

Automated Car Washing Unit

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Abstract

This paper presents design and development of an automatic touch less carwash system. The proposed system offers quick, convenient, and efficient carwash services. The steps involved in the car wash process consists of car peripheral mapping, adjustment of nozzles based on car peripheral mapping, and washing process. In the first step, object mapping is accomplished using appropriate sensor system. Subsequently, data acquired from sensors is processed and the relevant information regarding car periphery is stored. Finally, the position of the nozzles is adjusted (at appropriate position/angles) based on the car peripheral mapping. Once the nozzles are adjusted to appropriate angles, the washing process is initiated that includes foam spray, water spray and drying. With the intelligence incorporated in the design, the developed system is capable to consider the peripheral dimensions of objects for effective washing process.

Keywords: PLC (programmable logic control), L. M. Guide, Linear motion guide.

Introduction

Automatic Car Washing is a PLC based project. Using conveyor the first car washing system was opened in USA in 1940. This system has hoist system which was used in pull system. Now days latest advantages in science have made it possible. This was the replacement of pushing to achieve great reliability and efficiency in the automatic car washing system. PLC is an automation which plays a very important role. This conveyor course is very common in industrial countries. But in the conveyor practice having drawback that we cannot clean up the downside of the car. Then it was developed that using the pressure cylinder to lift the car so that one can clean the downside of the car.

Mr. Bambare Tejas, Ms. Bondre Varsha, Mr. Kapse Manoj, Mr. Khairnar Ketan, Mr. Kotkar in Automatic car washing and drying system explains about the use of electro-mechanical system for controlling automatic car washer. The mechanism for automatic car washer includes lifting of parallel vehicles and moving in forward direction. Then washing of vehicles takes place firstly with foam water then with soap water and again with clean water. Finally vehicle is lifted again and placed back parallel. The system is mainly divided into two section namely mechanical assembly and electrical control. It stresses the use of PLC in controlling of car washer.

Mr. Amir Hossein, Daei Sorkhabi & Bitu Khazini in Manufacturing of full automatic carwash using with intelligent control algorithm explains about the use of Programmable logic controller (PLC) in intelligent automatic car washer. The intelligent car washer has the ability to sense the dimensions of the car. The dimensions of vehicle plays important role to adjust various parameters such as washing brush position and time duration. This automation helps to increase speed, accuracy, productivity, safety along with reducing time and cost of washing.

Prof. Mhaske D.A., Bhavthankar R.G., Saindane A.R., Drade D.J. in PLC based car washing system explained about the use of PLC (programmable logic controller) for processing the operation of automatic car washer. PLC (Programmable Logic Controller) is normally called as Programmable controller. It is a strong state, computerized, Industrial Computer stations. It comprises of vast machines with robotized brushes

controlled by project legitimate controllers. Programmed auto washing framework is completely robotized with various phases of frothing, washing, drying and brushing.

Zeenal Lalluwadia ,Nidhi Bhatia, Jayana Rana, in Automatic car washing system using PLC explained about car washing system using SCADA and PLC. The washing system has three main processes namely washing, cleaning and drying. Hence the exterior of the car will be washed by detecting the car on conveyor belt and further controlled by PLC & SCADA. It consists Conveyor Belt, DC Motor, Inductive Type Proximity sensor, PLC, Relay, and Solenoid Valve. This system utilizes control using PLC, SCADA system will be installed on the operator panel and hence the operator can monitor and control the whole process.

COMPONENT

Various types of components are used in this project:

1.1 Proximity sensor

A proximity sensor is a detects the presence of nearby objects without any physical contacts by emitting electromagnetic field or a beam of electromagnetic radiation. In this contest, inductive type proximity sensor is used for detection of metal cars.

1.2 PLC

PLC is a specialized computer used for the control and operation of manufacturing process and machinery. It uses a programmable memory to store instructions and execute functions including on/off control, timing, counting, sequencing, arithmetic, and data handling.

1.3 Solenoid valve

It is an electronically operated device. For our requirements, the two port solenoid valve is the most suitable one. It is generally used to replace a manual valve.

1.4 Motor

In a dc motor, armature rotates inside a magnetic field. The basic principle of DC motor is that whenever a current carrying conductor is placed inside a magnetic field, there will be mechanical forces experienced by the conductor. Generally all dc motors work on same principle. In our project, we are going to use 24 V DC relay. We are going to use two dc motors for moving the conveyer belt.

