

Constantinescu Radu - Multifunctional Windshield Wiper

Introduction

This project describes a smart windshield/window wiper that can be actioned both manually and automatically when it detects that the surface is wet enough. It has a display to indicate the wetness, a button to switch between automatic and manual mode and a button for manual mode that activates the wiper.

General Description

List of Components

1. Arduino UNO
2. Push Buttons
3. Servo Motor
4. LCD Display
5. LED
6. Buzzer

1. Arduino UNO acts as the central unit that coordinates all modules, processes inputs, and controls outputs.
2. Buttons allow the user to control the operation mode and the wiper speed.
3. Servo Motor simulates the movement of the wipers, being controlled via PWM from the Arduino.
4. LCD Display shows information about the current state and operating mode.

- 5. LED provides visual feedback about the system's operation.
- 6. Buzzer delivers audible alerts during mode changes or when errors occur.

Hardware Design

Diagram



Electric Scheme



Bill of Materials

Component Name	Source	Datasheet
Arduino UNO	https://www.emag.ro/kit-de-programare-arduino-uno-r3-pagmil-pentru-inceptorii-display-icd-telecomanda-multicolor-m4/pd/DQ7JXSYBM/	https://docs.arduino.cc/resources/datasheets/A000066-datasheet.pdf
Servomotor	https://www.emag.ro/kit-de-programare-arduino-uno-r3-pagmil-pentru-inceptorii-display-icd-telecomanda-multicolor-m4/pd/DQ7JXSYBM/	http://www.ee.ic.ac.uk/pcheung/teaching/DE1_EE/stores/sg90_datasheet.pdf
Button 1, 2	https://www.emag.ro/kit-de-programare-arduino-uno-r3-pagmil-pentru-inceptorii-display-icd-telecomanda-multicolor-m4/pd/DQ7JXSYBM/	https://www.farnell.com/datasheets/2171929.pdf
Buzzer	https://www.emag.ro/kit-de-programare-arduino-uno-r3-pagmil-pentru-inceptorii-display-icd-telecomanda-multicolor-m4/pd/DQ7JXSYBM/	https://components101.com/sites/default/files/component_datasheet/Push-Button.pdf
Display LCD	https://www.emag.ro/kit-de-programare-arduino-uno-r3-pagmil-pentru-inceptorii-display-icd-telecomanda-multicolor-m4/pd/DQ7JXSYBM/	https://components101.com/sites/default/files/component_datasheet/Push-Button.pdf
Water Sensor	https://www.emag.ro/kit-de-programare-arduino-uno-r3-pagmil-pentru-inceptorii-display-icd-telecomanda-multicolor-m4/pd/DQ7JXSYBM/	https://curtocircuito.com.br/datasheet/sensor/nivel_de_agua_analogico.pdf?srsltid=AfmB0ooe3MdlHvFgHrDB80XTHUav9u0m59NW9-LnwV5f97U0Hj_Kc3V

