

Conversion Design of Arduino-Based Semi-Automatic Clothes Washer

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ABSTRACT

This research aims to develop and evaluate a system that converts a manual clothes washer into an Arduino-based semi-automatic one. The research method used is a method of designing and creating a system for the object of research or called the design method. The system design is used as an object where the system is discussed and tested to find out how the system works and performs itself. The design object is an efficient and practical clothes washing tool. Converting a manual clothes washer into an Arduino-based semi-automatic one is an innovative and efficient solution to increase convenience and effectiveness in the clothes washing process. The design of this conversion model provides a complete guide to convert a manual washing machine into a semi-automatic one, improving the efficiency and convenience of daily use. With proper implementation, this project can provide an effective and cost-effective solution for household users.

Keywords: *Conversion Design, Clothes Washing Machine, Arduino.*

INTRODUCTION

The process of washing clothes is a routine that cannot be avoided in everyday human life. Life in modern times cannot be separated from an increasingly instant lifestyle, no exception in terms of washing clothes. Along with the development of technology, the invention of washing machines can be said to be a tool that contributes greatly to household appliances as well as the hospitality industry and laundry business (Atsiq et al., 2022). By using a washing machine, the process of washing clothes automatically becomes easier and more efficient in the use of time. Someone can do several jobs at once, so that not much time is taken up washing clothes, not least in hotels and laundry businesses that demand fast-paced work with a washing machine capacity that can wash large amounts of clothes.

Continuous use of washing machines can reduce the service life of electronic and mechanical components in the washing machine itself. The washing machine module is one of the electronic components that is vulnerable to damage if the washing machine is used in abnormal conditions that exceed the usage capacity of a washing machine. With the price of replacing modules that are expensive, and difficult to obtain, it can be an obstacle in terms of time and finance for consumers who experience damage to the electronic components of this one washing machine (Febriansyach et al., 2020). By utilizing microcontroller technology from Arduino Uno and several supporting devices, we can anticipate a standard washing machine module with a microcontroller-based washing machine module. Arduino Uno is an open-source electronic prototyping platform, based on flexible and easy-to-use hardware and software (Ramadan et al., 2022).

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By utilizing microcontroller technology from arduino uno and several supporting devices, we can anticipate a standard washing machine module with a microcontroller-based washing machine module. arduino uno is an open-source electronic prototyping platform, based on flexible and easy-to-use hardware and software (Suraidi & Wulandari, 2021).

METHOD

The research method used is a method of designing and creating a system for the object of research or called the design method. The system design is used as an object where the system is discussed and tested to find out how the system works and performs itself. The design object is an efficient and practical clothes washing tool.

Block diagram is a diagram of a system, where the main parts or functions represented by blocks are connected by lines, which show the relationship of the blocks. When the system will be used, the user must prepare the necessary needs such as the availability of electrical power and water sources and adequate location. After all is fulfilled, the system is activated by the user and gives a start command if all materials such as clothes and water are available, water will be filled in the water tub which also functions as a washing container. The water pump will suck water and fill it into the tub or washing container. Once full enough, the motor will start moving and rotating the clothes in the container slowly and back and forth. Detergent can be given by the user at this stage. After the process has been running for a while, the next step is to replace the water by removing the dirty water from the dry hollow and refilling it with clean water and the motor returns to work rinsing by rotating back and forth until the clothes are completely clean. Here is a Portable Clothes Washer System:

