PROJECT REPORT

ABSTRACT

Project Title: Automatic Rain Sensing Car Wiper System

The turn of the century has seen a tremendous rise in technological advances in the field of automobiles. With 5G technology on its way and the development in the IoT sector, cars will start interacting with each other using V2V communications and become much more autonomous. In this project, an effort is made to move in the same direction by proposing a model for an automatic car wiper system that operates on sensing rain and snow on the windshield of a car. We develop a prototype for our idea by integrating a servo motor and raindrop sensor with an AT89C51 Microcontroller

Detail Requirements

High Level Requirements

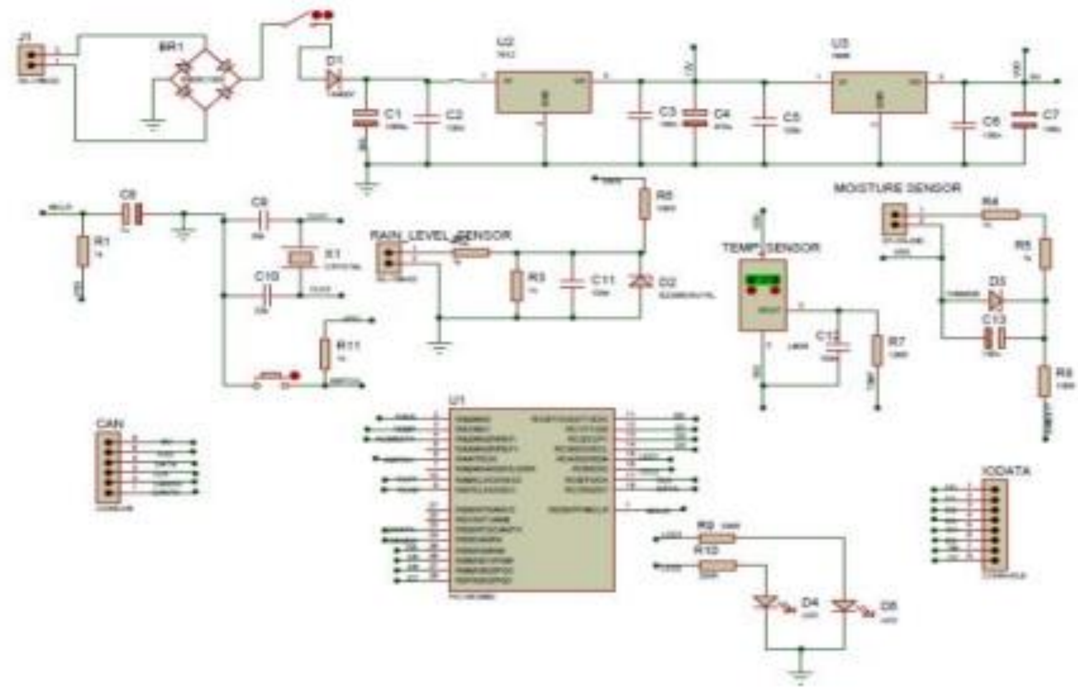
ID	Description	Status
HR01	AT89C51	Implemented
HR02	Transformer	Implemented
HR03	Rain Sensor	Implemented
HR04	Servo Motor	Implemented
HR05	Power Supply	Implemented

