



Design of Automatic Guided Vehicle Using Arduino Uno and RFID Sensor

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ABSTRACT: The basic idea of our project is to develop intelligent machines. Effective material handling is most important part of manufacturing and distribution process. The handling of material must be performed safely, efficiently, at low cost in timely manner, accurately without damage to the material. An Automatic Guided Vehicle (AGV) is one kind of transportation that follows the given respective paths and route. AGV can be used as material handling in warehouse, in energy and defense sector and to improve the healthcare system. It works just like a robot as it is able to sense and respond in the given environment. Considering that AGVs are used to optimize our work in almost all the fields. In this project we develop a prototype of an AGV which follows a given path on a flat surface with the help of two dc motors. Path can be determined by the user. RF module is used for communication between PC and microcontroller .Commands can be sent from PC based on location of vehicle. Microcontroller will then move the vehicle forward, left, right and stop. AGV is widely used in industrial fields and community services as well as in dangerous working areas where human cannot reach.

KEYWORDS: AGV, Automation, Material handling.

I. INTRODUCTION

In today's world many of the industries are getting automated using PLC and microcontrollers and thus it has become a main part of the industries. So our intended objective is to create products which are super energy efficient and help to create a sustainable future by improving the technology. In today's industrial 4.0 technology, automation is necessary. Product is transferred from one place to another manually which consumes time so there is a need of automatic system. Thus to perform this, vehicle can be used. It will reduce time as well as increase the accuracy.

AGV are gaining importance and finding increased utility in both commercial and industrial purposes. AGV are computer controlled, unmanned, highly flexible and intelligent mobile vehicles (usually Battery operated) installed with intelligent guidance systems such as optical, magnetic or laser for automated functionality characterized as either towing or load carrying. The first conventional AGV are developed in 1954 by A.M. Barrett and brought to market by Barrett Electronics of Northbrook Illinois. At the very first AGV was simply a tow truck that follows a wire instead of rail in the floor. But the AGV are the commercially used in 1973 for the purpose of moving car bodies through its final assembling plants to serve as an assembly platform.

Automated guided vehicles system (AGVS) is advanced material handling devices used to transport goods and materials between workstations and storehouses of an automated manufacturing system. An AGVS is a set of cooperative driverless vehicles, used within the same manufacturing floor and coordinated by a centralized or distributed computer-based control system. Thus, an AGVS possesses more flexibility and capacity than other conventional material handling systems and plays an important role in the flexible manufacturing system (FMS).



II. BLOCK DIAGRAM OF AGV

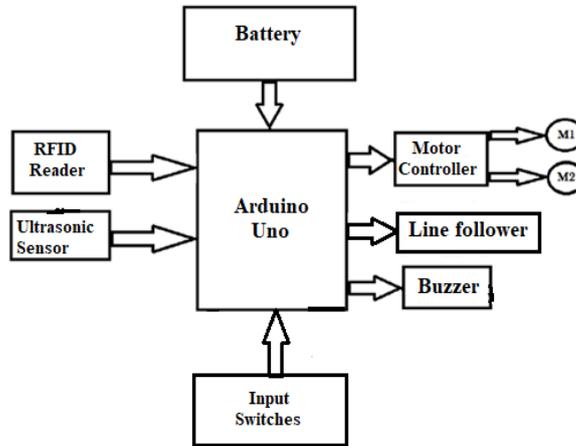


Fig.1 Block diagram of Automatic Guided vehicle.

III. PROPOSED SCHEME

The proposed project work is concentrated on “Automatic Guided Vehicle” (AGV) which is used for transportation of materials in industries. The function of each block is mentioned as follows:

Arduino Uno: The whole system of AGV is controlled through arduino uno with the programming. The arduino uno is an open source microcontroller board based on microchip AT mega 328 microcontroller. Operating voltage of arduino uno is 5V. Arduino uno has three inputs from battery, RFID (Radio Frequency Identifier) reader and ultrasonic sensor.

Battery: Battery supply of 12 V is used. Working current of battery is 7Ah. Lead acid battery is used.

RFID system: RFID system consists of two parts 1) RFID reader and 2) RFID tag.

1) RFID reader: is used to follow proposed path, RFID reader has magnetic chip which is used to identify the path of vehicle.

2) RFID tag: RFID tags are small chips. Tags can store few kilo bytes of data.

Ultrasonic sensor: An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that gives back information about an object.

$$\text{Distance} = \text{Speed} * \text{Time}$$

Ultrasonic sensor senses an obstacle in the path of vehicle.

Motor controller: Motor controller L298N is used. Motor controllers are devices which regulate the operation of an electric motor. Motor controllers often include a manual or automatic means for starting and stopping the motor, selecting forward or reverse rotation, speeding up or slowing down, and controlling other operational parameters.

Line follower: Navigation will be achieved by following black or white lines on the warehouse floor. They are constructed with infrared light emitting diodes coupled with phototransistors. Because the reflective properties of black and white surfaces are different, the sensor will return varying analog values relative to the surface.

Input switches: Input switches are provided to give location where material should be delivered.

Buzzer: Buzzer is an audible indicator. Working voltage of buzzer is 5V. An arduino is used to switch the buzzer on and off.

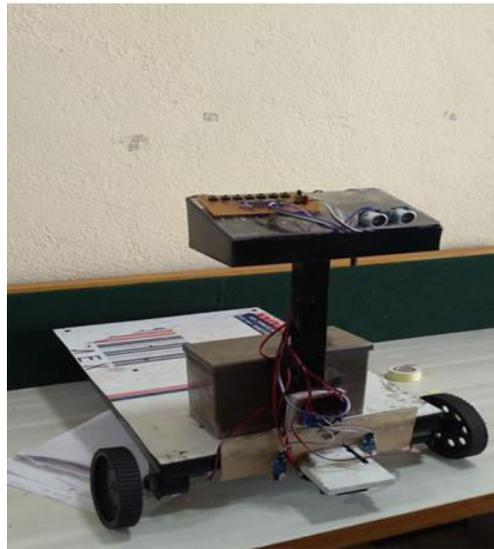


Fig.2 Hardware

IV. HARDWARE RESULTS

An automatic Guided Vehicle can carry weight of material from 10 to 20 Kg.

AGV not only follows path effectively but also start and stop according to obstacle, if it comes in path.

V. APPLICATIONS

Autonomy is the key factor for using AVG in different field. It will achieve high degree of accuracy and precision which will lead to minimize the error of the complete system and improved lead time. The AGV not only used inside the production house but also increase its premises to other service sector.

1. Material handling: Used in highly automotive and electronic factories, loading unloading station.
2. Warehouse: Used in e commerce warehouse for transporting the material.
3. Commercial: Baggage transport inside airport, supermarket, mall.
4. Energy and defense: Transport the material to human unreachable place, bomb and mine mapping, retrieval and disposal nuclear plant inspection, and steam generator, pipeline inspection.
5. Medical service: Deliver food and medicine administrative reports, handling hazardous material, disposal of biological waste.

VI. CONCLUSION

Automatic Guided Vehicle has productivity increasing feature in an industry. The effectiveness of the obstacle sensing system is also very high. Hence in mass production industries with large area, an AGV will definitely increase productivity, with decrease in expenditure and transportation time.

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