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Automatic Car Washing System

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Abstract
Automatic car washing system is very common and most of the countries have developed it. Car washing system is mostly associated with fuel and gas filling stations. It consists of machines which have automatically operated brushes controlled by some electronic controller. Automatic car washing system is operated at different stages mostly it consist of foaming, washing, drying and brushing. Different types of car washing systems are present around which are operated on number of controllers. The usage of water is in large quantity, thus water recycling plant are also part of the automatic car washing system. We have studied some of the car washing systems from various resources such as Internet, papers and decided to do this project. As compared to the foreign countries, this system is not used in many cities in India because of its cost, complexity and investment. But we have tried to minimize it and also the ease to use has been improved in this project.
Key components: Raspberry pi, IR sensor, Motor drivers, different types of motors.

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I. INTRODUCTION

The first automatic car washing system was established in the late 1930s. Automatic car washes consist of tunnel-like structure where a customer can drive their car or set the car on the conveyor. Some car washes have their customers pay through a online website and then automatically wash the car. When the customer completes the online payment or manual payment, the car is put into a line-up often called as conveyor. At some places the there is also facility of tire sensor which will get operated once the car is set on the conveyor. It also reports the customer about the stages that car has completed during washing. The attendant will instruct customer to set the car on the conveyor and put the car in neutral mode on the conveyor. Through various sensor the length of the car is detected and according to that delays and other instruction are set in the controller. A good car washing system uses different stages or station for washing. Various chemicals and other equipment such as frame, or arches, different sensor, motors are used at different stages. The carwash generally starts cleaning using presoaks applied through arches. They may apply a lower pH chemical followed by a higher pH chemical, or the order may be reversed depending on the condition. Chemical concentration and quality depend on the condition of the car. Chemical substance is carefully combined and used since they may affect the color, structure or any part of the car. The customer next encounters tire and wheel nozzles, where different formulas and concentration are used in order to remove the dust, mud, etc. The next stage is wraparounds, it is usually made of a soft cloth, or closed cell foam material. These wraparounds rub against the front bumper and, after washing the sides, it will also clean the rear of the vehicle including the license plate area. After the top brushes stage the car may pass through a second set of wraparounds. Then there is again washing stage where high pressure water streams are used in order to clean the foam and the dust. After second wash the car then passes through the drying stage were all the water is soaked and car is dried including the tiers and other parts. So, this is the basic concept on which every car washing system is based on.

Older car washing systems were operated manually and there was no use of any controller. So there arises many issues such as painting of the car was rubes, scratches on the sides and the glasses, the intricate parts were not cleaned properly. In order to resolve all such issues, the controller were used later. The most used controller were PLC and micro-controller. The installation charges are more for PLC and the micro-controller is more as compared to the raspberry pi. The coding that is used in raspberry pi is simple and easy to understand as compared to the PLC and micro-controller. Any person who doesn't have any electronics background can easily handle the station and control the whole system. The automatic car washing system has manually reduced the workload and the employees. Many car washing systems also provide various services such as polishing, and waxing the car's exterior by hand or machine, shampooing and steaming interiors, and other services related to the washing and protection.

