

Automated Automobile Cleaning System Using PLC and LabVIEW

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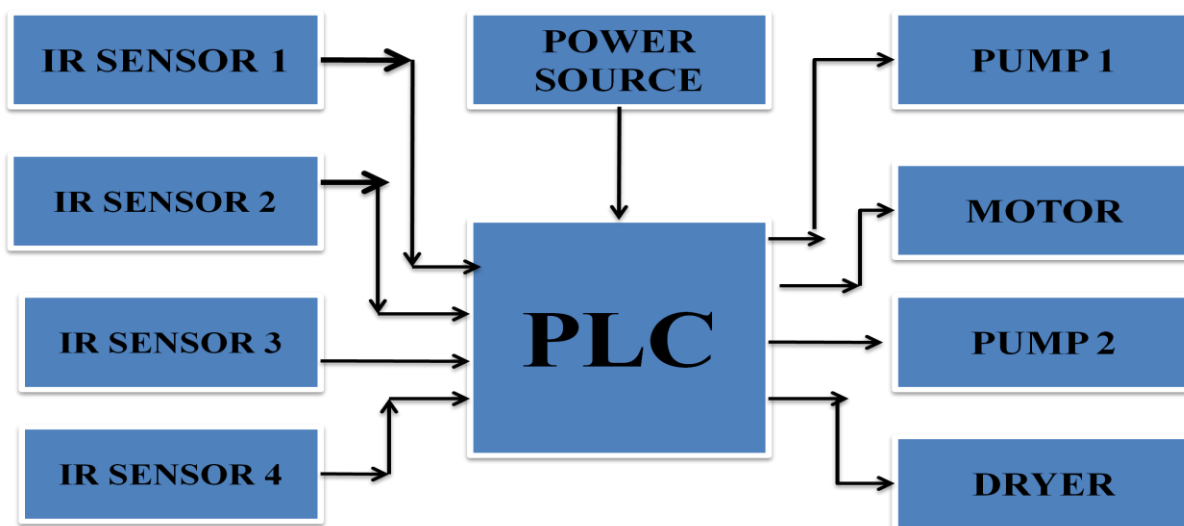
Abstract — The objective of this paper is to explain the method of designing a PLC based automobile cleaning system. Out of all the resources we human have, time is the most important one. So keeping this aspect as the basic theme of saving time and utilizing the time when an automobile is idly parked, this paper has been developed. Basically the idea is to first detect a parked car by means of an IR sensor. It's then sprinkled with soap water. As soon as a definite amount is sprayed, the sprayer stops and the conveyor belt starts moving until the next position of the brushes. This process of detection, stop and start of the belt and further processes involved in cleaning i.e. spraying water and drying are carried on further. To make the system more time efficient, more than one automobile can be cleaned at a time, by properly adjusting the time intervals.

Keywords- IR Sensors, PLC (Programmable Logic Controller), Conveyor belt, Relays, Switches

I. INTRODUCTION

Automobiles, especially cars can be either manually or mechanically cleaned. Manual cleaning requires a lot of time and labor. Furthermore, the result may or may not be satisfactory. Mechanical cleaning may be automatic or manually run. Again, the non-automated ones require more time and people to run the systems. So, the best way is opting for the third i.e. automatic cleaning, in which the switching on and off of processes are controlled by a controller based on the responses of the sensors. Here, we have chosen PLC as the one who does the part of the controller. This project utilizes a lot of water and so, water reusing system is a fundamental part of this automated car washing system yet at this stage, we have only explained the car washing part. We'll be working on the water recycling part in the next stage. Here, first the block diagram will be represented and explained.