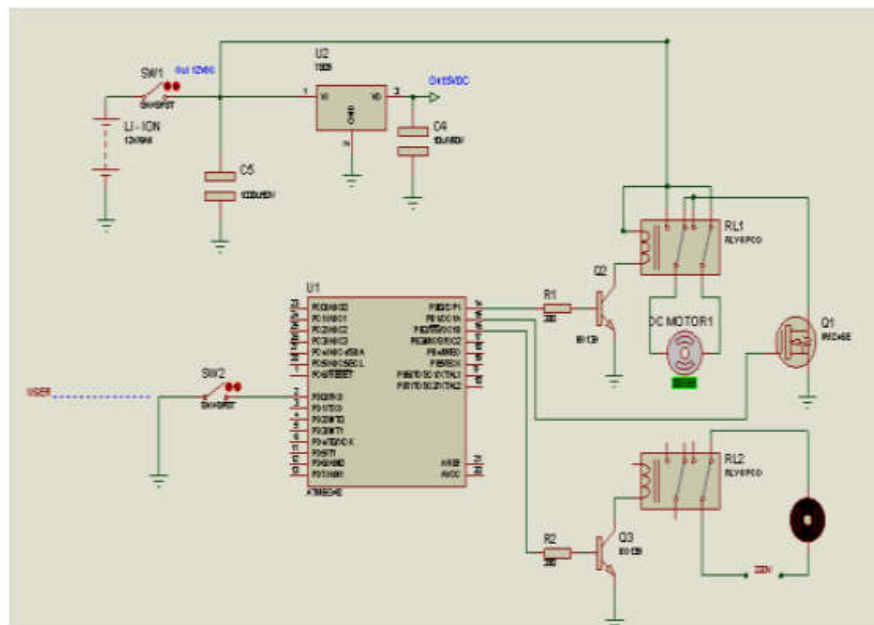


Figure 1. Portable Clothes Washer System

Source by (Annisa et al., 2020)

RESULT AND DISCUSSION

Converting a manual clothes washer to an Arduino-based semi-automatic one is an interesting project that can improve efficiency and convenience of use. Here is a basic guide to get started with this project. Materials and Equipment Needed ; Arduino Uno or other suitable version, Relay module to control the motor, DC motor or AC motor used for washing and squeezing, Solenoid valve to control water flow, Water level sensor to detect the water level in the machine, Temperature sensor (optional) to measure the water temperature, Buzzer or alarm to signal when the cycle is complete, Switch or button for manual control, LCD display (optional) to show machine status, Breadboard and jumper cables for connection, Power supply suitable for motor and Arduino. As shown in Figure 2.