Low Level Requirements

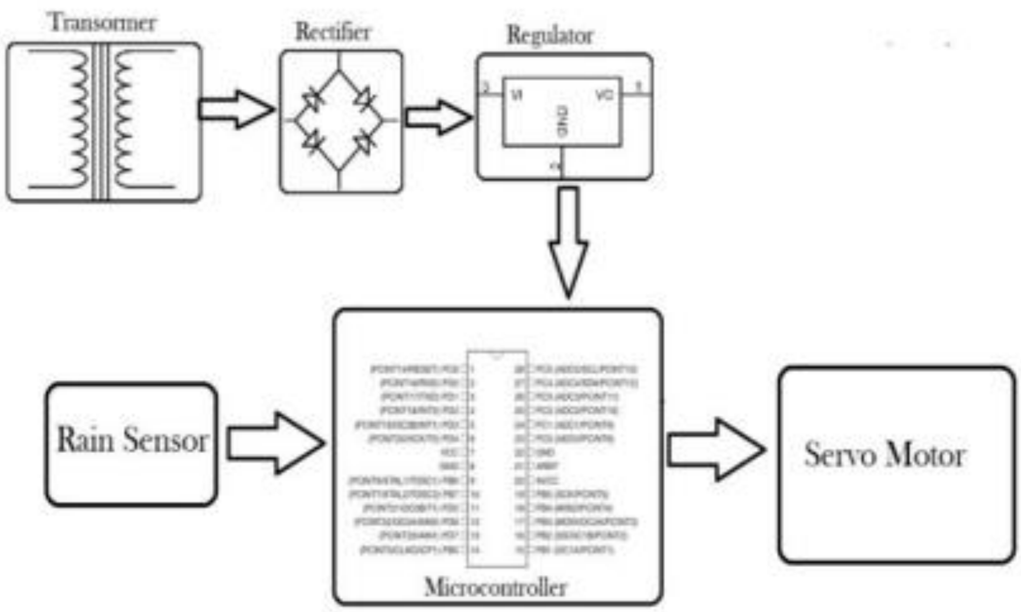
ID	Description	Status
LR01	Rectifier	Implemented
LR02	Regulator	Implemented

Design

The project implemented here is one such project where the microcontroller based system Rain Sensing Automatic Car Wiper.



BLOCK DIAGRAM



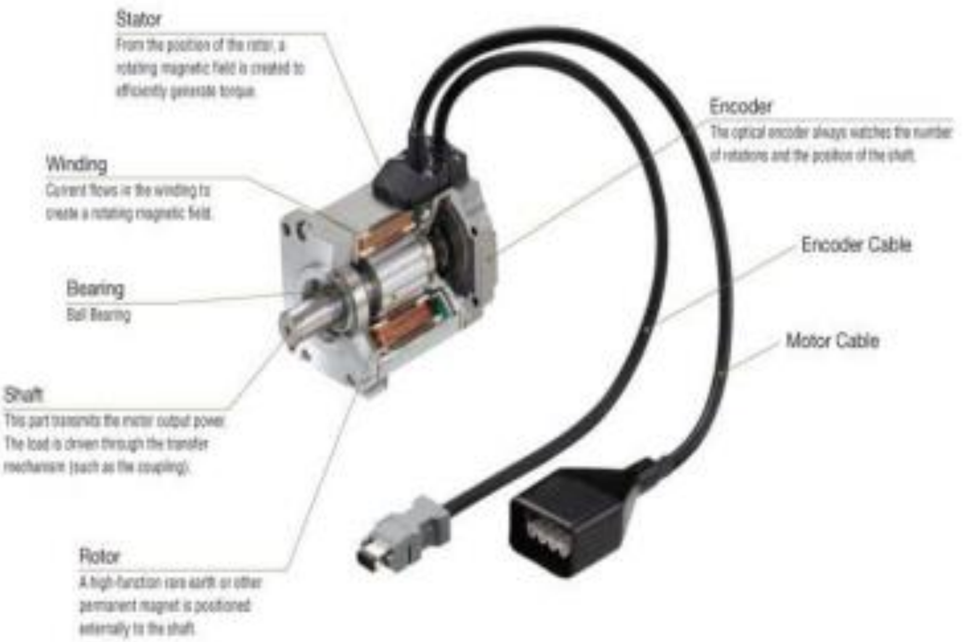
Component Description

1.Rain Sensor Module:

