IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 19, Issue 3, Ver. VI (May - June 2017), PP 103-108
www.iosrjournals.org

Design and Methodology of Automatic Guided Vehicles

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Abstract: *In assembling units, material invests more energy in a shop moving than being machined, which implies that there is additional time squandered in this way adding to the expense of the item. In this way, material dealing with techniques utilized are significant in improving the productivity of an assembling association. The major computerized material taking care of frameworks that are commonly utilized in cutting edge fabricating are mechanized guided vehicles (AGV) or portable robots, stockpiling and recovery frameworks (AS/RS) The essential target of this task is to structure a completely self-sufficient "line following AGV" fit for following a pre-planned way set apart on a surface. The microcontroller EM78P156ELP gets the contribution from a progression of infrared sensors and from these sources of info decides whether the AGV should proceed ahead or the bearing of the AGV ought to be changed. As needs be the speed of the engines is controlled and in this way the portable robot is made to follow the foreordained way. All together for the AGV to turn, one wheel is halted while the contrary wheel keeps on turning A'C' program is created which could in a perfect world control the way of the AGV. This source code is accumulated and the subsequent hex record is put into the microcontroller.*

I. Introduction

1. AUTOMATED GUIDED VEHICLES

An automatic guided vehicle is a programmable mobile vehicle. The automatic guided vehicle (AGV) is a mobile robot used in industrial applications to move materials around a manufacturing facility or a ware house.

2. PATH DECISION

AGVs have to make decisions on path selection. This is done through different methods: frequency select mode (wired navigation only), and path select mode (wireless navigation only) or via a magnetic tape on the floor not only to guide the AGV but also to issue steering commands and speed commands.

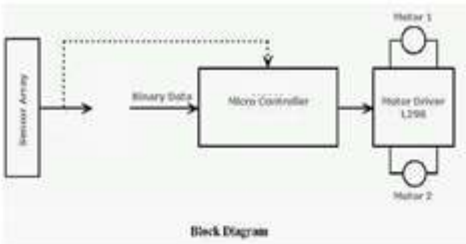
3. PATH SELECT MODE

An AGV using the path select mode chooses a path based on preprogrammed paths. It uses the measurements taken from the sensors and compares them to values given to them by programmers.

When an AGV approaches a decision point it only has to decide whether to follow path 1,2,3,etc. this decision is rather simple since it already knows its path from its programming. This method can increase the cost of an AGV because it is required to have a team of programmers to program the AGV with the correct paths and change the paths when necessary. This methood is easy to change and set up.

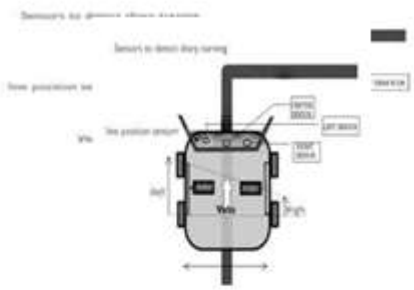
4. PATH FOLLOWING AGV

4.1 Basic Block Diagram of path Following AGV



The Basic Block Diagram of the AGV consists of 3 blocks as showing in the figure, namely,
1.Photo Logic Optical Sensor Module.
2.Microcontroller Module.
3.Motor Control Module.

4.2 PATH FOLLOWING AGV fig



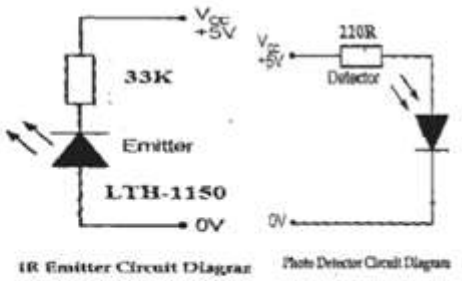
4.3 WORKING OF PATH FOLLOWING AGV

The photo Logic Optical Sensor Module consists of 3 IR sensors which sense the track using the light reflected from the black line on a light background. The sensors then depending on the position of the photo logic Optics send the signals to the next module that is the Micro-Controller Module. The signals from the Photo Logic Optical Sensor Module are given to the Micro-Controller Module where the signals are processed and depending on the signals received the microcontroller gives the corresponding output to the motor control module such that the AGV continues to follow the path.

The signals given by the microcontroller as a result of the signals from the Photo Logic Optical Sensors module are then given to the Motor Control Module, where depending on the signal either both the motors work or one of the motor works while the other motor stops working. When one motor works and the other motor stops workings, then this condition causes the AGV to turn in the direction of the motor which has stopped working. When both the motors continue to work then the AGV will move in a straight path. Thus making use of these conditions the AGV is made to follow the pre-defined path.

Thus as explained above the signal follows the order, Photo Logic Optical Sensor module to Micro-Controller Module and then to Motor Control Module and in this way continues to follow the pre-defined path which is a black line on a white background.

5. PHOTO LOGIC OPTICAL SENSOR

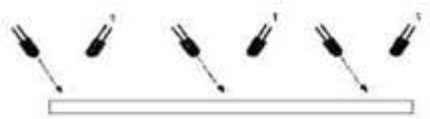


The Photo Interrupters consists of an IR emitter and a photo Detector. The Photo detector detects the light reflected from the ground. If the detector detects a reflected light, then it gives a signal 0 else it gives a signal 1 to the microcontroller.

5.1 PATH FOLLOWING BY SENSOR SIGNALS

The sensors are aligned so that if the AGV is centered on the track, then all the three sensors can see track – the output from all detectors will be high and the robot will continue in the previous direction.