1.5 Pressure cylinder

Pressure cylinder is mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion. Like hydraulic cylinders, something forces a piston to move in the desired direction

Methodology:

A programmable logic controller performs mainly three functions which are continuously repeated in a proper sequence. The three main functions are (1) Testing the input; (2) Execution of the program; (3) Updating the output. In a PLC there is a provision of input terminals for connecting the input devices and output terminals for connecting the output devices. In this research the metallic sensor used can be kept in the category of input devices and the motors or relays can be kept in the category of output devices. The most important function of a PLC is scanning the program continuously and this manipulation of program is continued using the above mentioned three main functions of a PLC. In PLCs, the operations are performed according to the input status and for all the possible inputs a set of commands are already stored in the memory of PLC.

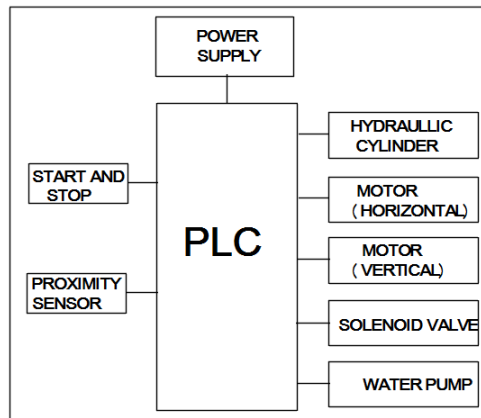


FIG-1, BLOCK DIAGRAM OF ELECTRONIC CIRCUIT

The car meant for washing should be kept on platform inside the car washing cabin, fig-2. Then platform along with car will be lifted up by four hydraulic cylinders as programmed by PLC programme. The underside of the car can be cleaned by nozzle sprayer attached to a PLC controlled transverse beam which will move to and fro longitudinally on LM guide & boss arrangement & above mechanism is located just below the car parking platform. The to and fro motion can be achieved by rack & pinion arrangement with servo motor. The longitudinal LM guide is resting on fixed longitudinal frame. After completion of cleaning bottom side, top portion of car has to be cleaned up. Then overhead nozzle sprayer mounted on cross member starts to operate injecting water on to car from top. This cross member can move to and fro throughout the length of car maintaining constant gap between car top and nozzle tip. This can be achieved due to proximity sensor mounted on bottom side of cross member. The height adjustment can be achieved by vertical motion of top cross member on LM guide & boss arrangement & at the same time it can move to and fro along the length of car. All the motion can be achieved due to attachment of servo motor and rack & pinion arrangement. In this mechanism total four servo motors are arranged in systematic manner & out of four two are responsible for vertical motion of top cross member & two for longitudinal motion of same. In this manner dust & rust can be removed from car by high pressure water injected from nozzle & water will be supplied to nozzle as per requirement through solenoid valve operated PLC programme.

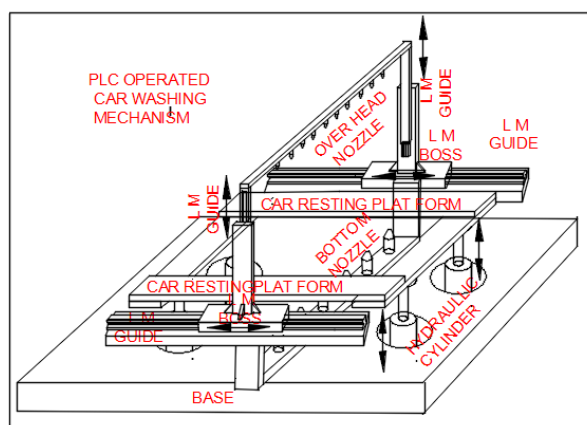


Fig-2(CAR WASHING UNIT)

Same procedure should be repeated for foaming & again washing should be done to remove every minute dust particle which was clogged to the car body at the greasy & oily surface.

In this mechanism all equipments are controlled as per PLC programme .& upper cross member maintain constant height from the contour of car top surface .So that water jet target the car body uniformly throughout the surface with equal intensity .

RESULT ANALYSIS

In Automatic Car Washing System, we performed all the operations needed to clean the car fruitfully by using PLC after achievement of the above processes by mechanism of this system car washing will be cost effective, time saving and pollution free. By using this process we can clean up the car up to 95%.

Advantages :

1. Diminish manual power.
2. Proper exploitation of foam and water.
3. Water jet striking pressure remain constant through out car body.
3. Easily operated system.
4. Consumption of time is less in washing.

Conclusion:

Putting all discussions together, one can conclude that the proposed method for controlling automatic car wash removes restrictions that exist on common systems and introduces a unique way to create error-free and highly efficient project. This paper will help to develop car washing automatically and results in high performance as water inject intensity remain constant throughout the car body surface. It requires less man power, time and no pollution

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