AUTOMATED ACR WASHING SYSTEM

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Abstract: **Automation is a need of time. With the increasing speed of life, the demand to perform tasks at a higher speed is being laid out too. This has ultimately led to a massive increasein the number of vehicles. To clean these vehicles there is a need for a proper washing system. The most common problem often encountered while cleaning these vehicles is time-consuming and overuse of water; one of the problems is overuse of water, in- country like the time there are still places where people don't get water for 10-15 days and we are wasting the water for the just carwash. time is a commodity that needs to be managed effectively and efficiently to maximize productivity. So, this project is developed to reduce the time to clean vehicles. In developed countries, automatic car washing system is already implemented and being used extensively but in developing countries like India,it's still uncommon and has a lot of potential for developing this system. In this automatic car washing project, we have useda conveyor belt on which the car will go through the various washing stages. When we press a switch conveyor belt on which the car is initially brought by a serviceman starts moving. Sensorsare placed at the platform adjacent to the moving conveyor belt at different places for car detection. When the first sensor senses the car, the process is turned on and the conveyor starts moving. In this process, several stages are followed for the entire carwashing named as soap water cleaning, brushing, clean water pouring drying. Hence the exterior of the car will be washedand this process is controlled by the PLC. Whether the exteriorof the car is cleaned properly or not can be easily detected bythe machine vision algorithm. in this, we have used the machine vision algorithm to check whether the car is cleaned or dusty before and after washing.**

Index Terms - **Automation, car washing system, PLC, machinevision algorithm**

I. INTRODUCTION

India's annual production in FY 2021 was 22.7 Mn vehiclesand 13 million vehicles from April to October 2021. Overall, Indian automobile export was 4.1 million vehicles in FY21. Indian automobile exports stood at 1,419,430 units from April2021 to June 2021 as compared to 436,500 units from April 2020 to June 2020.[7][8] Since due to increase in car productionis increasing day by day in the country. as an increase in car washing and looks also matter. in today's, people want their cars to behave good looks. so, cleaning the car is necessaryand people don't have much time to spend on cleaning the system. so automation washing help to keep their car look good by automatic washing with less time. Even by usingthis technology water can also be saved as compared to the traditional method of car cleaning manually. Car washingis a simple activity done to keep the exterior of the car clean. Mostly it is done manually in automobile garages or service centers of automobile companies. so by using an automated car wash 85 percent of water can be saved.The very first completely Automated Car Wash machine in Seattle, WA, came to life in 1951. This transformed theway people cleaned their cars and contributed to incredible investment possibilities for many businesses, opened by three brothers-Archie, Dean, and Eldon Anderson.[10][11]

II. PROBLEM STATMENT

As many developed countries use the automated car wash- ing system whereas India's car wash services still use the traditional method of car washing i.e., still manual cleaningor using use of high-pressure water gun is been used. This causes a lot of water waste .by using the manual methodthere is no control over the water discharge during the car wash system. Manual washing a of car consumes 40 to 140 gallons liters of water which means a car wash would consume182-637 liters of water in just one wash. In our country still, people wash their car on roads, society premises which causea lot of environmental issues by using this method of carwashing the system is less automated since we are in the worldof automation this process makes the low automated system. Even by using this system, there is possible car body damageif the pressure of the water gun increases. This manual way of car washing will result in more water consumption and waste of water. Even it will need more manpower, and energy aswell as it will take more time for cleaning.

III. OBJECTIVE

The objective of our project is to make a fully automated system. Other objectives are to reduce the water because usingmanual car washing consumes lots of water.to analyze the water required for the car wash depending on the size ofthe vehicle by making the process automated. we can savetime as well as energy by installing the automated car wash system and analyzing the amount of time required to wash the system. This will also reduce the manpower since manual washing requires more manpower.to verify the difference be- tween the manual car wash system and automated car system depending on water used and time required. The system canbe implemented using the plc which is environment-friendly and easy to use a controller. The next objective is that we can save the used water and can be used for the next process thatis by using the filters we can reuse the

used water again forthe next cleaning process.by using the machine vision we can check whether the car is proper wash or not this becomes the another objective for the project.
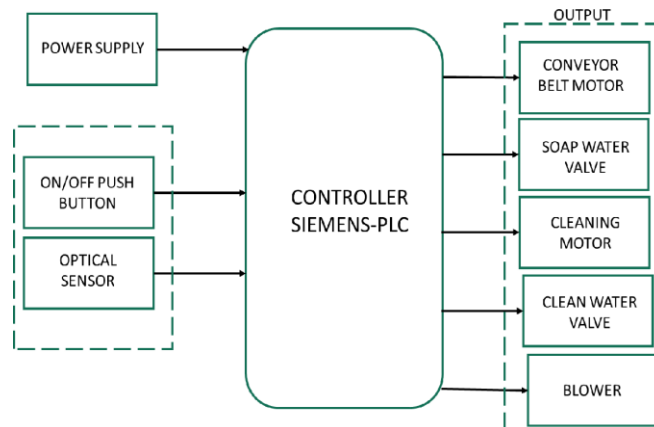
IV. BLOCK DIAGRAM