II. BLOCK DIAGRAM

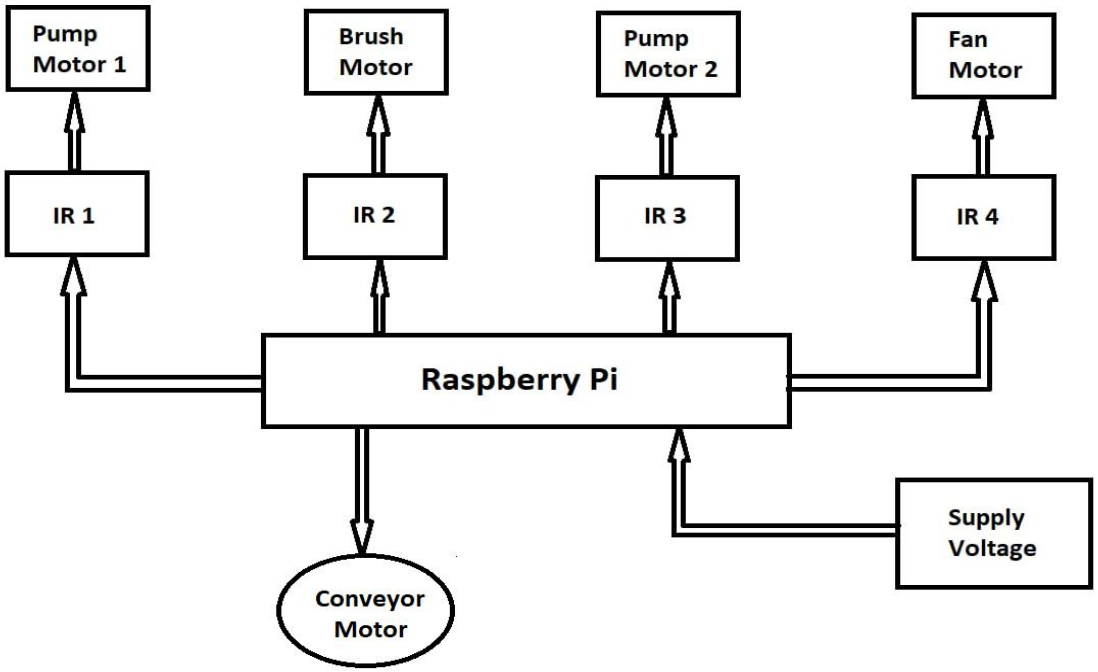

Figure 1:Automatic Car Washing System

This block diagram shows different stages that are present in the project and the correct implementation of the sensors and the motors that are present in the project. There are several IR sensor and different types of motors such as pump motor, fan motor and dc motor. This block diagram shows the connection between the motors and the sensor, which motor gets operated on when the sensor detects the car is shown.

III. COMPONENTS

3.1. Raspberry Pi

In fig.2 Raspberry Pi is a small-sized computer with an ARM processor. It can run on Linux. Raspberry Pi 3 Model B+, has 1 GB of RAM, dual-band Wi-Fi, Bluetooth 4.2, Bluetooth Low Energy (BLE), an Ethernet port, HDMI output, audio output, RCA composite video output four USB ports, and 0.1″-spaced pins.These pins provide access to general purpose inputs and outputs (GPIO). The Raspberry Pi requires a microSD card with an operating system on it. The Raspberry Pi is a low cost and small sized computer which can be plugged into a computer monitor or TV. It is faster and able to decode 4K video benefiting from large/ faster storage and faster network connections. This helps us to make streams available to any browser or VLC also.

Figure 2: Raspberry Pi

3.2. DC Pump Motor

A DC pump motor is a device that moves fluids in a variety of ways by using DC currents. They come in many different design types, also with its own method of operation, advantages.This DC 3-6 V Mini Micro Submersible Water Pump is a low cost, small size Submersible Pump Motor which can be operated from a 2.5 ~ 6V power supply. The capacity of motor is 120 liters per hour with a very low current consumption of 220mA. Just connect tube pipe to the motor outlet, submerge it in water and power it.

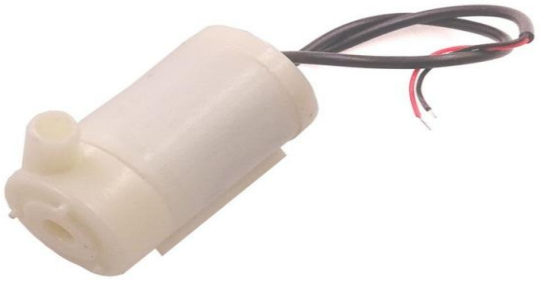

Figure 3: DC Pump Motor

3.3. DC Motors

A DC motor is arotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

DC motors were the first form of motor widely used, because they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, such as using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current.But as it is a lightweight brushed motor it is used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills.

Figure 4: DC Motor

3.4. Motor Driver

The L298 Driver is a high voltage, high current dual full bridge driver designed to accept standard TTL logic levels and drive inductive loads such relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together the corresponding external terminal can be used for the connection of an external sensing resistor

The L293D IC receives signals from the microprocessor .These signals transmit the relative signal to the motors. It has two voltage pins, one of which is used to draw current for the working of the L293D .The

second is used to apply voltage to the motors. The L293D switches it output signal according to the input received from the microprocessor. The L293D is a 16 pin IC, with eight pins, on each side, dedicated to the controlling of a motor. There are 2 INPUT pins, 2 OUTPUT pins and 1 ENABLE pin for each motor. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor.

