Development of Automated Guided Vehicle Application Based for Industries

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Abstract -

This project aims at reviewing of various material related to Automated guided vehicles (AGV). A Automated guided vehicles (AGV)is a vehicle that follows a predetermined route. AGVs can be used in warehouse handling, energy and defense applications, and can be used to improve healthcare systems. It works in the same way that a robot can sense a certain environment and react to it. Since Efficient material handling is the most important part of the manufacturing and distribution process this implies material handling must be done accurately, on time, safely, efficiently and at low cost without damaging the material. Considering that AGV is used to optimize work in almost all fields, in this project, we are talking about development of a product AGV that moves along a fixed route on a flat surface with a DC motor, Users can set the path, the sensor module is used to transfer information between the controller and the motor controller, the controller then moves the car forward, left, right and stops. AGVs are widely used in industrial and public spaces, as well as in hazardous industrial areas where people cannot enter. AGV have been used for transmitting materials and parts between the two workstation or points. This is used to reduce human effort and time. In this project we are making four wheeled prototype that can move along the path from one station to other station. The AGV uses hall effect magnetic sensor to follow the path, the is made up of the magnetic strip or simply magnetic tape. The controller used is arduino uno and motor driver IC L293D which controls all the navigation of AGV. No human intervention is required during its task execution. Safety measures are provided to AGV by using fire sensor and obstacle detection with the help of buzzer.

Keywords— AGV (Automated guided Vehicle), Mechanization, Automation and Material Handling etc.

1. Introduction

The development of vehicle Automated guided vehicles (AGV) has become an important and active research topic in the development of advanced autonomous markets. AGV is general, covering all vehicle designs suitable for operation without driver intervention. Robot-driven vehicles have found a huge number of applications today. AGV s are currently different adventures and the fundamental limitations of their use are mainly due to the segments of transported goods or spatial ideas. Various uses for AGV are indeed possible, but the acquisition and implementation of such systems is largely based on research involving money.

In a normal transportation society, productivity is governed by human wealth. AGV is unusually versatile in the light of long-distance correspondence. Its ability to talk to different autonomous vehicles ensures predictable behavior. Continuous coordination between vehicles increases the profitability of saving money. Bringing unmanned vehicles onto the warehouse floor affects safety. With the help of the natural sensors guide, AGV recognizes the requests as an accident. Computerization prevents overloading of vehicles and their potential disasters.

We have mentioned five types of Automated guided vehicles (AGV) which are :-

a) AGVs Tow truck

This was the first of its kind. This is also called automatic path tracking. This custom trailer can use flatbed trailer and trailerable trailers. It is used to transport very large loads.

b) AGV Unit load Carrier

Used to carry a single load on a vehicle. They are equipped with electric or non-motorized decks with roller belts or special chain decks. Cargo can be moved by forklifts, forklifts, and automatic handling equipment. etc.

c) AGVs Forklift

For loading, no special equipment is required except for the loads kept on the pallet. It is limited to loading at floor level and unloading on pallets. It is mainly used for the distribution function. It has a load capacity of about 1000-2000 pounds. Speed is about 200 ft/min. It can be loaded or unloaded manually or automatically.

d) AGVs Forklift

Can pick up and drop loads or loads on the floor. The receiving and falling heights are different. The forklift can lift the fork according to the load frame at various heights. And it is used when or when full automation is required. This is a very expensive AGV.

e) AGVs light load carriers.

This AGV has a capacity of less than 550 lbs. It is used to handle light and small loads at reasonable distances. It is divided between the storage space and the number of workstations, which is a given. Speed is about 100 ft/min, turning radius is 2 ft. It is limited to a specific field.

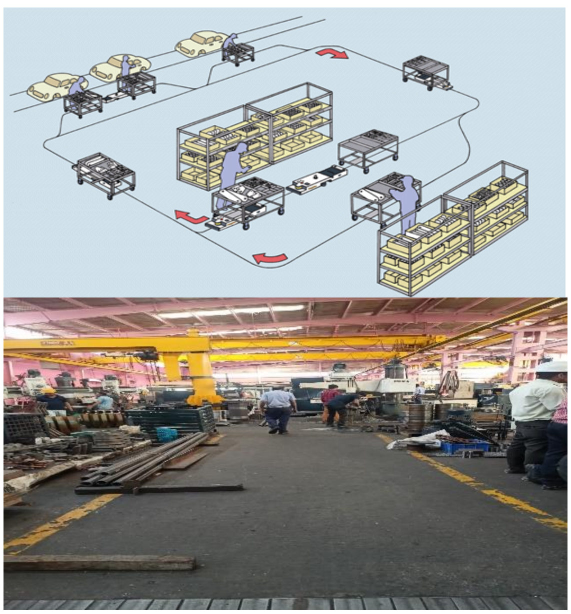

Figure 1 Industrial storekeeping by AGV

- Used of such AGV system the tedious work of making the heavy auto parts carriage from one place to another within the department of the industry is hereby faithfully and easily casted off by the system.