A.car washing system
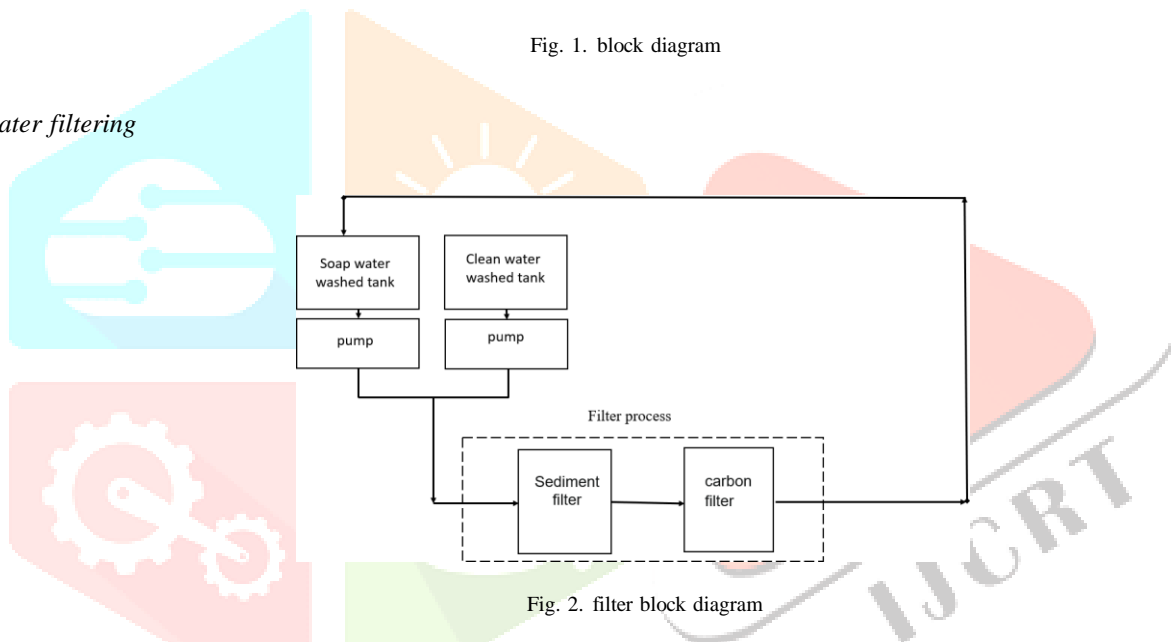

Fig. 1. block diagram

B.water filtering

Fig. 2. filter block diagram

V. PROCESS FLOW

The fig 3 shows the complete car washing system. in this system the car will enter on the conveyor and as soon as the sensor will detect the car the first stage is soap water cleaning will take place after that car will move to the next station that is brushing station here the cleaning of the car will take place process the done the car will move to the next stage that is clean water wash and then at the last stage the dryingof the car will take. This is the car washing system. In thenext part, the water that is been used will be stored and that water will be reused using the filtering process. the filtering process is been explained in the latter part of this chapter ofthe report. So this is the complete idea of the system[2][3][4][5]

Fig. 3. block diagram

1.Soap Washing

In an automated car washing system, the primary stage is car washing. In this first stage, the car is to be washed using soap water spray to remove dust or mud from the outer body and wheels of the car. This process is currently done manually in garage or automobile service stations. In our project we will use an automatic system that is when the car is sensed onthe conveyor belt by the proximity sensor, will send a signalto the plc and plc will command the solenoid valve and solenoid valve will get opened and hence water is sprayedon the car. Here in this stage washing is done with the Foamto remove the dirt. When this stage is completed, the car is moved ahead to the next station.

2.Cleaning

In this system after washing the next stage, the process is called Cleaning. In cleaning, the car is sensed by the sensor, and the mechanism of the motor with a brush is used for cleaning. A set of horizontal brushes wash the top, front, and rear of the vehicles. Two sets of side brushes wash the area around the vehicles, and another set of wheel brushes cleans the wheel. The water rinses away. After the cleaning, the car moves to the next station.