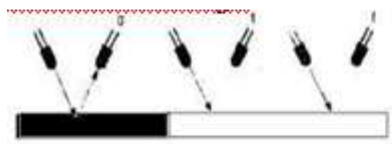
Left sensor Centre sensor Right sensor



3 SENSORS SENSING THE PATH

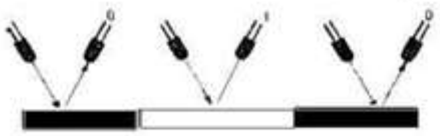
If the robot goes either left or right of the line, initially one sensor will not see the track and other two will see the track, then one detector will be low and the other two will be high the robot will move in a direction such that sensor which is low at this stage starts sensing again.

As we can notice from the figure when the right sensor does not sense the track, then that detector will be low and correspondingly the AGV will be made to move left until the right sensor detects the track.
LeftsensorCentresensorRight sensor



We can notice from the figure when the left sensor does not sense the track, then that detector will be low and correspondingly the AGV will be made to move right until the left sensor detects the tracks

When all the three sensors cannot see the line as shown in the figure, then the output from all the sensors will be low and the AGV will then move according to the last sensor values to see the tracks.



center sensor detects the track

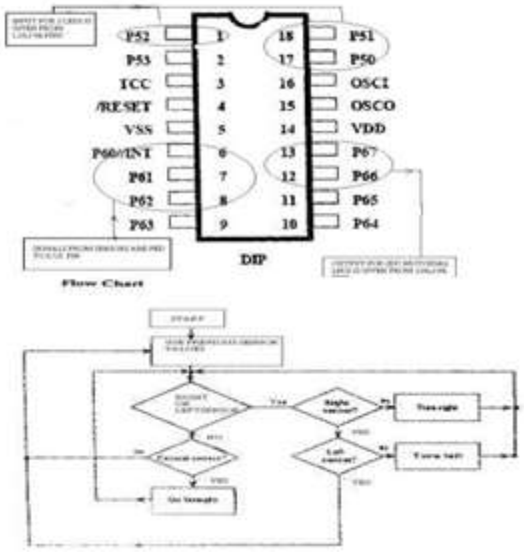
LEFTSENS	CENTERSE	RIGHTSEN	AGV MOTION
0	0	0	Previous value
0	0	1	Turn Right
0	1	0	Forward
0	1	1	Turn Right
1	0	0	Turn left
1	0	1	Turn Right
1	1	0	Turn left
1	1	1	Previous value

TABLE INDICATING WHICH SENSOR SENSING THE PATH AND AGV DIRECTION OF MOVEMENT

6. MICRO CONTROLLER MODULE

Microcontroller (MCU) is a computer-on-a-chip used to control electronic devices. It is a type of microprocessor emphasizing self-sufficiency and cost- effectiveness, in contrast to a general-purpose microprocessor. The kind used in a PC. A typical microcontroller contains all the memory. Peripherals and input/output interfaces needed. Whereas a general purpose microprocessor requires additional chips to provide these functions.

PINS OF Microcontroller EM78P156ELP



6.1 Flow chart of path following AGV

6.2 DC Motors

The most common actuator you will use (and the most common in mobile robotics in general) is the direct current (DC) motor. They are simple, cheap, and easy to use.

6.3. OTHER COMPONENTS

- 3V DC Motors.
- Transistors.
- IN 4004 Diode.
- 5 Pins Harness.
- 5 Pin headers (90X, 180X).
- 100uf, 4.7uf Electrolytic Capacitors
- 331, 104 Ceramic Capacitors.
- PCB (Sensor, Main PCB)
- Microphone.
- Resistors, LED's Slide switch.
- Battery Box.

The two 3V DC motors are used for the movement of the robot in forward, left and right directions. 8050, C1815 transistors are used in motor control module to switch ON/OFF the power supply according to the signal from the microcontroller. Pin header, Pin harness are used to transfer the signal from the sensor module to the microcontroller module. Microphone is used to start the robot at the beginning.

The three red LED's are used to indicate which of the three sensors are detecting the line and the two green LED's are used to Indicate the working motor mechanics of transversely loaded, high temperature composites with a thermally induced residual stress field and a vanishingly weak fiber-matrix interface strength. Robertson et al [6] has presented the formulation of a new 3-dimensional micromechanical modelfor fiber reinforced material. It is based on the relaxation of the coupling effect between the normal and shear stress. Asp, L.E, Berglund, L.A., [7] developed failure initiation in polymer-matrix composites loaded transverse to the fibers is investigated by a numerical parametric study where the effects of constituent properties, interphase properties and thickness are examined. Dragan, [8] stresses in the models from unidirectional carbon/epoxy composite material are studied using Finite Element Method (FEM), can be used in order to predict stress distribution on the examinated model. N. Krishna Vihari [9] adopted micromechanical approach to predict the stresses at the fiber-matrix interface of Boron/S-G/E-G fiber and Epoxy matrix.

II. Conclusion

The primary objective of this project was to build a path following agv ; this objective has been achieved.

LEFTSEN	CENTERS	RIGHTSE	AGV MOTION
0	0	0	Previous value
0	0	1	Turn Right
0	1	0	Forward
0	1	1	Turn Right
1	0	0	Turn left
1	0	1	Turn Right
1	1	0	Turn left
1	1	1	Previous value

TABLE INDICATING WHICH SENSOR SENSING THE PATH AND AGV DIRECTION OF MOVEMENT

[1] When right sensor senses the path AGV turns to right
[2] When left sensor senses the path AGV turns to left
[3] When centre sensor senses the path AGV goes forward
[4] When all three sensors sense the path AGV goes in previous direction

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