This accomplishment has rendered the following-

1. Time saving
2. Elimination of physical labor which otherwise is to be bored by human workers.
3. Systematic operation.
4. More or less wireless operating mode of operation.

2. Problem Identification

The PTV operated in a model warehouse, built to scale. Its primary task was to relocate pallets within the warehouse. A external input generated by an infrared remote control notified the PTV whether a pallet was entering or exiting the warehouse. To get to its destination, the vehicle traversed the warehouse by following high contrast lines. When the four pair line follower module detected an intersection, the PTV determined whether to turn or go straight by using an algorithm that incorporated the vehicles current location and direction.

Automation in production has become more and more popular, not only in large factories but also in small and medium factories, Automatic machines are gradually replacing manual steps in the production process to increase productivity and product quality.

A robot is one of the automatic devices to replace humans in the transportation process. Because of the ability to perform dangerous, dirty and/or repetitive tasks with consistent precision and accuracy, the industrial transport vehicles is increasingly used in a variety of industries and applications.

3. Objectives

- Development of Automated Optimized Vehicle using Application based controlling.
- The project objectives are to build advanced technology based on android application and Bluetooth technology based automated guided Vehicle (AGV).
- To minimized the cost for making the AGV.
- To study the technology and sensor based automated guided system behind AGV.
- Use of Obstacle sensing technology , for any obstacle in front of AGV.
- To identify the results obtain from AGV testing
- Write research paper and thesis as per data derived from this AGV system.

4. Literature Review

- *Abhishek Bhardwaj, Kshitij Anand, Murtaza Khasamwala*[1]

The aim of the presented work is to find that fuzzy logic based PID control is a clear innovation over traditional PID control systems and that the application of LIDAR and camera based. Techniques can help enable free. roaming AGVs. lending increases sustainability and flexibility. For a control system consisting of one AGV and multiple processing stations, the optimal path planning algorithm is a genetic algorithm enhanced centralized fuzzy-logic control system, for multiple robots, the dynamic priority is shared by a free-roaming AGV system with a propeller. - decentralized. Control was found to be much more effective at simultaneously solving paths and reducing real-time conflicts with other robots compared to purely centralized systems.

- *Xiaojun Wu and Yang Yang*[2]

This article suggests a combined controller for path tracking and introduces a new type of hub motor-based omnidirectional autopilot. A fuzzy controller plus a multi-step predictive optimum controller make up the suggested controller. First, a kinematic model of the complete vehicle is supplied, along with a position (position, angle) model in a global coordinate system. We then build a universal controller based on the simulation. The control system uses lateral and directional deviation as input variables, and the threshold value is adjusted in accordance with the input variable's value to correct the large position deviation area. Finally, a self-developed control system based on a free scale minimum system and an industrial computer combine to create the conventional controller. For tracking studies, straight and curved pathways were used to test the joint controller's capacity to minimize position error. According to the test results, the suggested guided vehicle has good tracking capabilities that satisfy the design goals.

- *Qiang Fang and Cunxi Xie[3]*

This article introduces the research area of intelligent mobile robots known as vision-based AGV. One difficulty is the prolonged image acquisition and processing time, which causes sluggish speed and inaccurate navigation. Vision systems and other sensors are combined in this piece. The computer vision system recognizes the control information and produces a unique composite function (DCF). The use of fuzzy linguistics is then applied to the smart speed design preview. For real-time control, embedded information from numerous sensors is utilized. As a result, the system has the intelligence to adjust to complicated lanes, enabling the AGV to rapidly and precisely follow the route. Additionally, it improves the system's dependability by offering collision-free planning, two-phase collision-free control, and accident-handling continuation strategies (disruption or failure of the AGV). This can be effectively demonstrated by simulation studies and actual application outcomes.

- *Jiahui Qi1, Yaohua W[4]*

The trajectory tracking problem of a two-wheeled automated guided vehicle (AGV) is addressed in this research, taking into account a variety of practical restrictions. A trajectory tracking controller based on model predictive control is proposed. Designed. The first step is to develop a kinematic model of two controllable automatic carts. To achieve quick and precise tracking, a trajectory tracking model based on model predictive control is constructed. Finally, we compare our simulation studies with AGVs based on comparably integrated differential trajectory tracking controllers to examine the impact of the expected time domain length on system performance. The experimental findings demonstrate that the model predictive controller is capable of meeting a wide range of real-time limitations and achieving the real-time continuous curve aim with high efficacy and dependability.

- *Nishchal K. Verma, Soubhagya Kumar Sahu, Aquib Mustafa , Narendra K. Dhar and Al Salour[5]*

Industrial forklift automation solutions in this article must be effective in terms of time, labour, and cost. To do this, you can improve your routing algorithm. There may be several loading, unloading, and dumping locations from an industrial standpoint. Material handling requires automatic trolleys to travel to several locations. In order to ensure that forklifts choose the best route, we suggest a priority-based approach that can be used in industrial settings. This approach focuses on prioritising the locations to be visited and planning the best path across them in accordance with the same importance.