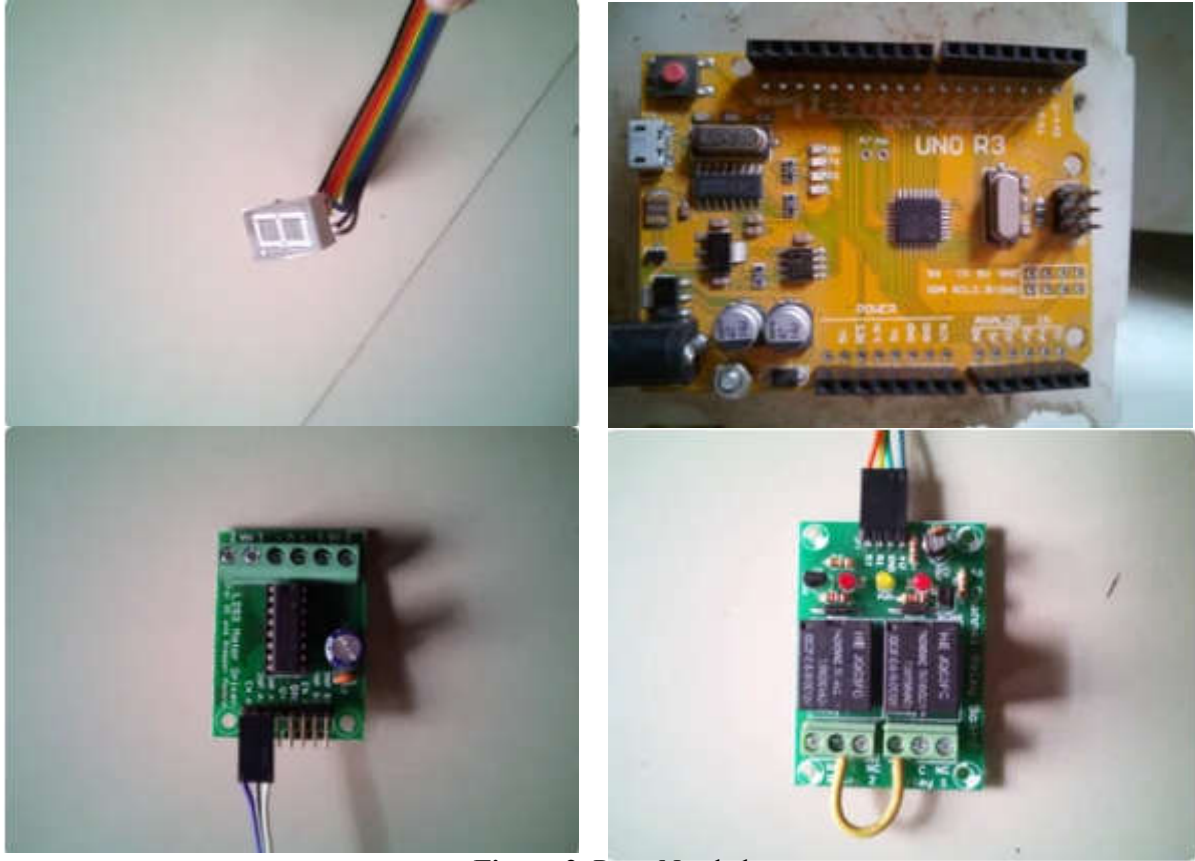


Figure 2. Parts Needed

The following is a model design for converting a manual clothes washer to an Arduino-based semi-automatic one. This design includes mechanical and electronic parts, as well as the workflow of the system.

- System Block Diagram

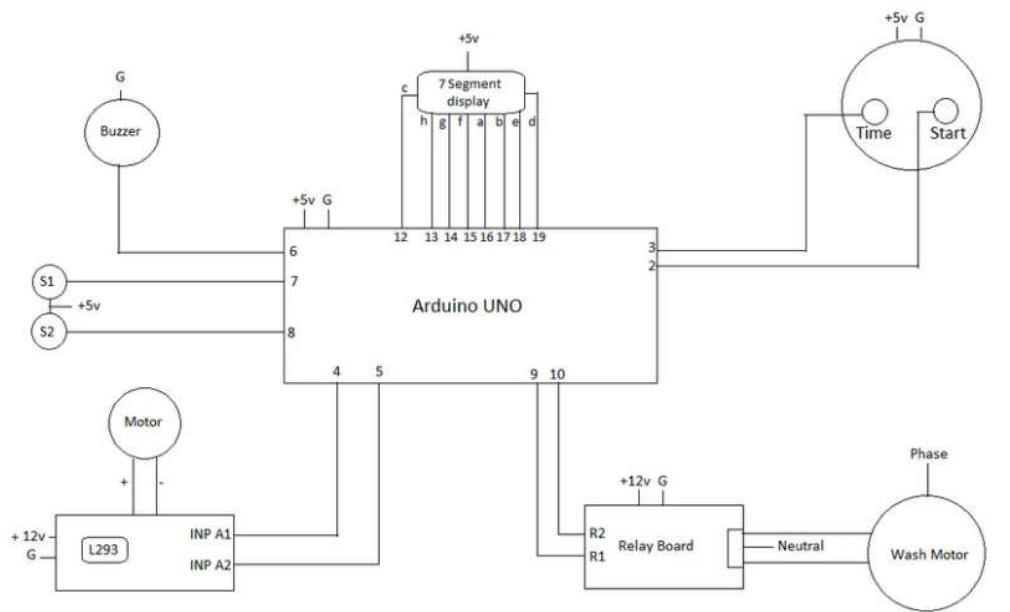


Figure 3. System Block Diagram

- Initialization: The system is powered on, and the Arduino initializes all components.
- Start: The user presses the button to start the wash cycle.
- Water Filling:
 - The solenoid valve is opened to fill the drum with water.

- The water level sensor detects when the water reaches the desired level, then the solenoid valve is closed.
- Washing Cycle:
 - The motor is activated to rotate the drum and wash the clothes.
 - The wash cycle lasts for a predetermined amount of time.
- Water Drain:
 - Once the washing is complete, the water pump is activated to drain the water from the drum.
- Rinsing:
 - The water filling process is repeated for the first and second rinse (optional).
- Squeezing:
 - The motor is reactivated at a higher speed to wring out the clothes.
- Finish:
 - Once the cycle is complete, the buzzer sounds to notify the user.
 - The LCD displays a message that the washing process is complete
- Mechanical Design

Mechanical Components include; 1) The washing machine drum is where the clothes are washed. 2) DC / AC motor functioned to move the drum to wash and squeeze clothes. 3) Solenoid Valve is to control the flow of water into the drum. 4) Water Pump is functioned to drain water from the drum. 5) Water Level Sensor to detect the water level in the drum. 6) The Squeeze Lever is used by the mechanism to squeeze the clothes (if not using a separate squeeze motor).