3.Water Washing

In an automated car system after cleaning next stage is car washing using clean water. In this stage, the car is to bewashed using clean water spray to remove if any soap isremained on the outer body and from the wheels of the car. This process is currently done manually in garage orautomobile service stations. In our project we will use anautomatic system that is when the car is sensed on the conveyor belt by the proximity sensor, will send a signal tothe plc and plc will command the solenoid valve and solenoid valve will get opened and hence water is sprayed on the car. Here in this stage washing is done with clean water to remove any soap or dirt. When this stage is completed, thecar is moved ahead to the next station.

4.Drying

In our system, this is the last stage After water washing the further process is called drying. In drying, the car is sensedby the proximity sensor, the proximity sensor will send the signal to plc and plc will energize the dryer/fans start. Acompressed air dryer or fan is used for removing water vapor from compressed air which is commonly found in a widerange of industrial and commercial facilities. Hence the car will be dried using the dryers. After this stage, the car iscleaned, and hence the conveyor belt starts, and the car is removed from the conveyor belt.
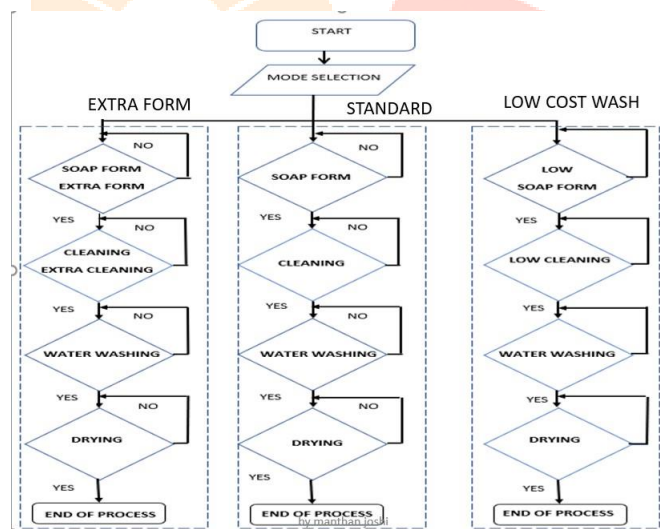
VI. DIFFERENT TYPE OF CAR WASHING

Fig. 4. block diagram

In-car washing, there will be three types of wash depending on the customer's need and the amount of dirt on the car.

1.Standard process

The standard cleaning process will be done by all types of customers. in this process, the normal washing of the car will be done through all the four-stage processes shown in the above flowchart.

2.Extra form cleaning

In this process, more forms will be applied so the number of forms will be more than the car cleaning time will increaseand this process will be done for the dirtier cars. This process will take more time and water as compared to the standard cleaning.

3.Low car washing

In this process the less form will be applied so the amount of process will be low then the car cleaning time will decrease and this process will be done for those who just want toclean their car regularly. This process will take less time and water as compared to the standard cleaning.
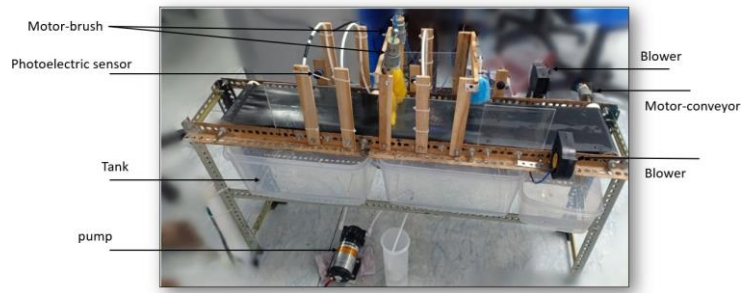
VII. HARDWARE
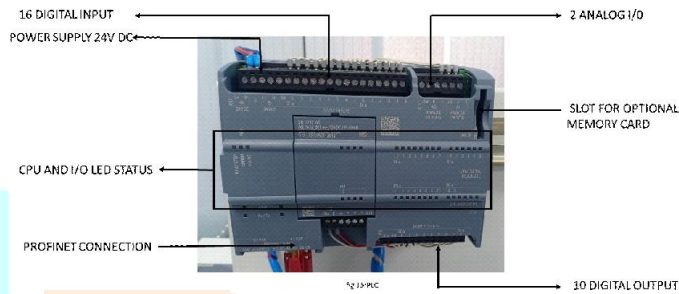

Fig. 5. Hardware

A.PLC

Fig 6. PLC

B. PHOTOELCTRIC SENSOR

specification: • 4-wire sensor with Vcc, ground, NO, and NC
• Waterproof • Detection Distance: Up to 700 mm • SupplyVoltage (V) 10-30VDC

