set up a series and multitester.
2. First check the power supplay12volt circuit is in good condition.
3. Connect the mesh voltage to the 12VDC power supply circuit.
4. Prepare a multitester at the VDC state to measure voltage.
5. Calibrate the tool used to measure the circuit so that accurate results are obtained.
6. Connect the multitester at the circuit test point, then record the results.

Table 2. Supply Power Series Testing

Measurement	Power Supply12 VDC	Information
Voltage	0-Volt	Inactive/ *Standby*
	11,6-Volt	Active
Electric Current	0 Ampere	Inactive/ *Standby*
	1 Ampere	Active

4. CONCLUSION

Arduino circuits use a 12volt power supply to produce a 12volt voltage output connected to the Arduino microcontroller as a power supply. While LCD output voltage uses a 5volt power supply that is regulated using IC 7805 to produce a voltage output of 5volt connected to the Arduino microcontroller as a power supply, while the wiper motor uses a voltage of 220Volt. The system is designed using Arduino microcontrollers, moisture sensors YL-69, and relay modules 5volt as the source of the controlling tool. The 5volt relay module is used to control the voltage given the 12volt power supply. How the work of the Arduino-based automatic watering tool with wiper motors Instead of water pumps is the YL 69 soil moisture sensor is processed by microcontrollers, where the soil-moisture sensor YL-69 determines the soil moisture level there are 3 conditions that percentage specified in moisture sensor YL-69 that is moist, wet, dry. When the moisture sensor YL-69 detects dry soil that ranges from 0 to 300driver relays connected to wiper motors that are given a voltage of 220volt.

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