II. BLOCK DIAGRAM

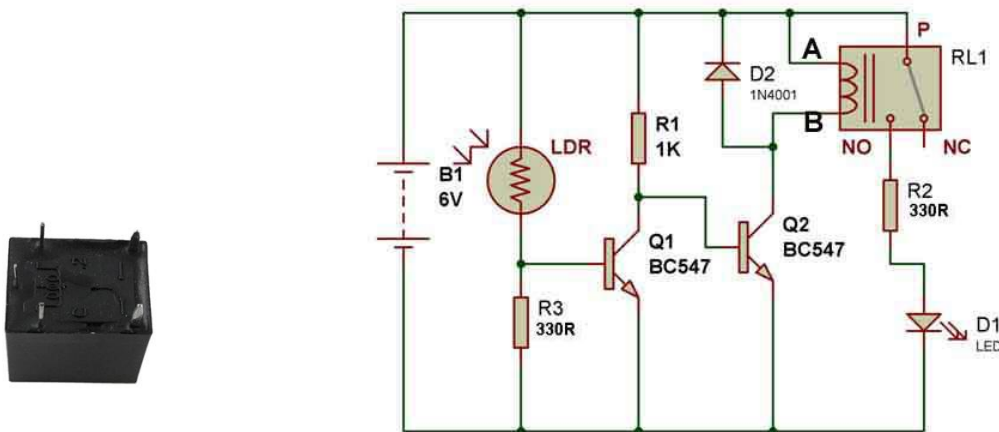


2.1 PLC

A PLC, programmable logic controller, or programmable controller is a digital computer used for automation of basically the industrial processes such as amusement rides or assembly lines. They have many digital and analog input-output ports and are able to be worked upon in extended temperature ranges. They have good immunity to noise and resistance to vibration and impact. Programs can be uploaded from or downloaded onto a PLC through Ethernet, RS-232, RS-485, or RS-422 cables from a computer. Sometimes the programs are also transferred through a removable chip such as an EPROM. The PLC used in this paper has been programmed using ladder logic which is a logical representation of NOs (normally open) switches and NCs (normally closed) switches.

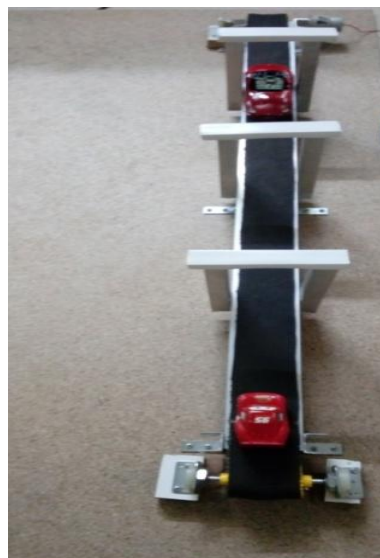
2.2 Relays

Relay is basically a switching device which has three main shifts, namely, NO, NC and Common. NC stands for normally closed and NO stands for normally open. The middle one is Common, having a supply of 230V. A relay has a coil wound around a soft iron core which when is completed by a circuit, shifts the NO to NC state and NC to NO state. Thus, if a device is to be run continuously unless triggered, it is connected to NC or else if it is to be started when triggered, it is connected to NO. In this paper, when the automobile is detected by the IR sensor, it sends a high pulse to the relay, which then intimates the PLC to switch on the required cleaning process. PLC works at 24V whereas sensor gives out a 5V detection. Hence, relays are required to convert the 5V detection to 24V.



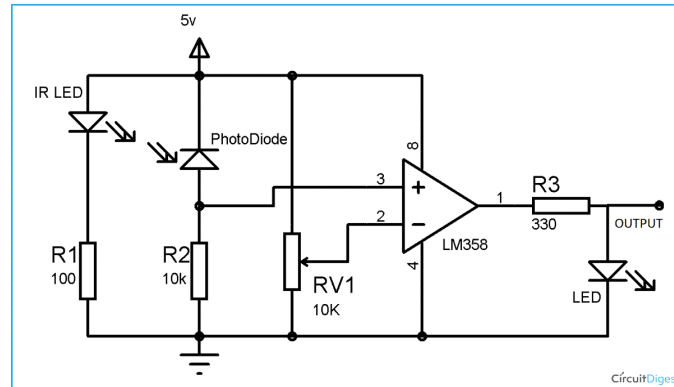
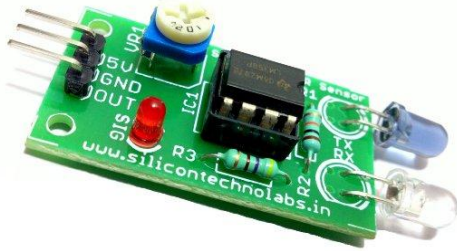
2.3 Conveyor Belt

The conveyor belt provides the transportation facility to the automobile to be cleaned while in the cleaning process. It moves on the rotation of the motor on which it goes. The start and stop of that motor occurs on the instructions provided by the PLC. As the motor moves, the conveyor belt shifts the vehicle through the consequent cleaning stages.