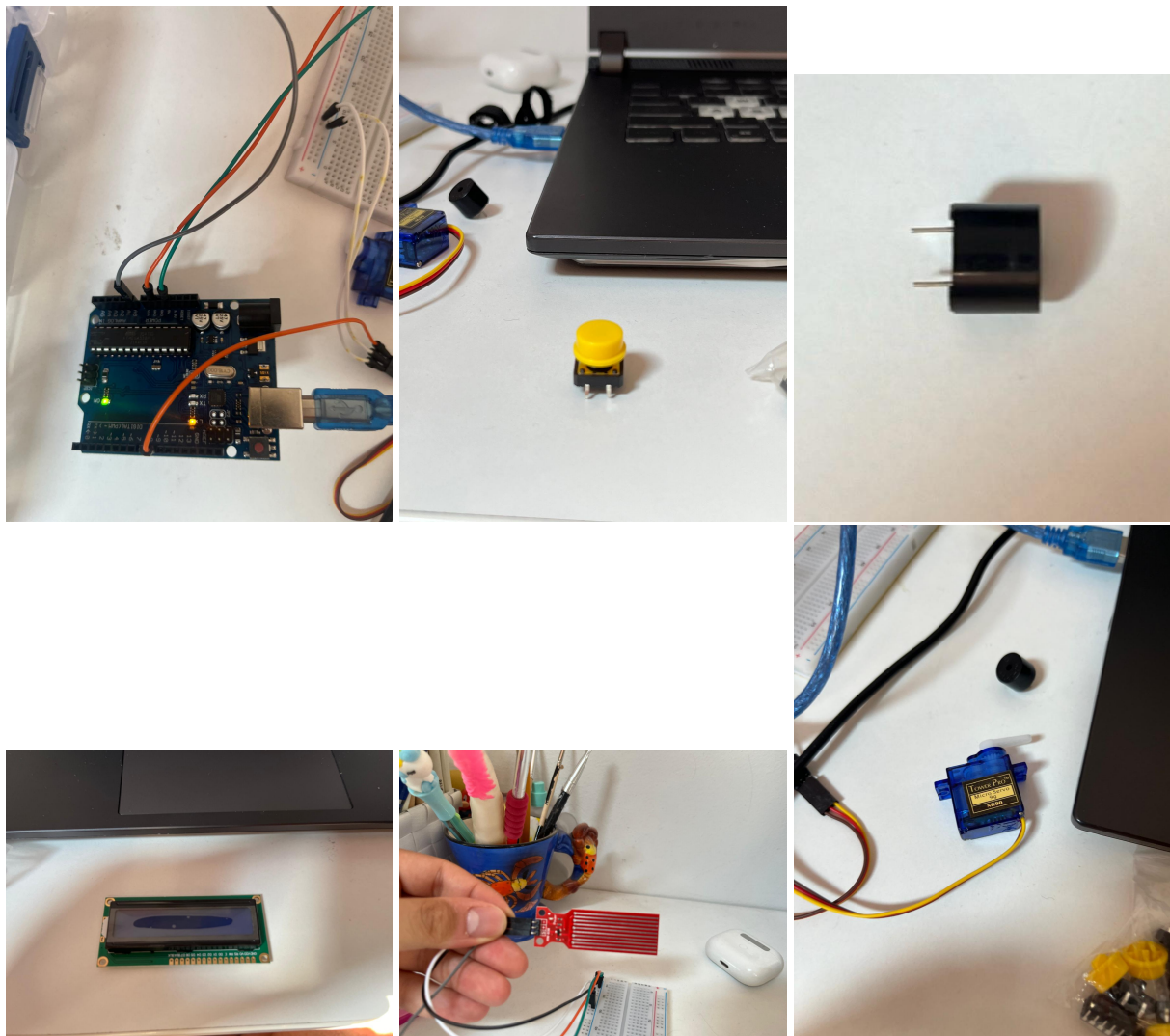
Components Description

- Arduino UNO R3 - the microcontroller used;
- Push Button - basic arduino buttons used for changing the mode or actioning the wiper
- Servo motor SG90 - servo motor used for actioning the wiper
- ADIY Sensor - used for measuring the humidity of the windshield
- Passive buzzer - used to alert the user that the wiper is working
- LCD Display - used to indicate the mode

Arduino Pins:

- A0 - used for analog reading of the water sensor value
- A4/A5 - used for connecting the SDA/SCL lines of the LCD
- 2 - pin used for the mode change button
- 3 - pin used for the wiper activation button in manual mode
- 5 - used for PWM signal to control the buzzer
- 9 - used for the servo motor

Gallery



Software Design

Development Environment

The development environment used for this project was the Arduino IDE, which is easy to use, but also offers support for writing code using the registers and interfaces supported by the Arduino UNO.

External Libraries

Library	Used for	Required because
Servo.h	Controlling the servo motor	Rotating/Moving a servo motor
avr/interrupt.h	Low-level interrupt control	Using ISR() and hardware registers
Wire.h	I2C communication	LCD is connected via I2C
LiquidCrystal_I2C.h	Displaying text on the LCD	High-level LCD control over I2C

Used Interfaces - Lab Usage

- ISR - when actioning a button, an interruption is triggered
- PWM - for actioning the buzzer
- I2C - for displaying the state

- USART - for debugging and console information

Source Code

[source_code.zip](#)

Results

Video proof of raw design and with the whole product

https://drive.google.com/drive/folders/123VwAVxQlJmBttF90n_Psw8wdLOVLCND?usp=drive_link

Download

[final.zip](#)

Resources

- <https://projecthub.arduino.cc/daryllqayyim/water-sensor-basic-13d33f>
- <https://forum.arduino.cc/t/understanding-isr/879653>
- <https://github.com/fdebrabander/Arduino-LiquidCrystal-I2C-library>
- <https://sigmanortec.ro/servomotor-sg90-360-continuu>
- <https://www.optimusdigital.ro/ro/?srsltid=AfmBOorPDAUjiUHljGVcB138-fKPVfHSRtsjjfzg-BG8uQtQrKf3puhm>
- <https://www.circuito.io/blog/arduino-uno-pinout/>

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