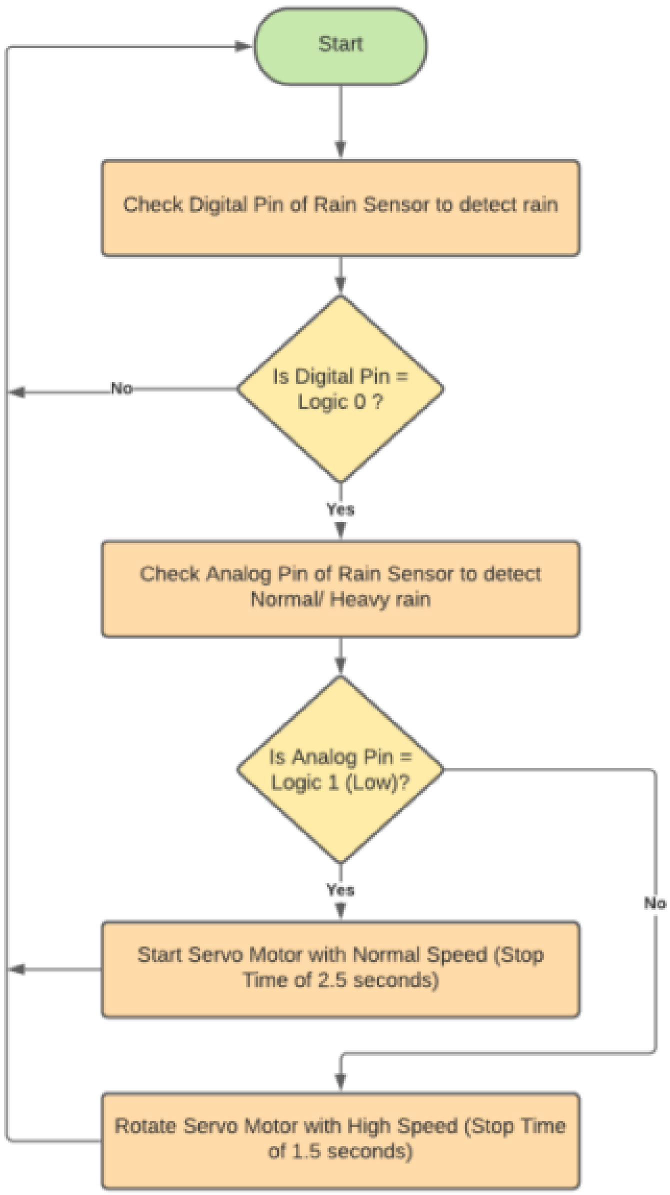
A rain sensor module is an easy tool for rain detection (Gupta et al.). It can be used as a switch when a raindrop falls through the raining board and for measuring rainfall intensity. Figure 3 shows a depiction of a typical Rain Sen sor Module. Due to its compact design and light weight, it can be easily attached into any system. The module fea tures, a rain board, and the control board that is separate for more convenience, a power indicator LED, and sensitivity adjustable through a potentiometer. A raindrop sensor is a board coated with nickel in the form of lines. It works on the principle of ohms law. When there is no raindrop on board. Resistance is high so we get high voltage according to V=IR. When raindrop present it reduces the resistance be cause water is a conductor of electricity and the presence of water connects nickel lines in parallel so reduced resistance and the reduced voltage drop across it.

2.Servo Motor

Servo motors (Sachin & Gaonkar, 2013) are self-contained mechanical devices that are used to control the machines with great precision. Usually the servo motor is used to control the angular motion from 0° to 180° and 0° to 90°. The servo motor can be moved to a desired angular position by sending Pulse Width Modulated (Holtz, 1992) signals on the control wire. The servo understands the language of pulse position modulation. A pulse of width varying from 1 millisecond to 2 milliseconds in a repeated time frame is sent to the servo around 50 times in a second. The width of the pulse determines the angular position. For example, a pulse of 1 millisecond moves the servo towards 0°, while a 2 milliseconds wide pulse would take it to 180°. The pulse width for in-between angular positions can be interpolated accordingly. Thus a pulse of width 1.5 milliseconds will shift the servo to 90°. It must be noted that these values are only approximations. The actual behavior of the servos differs based on their manufacturer. A sequence of such pulses (50 in one second) is required to be passed to the servo to sustain a particular angular position. When the servo receives a pulse, it can retain the corresponding an gular position for the next 20 milliseconds. So a pulse in every 20 millisecond time frame must be fed to the servo. Figure 4 shows an example of the servo motor we have used in our implementation, while Figure 5 shows the operation of servo motor based on Pulse Width Modulated signals.