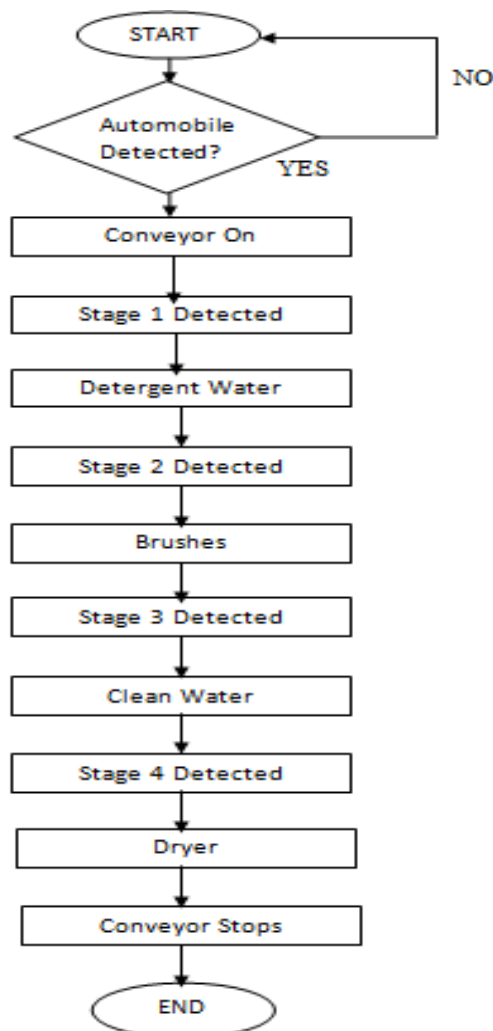
2.4 IR Sensor

IR sensor is actually a small arrangement of an LED (light emitting diode) and a photo diode. They are kept on the opposite sides of the conveyor belt at various stages. As shown in figure, the photo diode is connected in reverse bias to the 5V source due to which the relay is connected to ground and is not in excited state. As soon as the automobile blocks the light coming out from the LED, the working of photo diode stops and current is flown from the source to the relay, which makes it excited. This denotes detection of the automobile which is then intimated to the PLC.