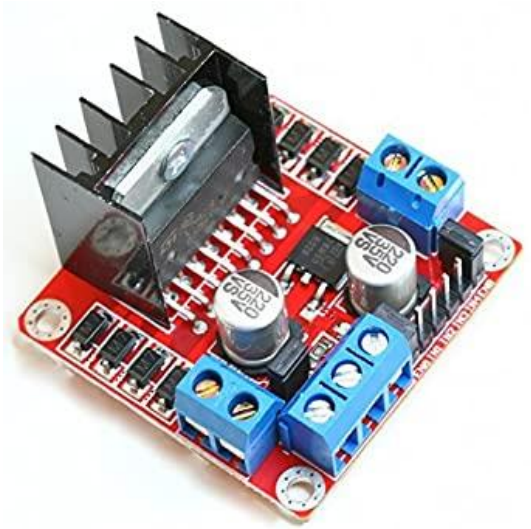

Figure 5: Motor Driver(L293D)

3.5. DC Fan Motor

DC fans are usually available at three nominal voltages: 12V, 24V and 48V. If the system has regulated power supply in one of these, then a DC fan may be selected which will give the exact performance required and as expected, regardless of the AC input variables which plague AC fans. As the speed and airflow of a typical DC fan is proportional to the voltage supplied, a single product may be used to meet different applications by setting the supply voltage to what will give the desired airflow.

Figure 6: Fan Motor

3.6. LCD Display

An LCD is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. It is easy to interface with a micro-controller because of an embedded controller . This controller is standard across many displays, which means many micro-controllers (including the Raspberry Pi) have libraries that make displaying messages as easy as a single line of code. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

Figure 7: LCD Display

3.7. IR Sensor Obstacle

The working principle of an infrared sensor is similar to the object detection sensor. This sensor includes an IR LED & an IR Photodiode. So by combining these two can form a photo-coupler or optocoupler. The physics laws used in this sensor are planks radiation, Stephan Boltzmann &Wiens displacement.

IR LED is one kind of transmitter that emits IR radiations. This LED looks same as standard LED and the radiation which is generated by this is not visible to the human eye. Infrared receivers mainly detect the radiation using an infrared transmitter. These infrared receivers are available in photodiodes form. IR Photodiodes are dissimilar as compared with usual photodiodes because they detect simply IR radiation..

Once it is used as the combination of an IR transmitter & receiver, then the receiver's wavelength must equal the transmitter. Here, the transmitter is IR LED and the receiver is IR photodiode. The infrared photodiode is responsive to the infrared light which is generated through an infrared LED. The resistance of photo-diode & the change in output voltage is in proportion to the infrared light obtained. This is the IR sensor's working principle.

Once the infrared transmitter generates emission, then it arrives at the object & some of the emission will reflect back toward the infrared receiver. The sensor output can be decided by the IR receiver depending on the intensity of the response.

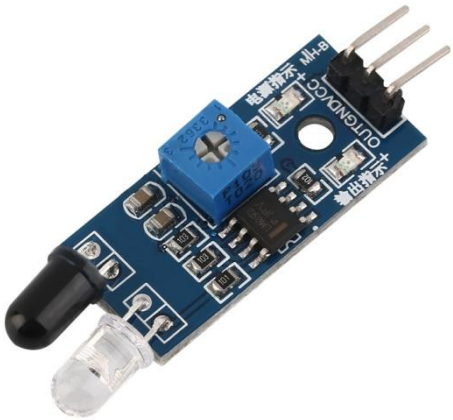

Figure 8: IR Sensor

IV. WORKING

The design of the automatic car washing system is presented in block diagram. Firstly, IR sensor1 senses the presence of the car. If the car is detected, the conveyor belt starts. When the car is detected by the sensor2, it sends signal to the Raspberry Pi. At that time, the conveyor belt stops and then the car has to be washed with soapy water and hence the pump motor starts and soapy water is sprayed on the car. The delay time is set as 10 seconds for soapy water and then the conveyor belt starts to go ahead the brushing process.

After the washing stage the car is moved ahead for cleaning using brush. The IR sensor3 detects the car and hence the car is cleaned using the brushes as shown. The delay time for brushing is set as 15 seconds and then, the conveyor belt starts to go ahead to sensor 4.