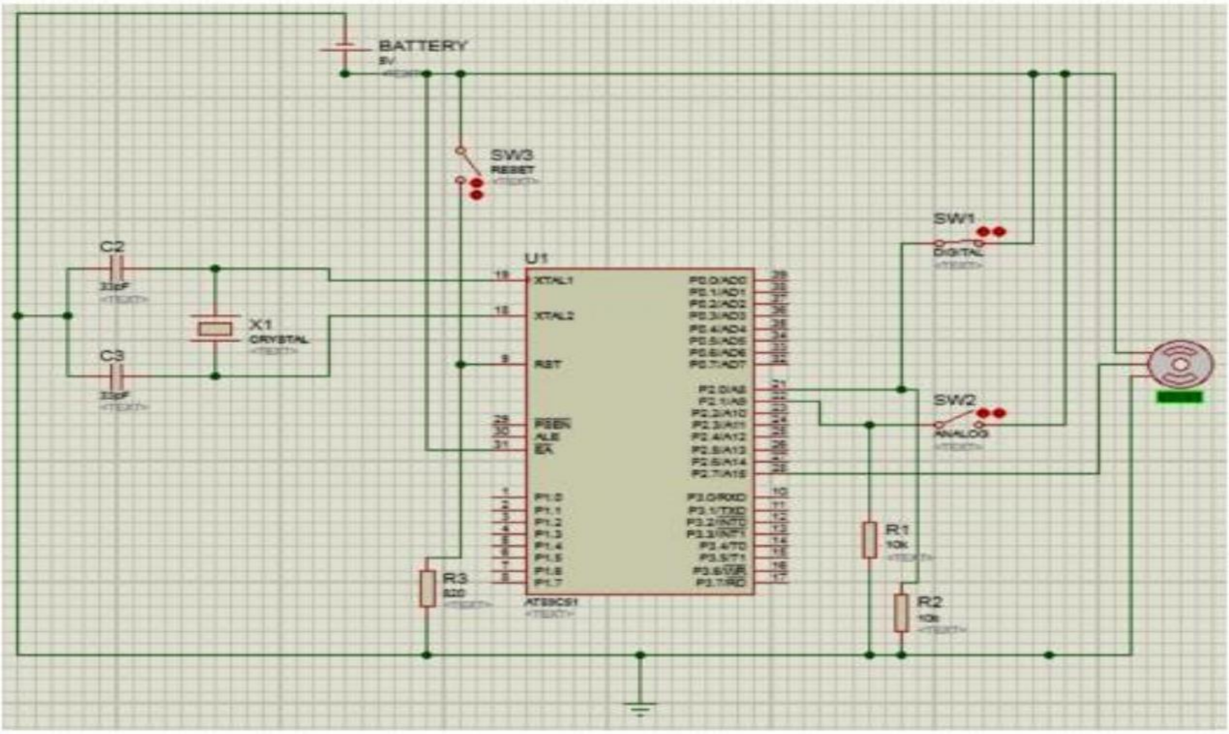
FLOW CHART


Start
Check Digital Pin of Rain Sensor to detect rain
Is Digital Pin = Logic 0 ?
No
Yes
Check Analog Pin of Rain Sensor to detect Normal/ Heavy rain
Is Analog Pin = Logic 1 (Low)?
Yes
No
Start Servo Motor with Normal Speed (Stop Time of 2.5 seconds)
Rotate Servo Motor with High Speed (Stop Time of 1.5 seconds)

TEST CASES

Test ID	Description	Expected Input	Expected Output	Actual Output	Pass/Fail
TID_01	Car wiper control	Function values	SUCCESS	SUCCESS	PASS
TID_02	Sensor control	Function values	SUCCESS	SUCCESS	PASS
TID_03	Servo motor control	Function values	SUCCESS	SUCCESS	PASS

OUTPUT



Thus, we have implemented a model that senses rains and automatically switches on the wiper and adjusts its speed according to the intensity of the rain. As the intensity of the rain increases, the speed of the wiper increases to a certain level. Figure 6 shows the workflow for our proposal. The microcontroller checks for the digital pin and analog pin inputs of the rain sensor. When there is slight water on the sensor, the digital pin is set to logic ’0’. This is used to detect presence of rain water. To check the intensity of rain, we monitor the analog pin output of the rain sensor, whose threshold can be adjusted manually through an attached Potentiometer to indicate how much water should be considered as high rain. According to our observations, the wiper takes 2.2 seconds when a drop of water is poured on the sensor, while it takes only 1.4 seconds when the sensor is submerged in a glass of water. We learned how to interface servo motor with AT89C51 Microcontroller and the rain sensor module interfacing with AT89C51 Microcontroller. Figure 10 shows the prototype we have developed to demonstrate our idea