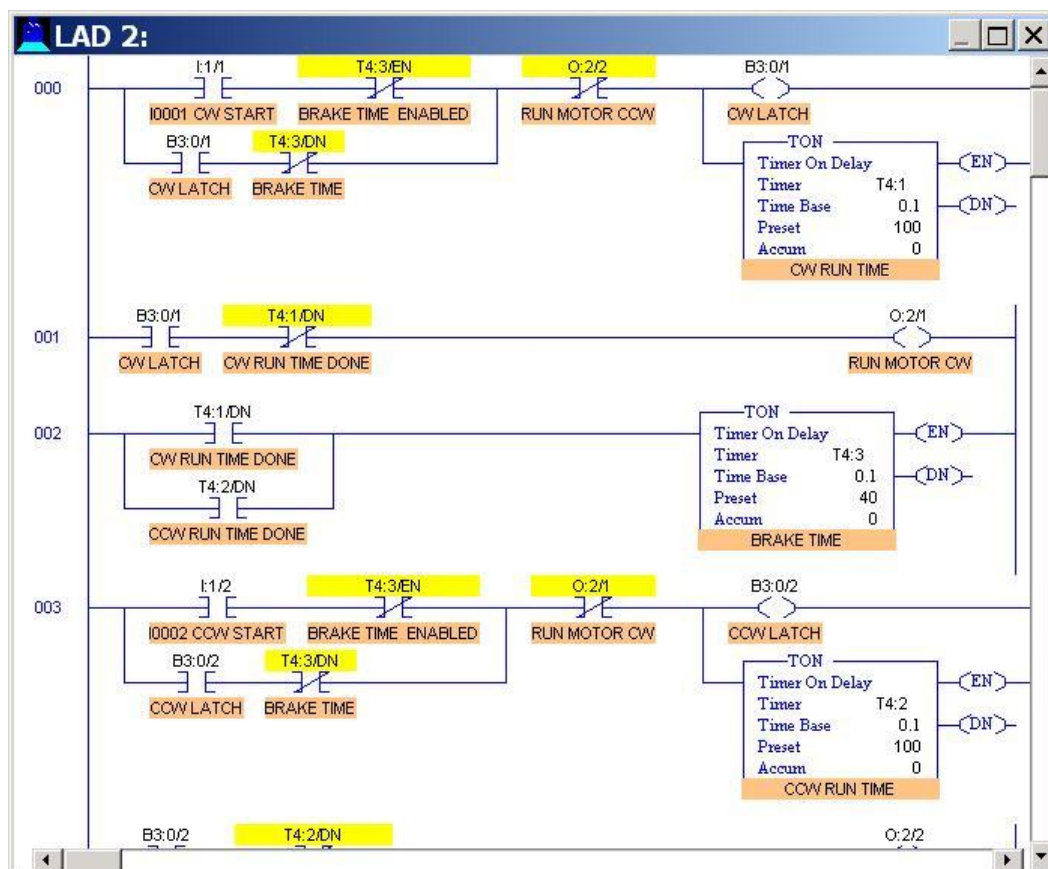
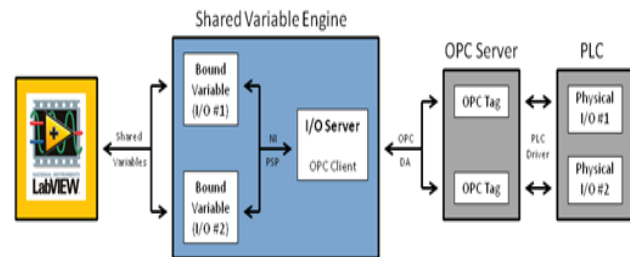
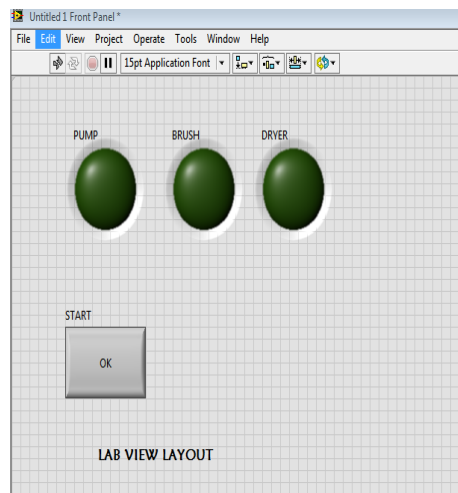


III. WORKING AND FLOW CHART

- The car is first detected by IR Sensor1 which intimates the PLC to carry on the complete process of cleaning, starting with first turning on the motor, running the conveyor which then moves the car through 4 stages.
- At the first stage, soap water is sprayed upon the car by pump1.
- When it nears the 2nd stage, IR Sensor2 detects it which triggers the motion of the brushes acting as scrubs.
- As soon as IR Sensor 3 detects the car at the 3rd stage, pump2, for spray of clean water starts which cleans off the soap water along with dirt.
- Finally as IR Sensor4 detects the car, the dryer is switched on by the PLC and the car is good to go.



IV. INTERFACING AND CODING



V. RESULT AND CONCLUSION

This prototype is an excellent method to automatically clean cars or other automobiles efficiently, less laboriously and in much more time efficient way than the conventional methods. In this system, more than one car can be cleaned simultaneously. By simply adjusting the system to make more components be active at a particular time and wisely adjusting the time intervals say, the 1st car is dried while the 2nd is brushed and the 3rd is cleaned and so on we can increase the efficiency and effectiveness of the system by reduction in the time and energy consumed

VI. FUTURE SCOPE

This project utilizes a lot of water and so, water reusing system is a fundamental part of this automated car washing system. Yet at this stage, we have only explained the car washing part. We'll be working on the water recycling part in the next stage. Also this project can be effectively incorporated with the car parking areas for better utilization of time.

VII. REFERENCES

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