The last stage of car washing system is drying the car for which the car is again moved ahead and when the IR sensor4 detects the car in place, the fan turns on and the car is dried.The delay time is set as 10 seconds to get the dry condition. And then, the conveyor is moved down the conveyer belt and the process is finished.

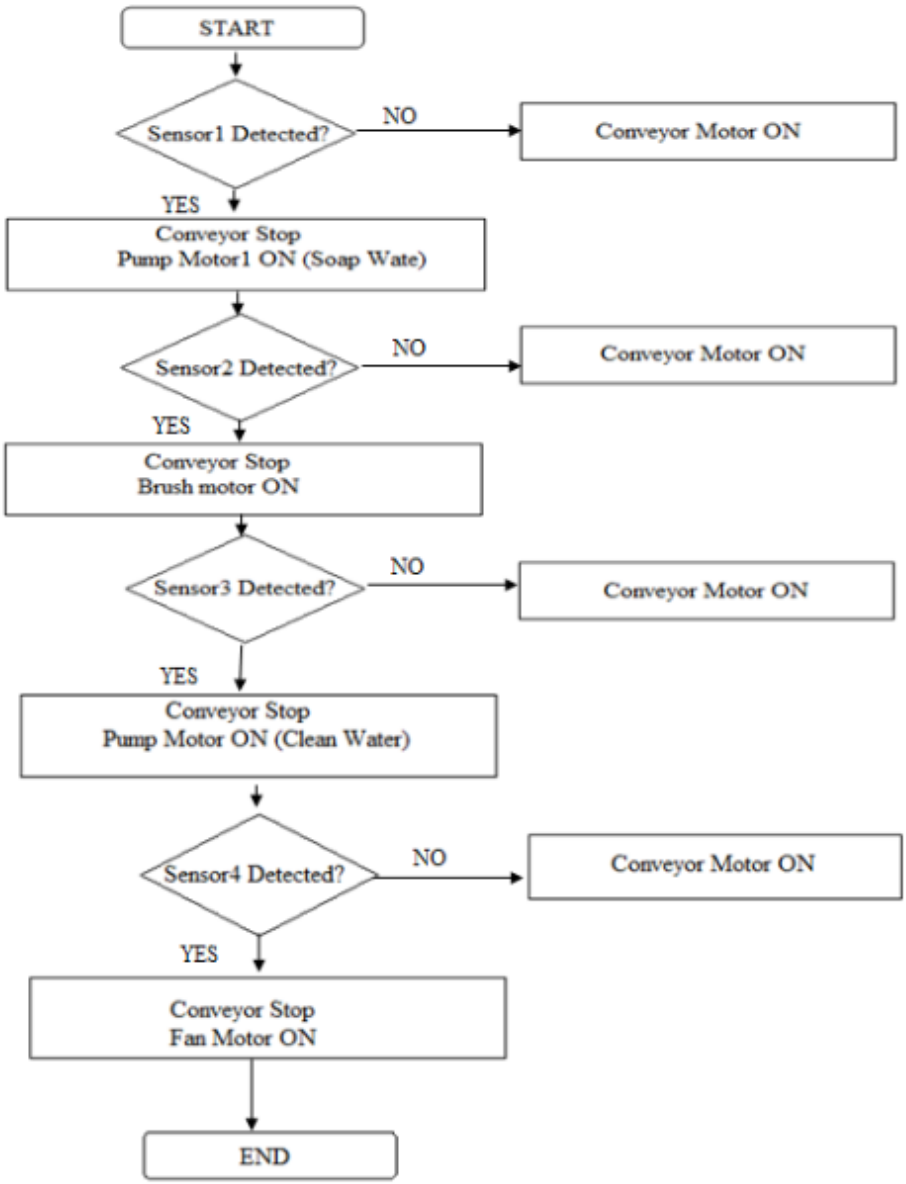

Figure 9:Flow Chart of Automatic Car Washing System

V. CONCLUSION

This project will help to perform car washing automatically which results in high quality end product. Thus it will be User-friendly and capable to wash multiple cars at a time. The systemalso requires less man power, time and no pollution. In this century people mostly prefer large production in less time, so in future the automatic car washing system is more beneficial and will have more demand for saving time for operation, reducing man power, and improving the economy of the system.

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