RESEARCH ARTICLE OPEN ACCESS

Modelling and Manufacturing Of Path Following Robot with Spray Painting

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ABSTRACT

Now a days in Industry robots are widely used for different type of operations, were as ours is for spray painting process, present industries consists of as fixed type of spray painting, such as automotive. Here we introduce motion of Robot guided by a path based on the CAD models process for spray painting. Spray painting is critical for product quality, process cycle time and material waste etc. Currently automated robot path planning has always caused a bottleneck for the spray painting processes because typical manual teaching methods are time consuming, error-prone and skill dependent. It is essential to develop automated tool path planning methods to replace fixed spraying to motion in order to reduce the cost and improve robot efficiency usage.

Keywords :– IRsensor ,wiper motor, battery ,Ardunio, Microcontroller, Sensor

I. INTRODUCTION

A line follower robot is basically a robot designed to follow a line or path already pre-determined by the user. This line or path may be as simple as a physical white line on the floor or as complex path making scheme e.g. embedded lines, magnetic markers and laser guide markers.

In order to detect these specific markers or lines various sensing schemes can be employed. These schemes may vary from simple low cost line sensing circuit to expansive vision system. The choice of these schemes would be dependent upon the sensing accuracy and flexibility require. From the industrial point of view, the path following robot has been implemented in semi to fully autonomous plans. In this environment, these robots functions as materials carrier to deliver products from one manufacturing point to another where rail ,conveyor and gantry solutions are not possible. Apart from line following capabilities, these robots should also have the capability to navigate junctions and decide on which junction to turn and which junction ignore. This would require the robot to have 90 degrees turn and also junction counting capabilities. To add on to the complexity of the problem, sensor positioning also place a role in optimizing in the robots performance for the tasks mentioned earlier. Line following robots with pick and placement capabilities is commonly used in manufacturing plants.

Spray painting

Spray painting is a painting technique where a device sprays a coating through the air onto a surface. The most common types employ compressed gas usually air to atomize and direct the paint particles. Spray guns evolved from airbrushes, and the two are usually distinguished by their size and the size of the spray pattern they produce. Airbrushes are hand-held and used instead of a brush for detailed work such as photo retouching, painting nails or fine art.

These move on a specified path to pick the components from specified location and place them on desired locations. Basically, a line following robot is a self operating robot that detects and follows a line drawn on the floor. The path to be taken is indicated by a black line on a white surface. The control system used must sense the line and man oeuvre the robot to stay on course while constantly correcting the wrong moves using feedback mechanism, thus forming a simple yet effective closed loop system.

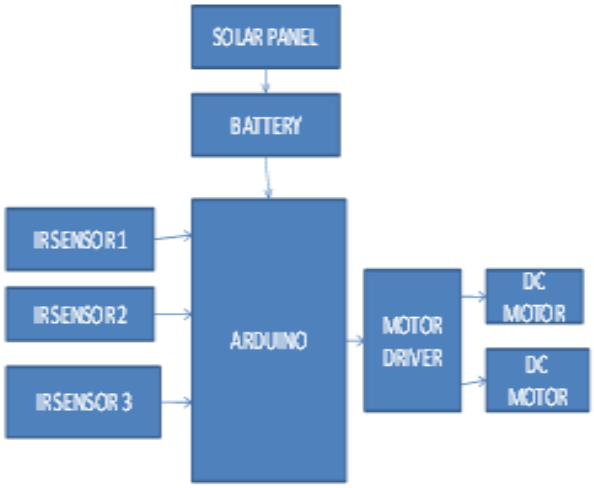

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Fig:1 . Block diagram

II. LITERATURE REVIEW

MEHRAN PAKDAMAN [1] (2009):

The Line follower robot is a mobile machine that can detect and follow the line drawn on the floor. Generally, the path is predefined and can be either visible like a black line on a white surface with a high contrasted color or it can be invisible like a magnetic field. Definitely, this kind of Robot should sense the line with its Infrared Ray (IR) sensors that installed under the robot. Thus the path will be followed by the line follower robot.

G.C.NANDY [9] (1998):

A dynamic model of a gyroscopic wheel, an important component of Gyrover, a single-wheel robot developed at Carnegie Mellon University. The Gyrover robot consists of a single wheel, and is actuated through a spinning flywheel attached through a two-link manipulator at the wheel bearing.

MATHIAS HAUAN ARBO [10] (2018):

The model predictive path following controller and the model predictive trajectory tracking controller are compared for a robotic manipulator. We consider both the Runge-Kutta and collocation based discretization. We show how path-following can stop at obstructions in a way trajectory tracking cannot.