Fig. 7. photoelectric sensor

C.DC Motor

specification: • Supply voltage: 24 V DC 2 wire • Rpm:100rpm

fig 8. DC motor

D. DC pump

specification: • Supply voltage: 24 V DC • Maximum cur- rent is less than 3.0 amp • Inlet pressure: 20 psi • Self suction: less than 5.0 meter • Open flow greater than 2800ml/min • Working flow greater than 2400ml/min

Fig. 9 dc pump

E.Dc blower

specification: • Supply voltage:- 24 VDC • Current :- 0.33ampere • Speed:- 2700 RPM • Power Connection:- 2 wire's

Fig. 10 dc blower

VIII. MACHINE VISION

A. RESNET50

Machine vision is the capability of a computer to perceivethe environment. One or more video cameras are used with analog-to-digital conversion and digital signal processing. Theimage data is sent to a computer or robot controller. Machine vision is usually linked with a computer's ability to see. The term, computer vision, is used to designate the technology in which a computer digitizes an image, processes the data, and takes some type of action.

A machine vision system uses a sensor in the robot for viewing and recognizing an object with the help of a computer. Machine vision is used in a variety of industrial processes, such as material inspection, object recognition, pattern recognition, and electronic component analysis, along with the recognition of signatures, optical characters, and currency.

In our project, we are using machine vision using CNN (convolution neural network) RESNET50 residual network 50
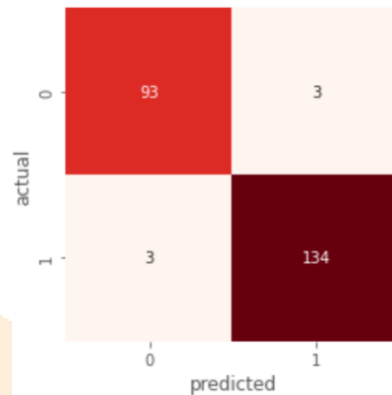
B. CONFUSION MATRIX

fig 11. Confusion matrix

1. Accuracy = (TP + TN)/TOTAL = (134+93)/233 = 0.974
2. Misclassification Rate (Error rate) = 1- accuracy =1- 0.974=0.026
3. True positive rate = TP/actual yes =134/136 = 0.985
4. False positive rate = FP/actual no = 3/96 = 0.03
5. True Negative rate = 1- FPR = 1-0.03 = 0.97
6. Precision = TP/Predicted Yes =134/137 = 0.978
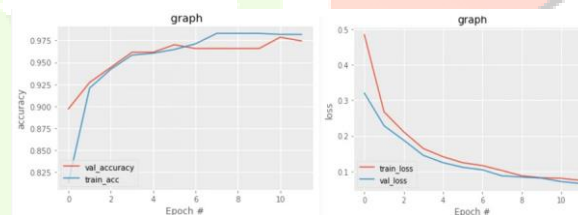

Fig 12. Graph

The machine vision accuracy of system is 97.4 percent.

IX. OUTPUT

A. CAR WASHING SYSTEM

These are the output for car washing at different stages.

Fig. 13. outputS

B. MACHINE VISION

In this we will see the output of machine vision system to check whether car is clean or dusty.In this it will detect the car is dusty before washing

Fig. 14. dusty car
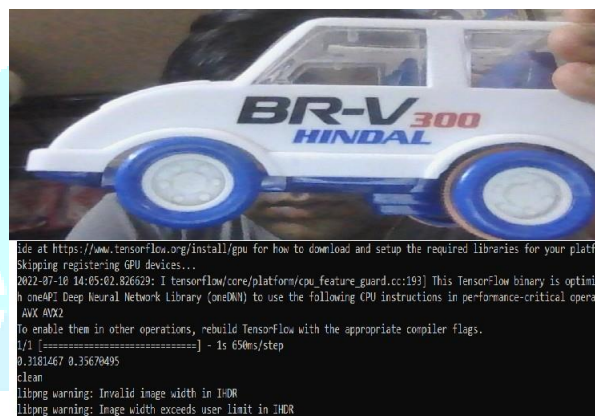
In this it will detect the car is clean after washing

Fig. 15. clean car

From machine vision, we can easily detect the car is dusty orclean.

X. CONCLUSION

We can conclude that the prototype of an automated car washing system is quite beneficial in saving water as well as the time of operation system. As per the result, we can say thataverage of 87 percent of water can be saved. The time requiredfor the washing will be approx. of 2-3 min for the prototype. With the help of the machine vision algorithm, we can clearly say that the car is completely cleaned after all the processes. With the help of filtered water is been filtered properly. This type of automated process will Save water, Save time, energy,and manpower.

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