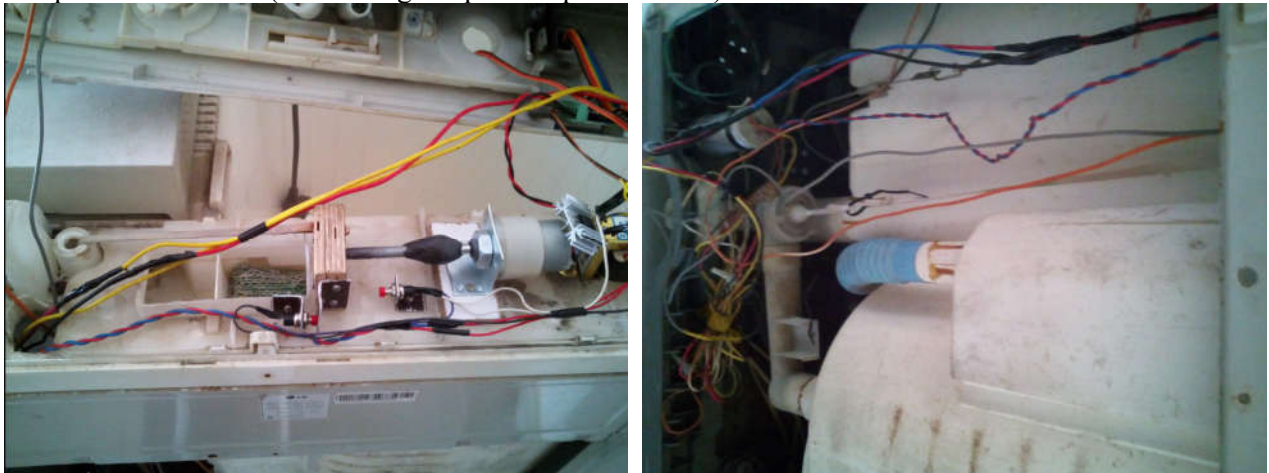


Figure 4. Drain System

- Electronic Design

Electronic Components: 1) Arduino Uno is the main controller of the system. 2) Relay Module is used to control the motor and solenoid valve. 3) Level Sensor is a sensor to detect the water level. 4) Temperature Sensor (Optional) is a sensor to measure water temperature. 5) Buzzer is used to signal when the cycle is complete. 6) LCD Display is used to display the status of the machine. 7) Button/Switch is the button to start and stop the washing cycle. 8) Power Supply is used to supply power to the motor, solenoid valve, and Arduino.

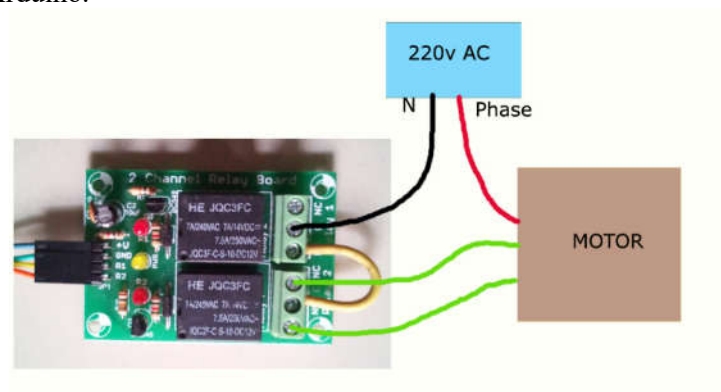


Figure 5. Washing Motor Control and Wiring

CONCLUSIONS

Converting a manual clothes washer into an Arduino-based semi-automatic one is an innovative and efficient solution to increase convenience and effectiveness in the clothes washing process. The design of this conversion model provides a complete guide to convert a manual washing machine into a semi-automatic one, improving the efficiency and convenience of daily use. With proper implementation, this project can provide an effective and cost-effective solution for household users.

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