III. WORKING PROCEDURE

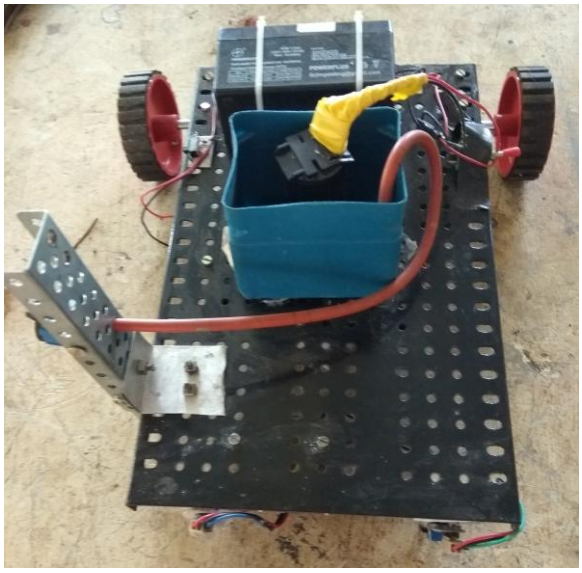
3.1. WORKING PROCEDURE PATH FOLLOWING ROBOT

The line fallowing robot is one of the self-operating robots. That detects and fallows a line drawn on the area. The line is indicated by white line on a block surface or block line on a white surface. This system must be sense by the line. This application is depends upon the sensors. Here we are using two sensors for path detection purpose. That is proximity sensor and IR sensor. The proximity sensor used for path detection and IR sensor used for obstacle detection. These sensors mounted at front end of the robot.

3.2. WORKING PROCEDURE OF SPRAY PAINTING

It is a machine which is used to apply cover layer for any object or a product in this air wil be mixed in the paint will appling to product it works process wiper motor will be placed in the tank which contains of paint and by the wiper motor paint will be injected in to the pipe one end of the pipe is connected to the wiper motor and other to the nozzle, will paint injedted in the pipe the mixture of paint and compresed air will sprinkled in the atmosphere the detail of the spray painting is given below.

Tank Capacity : 250ml
Discharge Range : 20cm - 25cm
Spray area :20mm



IV. COMPONENTS

- IR Sensors
- Battery
- Arduino
- Motor drvier
- Dc gear motor
- Wiper motor

- Spray nozzle

1. IR SENSORS:

The robot uses IR sensors to sense the line, IR sensors consist of two diodes that one of them sends ray and another one must receive it. If the receiver receives the reflection ray, it means that the robot is on white and if it cannot receive it, so the robot is on black.

Fig: 2 IR reflectance sensors

2. BATTERY

Fig: 3 12v battery

3. ARDUINO UNO

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free.

Figure : 4. Arduino microcontroller

4. **MOTOR DRIVER:**

We must use a driver IC for controlling the motors. The microcontroller sends a signal to the driver that acts as a switch. If the signal received by the driver is high, it will rotate the motor or else it won't do so. Note that the microcontroller only sends a signal to a switch which gives the voltage required by the motor to rotate One of good driver for our project is L298 which can be used to control two motors.

5. **DC GEAR MOTOR:**

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy.

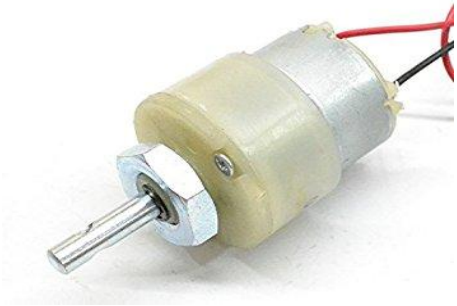


Fig:5. DC Motor

6. WIPER MOTOR:

Fig :6 Wiper Motor

7. SPRAY NOZZLE

Fig :7 Spray Nozzle

5. 3D MODEL

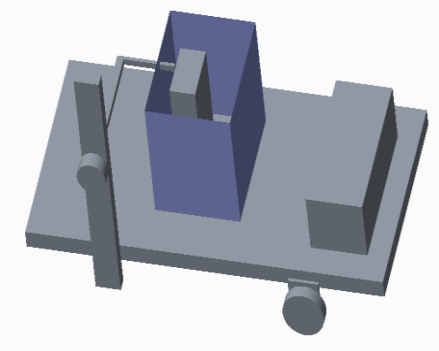


Fig:Top inclined view

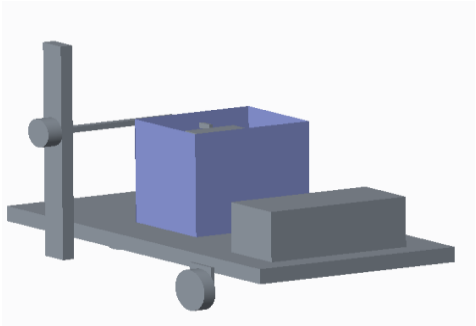


Fig:Side inclined view

V. APPLICATIONS

- The energy is stored in the battery, which is used to operate the line follower robot.
- Line follower Robots are commonly used for automation process in industries, military applications and consumer applications.
- They are very useful as they can work without any supervision i.e. they work as automatic guided vehicles.
- With additional features like obstacle avoidance and other security measures, line follower robots can be used in driver less cars. Automatic painting robots are widely used in automobiles, Enamel and other technology production areas.

VI. CONCLUSION

The line follower is a self-operating robot that detects and follows a line that is drawn on the floor. The path consists of a black line on a white surface (or it may be reverse of that). The control system used must sense a line and maneuver the robot to stay on course, while constantly correcting the wrong moves using feedback mechanism, thus forming a simple yet effective closed loop System. The robot is designed to follow very tight curves. There are still things to do after you've come this far. Things like right angle turns, discontinuities and intersections are still left to be done! Maybe your current hardware is not enough to handle these, but that's for you to find out! You can re-orient the sensors and make a wall-follower or maze solver robot tool.

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