- *Ha Quang Thinh Ngo, Anh Son Tran[6]*

In this article, it is challenging to foresee potential production-related issues like lifting and unloading shipped goods. When an auto-guided vehicle travels along a route, this can cause erratic movement. In this work, an AGV with a fuzzy reasoning system was used to reduce tracking error under a range of load situations. For testing purposes, automatic forklifts are used in actual industrial settings with varying loads. The outcomes demonstrate that the vehicle can operate effectively no matter what weight it is carrying.

- *Hai-Bo Zhang, Kui Yuan, Sw-Qi Mei, Qjng-Rui Zhou[7]*

In the context of self-guided vehicles, guided route tracking is frequently used in this article. Rich information, cheap cost, noiselessness, and safety are all advantages that visual navigation has over visionless navigation. This article outlines a navigation system that makes use of visual data and colour samples collected while driving. In our method, the system first leverages duality and mathematical form to identify each object's support before using a sophisticated Hough transform technique to identify control lines. Finally, the steering controller and motor controller receive the appropriate inputs from the route tracking module. Results from experiments show that our strategy is reliable and successful.

- *Lotfi Beji and Yasmina Bestaoui[8]*

This article's initial section discusses motion generation while taking kinematics and motor constraints into account. Standard kinematic restrictions alone don't always yield all feasible trajectories. Thus, we concentrate on the motor current, speed restriction, and speed limit. An autonomous vehicle's ideal speed is calculated for a given course with a known curvature. The major findings are applicable to circumstances in real life where the model's parameters defining the motion of the car are unknown. To maintain vehicle control even with unreliable standard AGW parameters, a non-linear approach is suggested. The proposed results are demonstrated with simulations and annotations, and the major results are proven using the Lyapunov notion.

- *Yuri A. Kapitanyuk, Anton V. Proskurnikov Ming Cao[9]*

In this research, we propose a Guidance Vector Field (GVF)-based path-tracking algorithm for non-holonomic mobile robots. A gentle indirect curve may be the desired path. a range of predetermined smooth activity levels. The

FGW is built with the aid of this function and the robot's kinematic model, and the integral curve converges to the trajectory. The robot is then moved along the intended path using a non-linear motion controller that directs the robot along these integral curves. We create the algorithm's global convergence conditions and put a wheeled robot to the test to show how effective and useful it is.

- *Jian LUO *, Huayi YIN, Bo LI, Changqing WU*[10]

The automatic guided vehicle (AGV) route planning issue in autonomous vehicle storage and retrieval systems (AVS/RS) is discussed in this work. We suggest a new approach by including communication features known as Com-I-DIDs into the Interactive Dynamic Impact Diagrams (I-DIDs) framework to address the AGV system problem in a dynamic uncertain environment. In order to determine the shortest path strategy and reduce the anticipated total expenses, our activity concentrates on communication and cooperation between cooperating parties. We begin by introducing the works on AGV route planning, offer a novel approach by adding communication to the I-DID model, and then conduct a case study to address AGV route planning in AVS/RS.

5. Proposed System

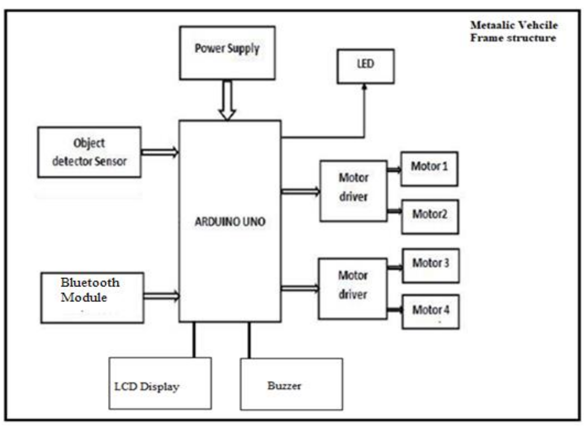

Fig. 1. Block Diagram of system

6. Working Principle

The proposed project work is concentrated on "automated 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, Line follwing IR sensor reader and ultrasonic sensor.
- **Battery:** Battery supply of 12 V is used. Working current of battery is 7Ah. Lead acid battery is used.
- **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.

Distance = Speed * 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.

7. Conclusion

The science is growing and many advances have been made in the field of automated guided vehicles, but these advances have contributed to the increase in the cost of AGVs. AGV manufacturers face many challenges when developing AGVs, but are always prepared to address them. This is because many previous researchers mainly focus only on road tracking systems. Added Road Tracking with an Obstacle Sensing System that detects obstacles in front of the vehicle following the road. The AGV in this project is designed for small and medium-sized businesses with road monitoring and obstacle detection systems in the most accessible and user-friendly way. And we were developing a AGV for a small company with a small budget. Self-driving cars play a role in increasing productivity. The effectiveness of the obstacle detection system is also very high. Therefore, in large-area mass production industries, AGV will definitely improve productivity, reducing transportation costs and time.

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