AUTOMATED GUIDED VEHICLE USING SERVO MOTOR IN INDOOR POSITIONING SYSTEM

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Abstract - *Automated guided vehicles (AGVs) are increasingly being used in industrial facilities to improve efficiency of internal transportation processes. In this work, we have analyzed what are the requirements for AGV systems and made a correspondence to our controller architecture, which relies on multi-agent systems. We show that, by using our agent-based model, it is possible to rapidly deploy AGV system controllers and attain higher degrees of robustness and flexibility than by using conventional approaches. This System introduced the idea of how to apply to AGV'S (Automated Guided Vehicles). These vehicles are mainly useful for material handling and floor transportation purpose. The vehicle has different sensors installed in it, it does not only introduce the idea to analyze, process and store the sensors data but also transferring real-time data using PLC Through Web Server. Due to this noteworthy feature, a user can view each specific sensor data and it's visualization with the help of the web server system.*
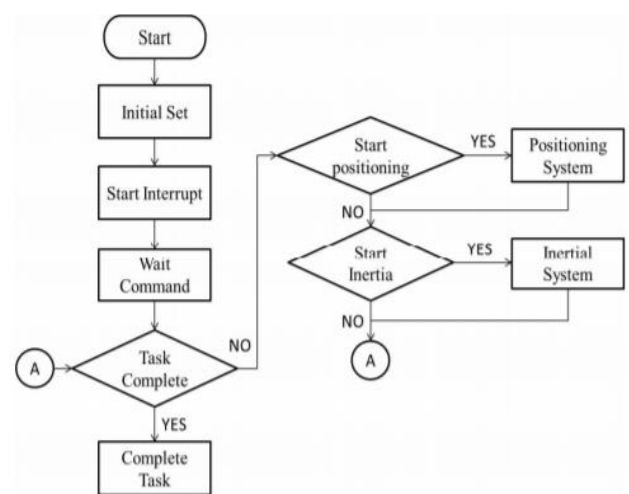
Key Words: **Automatic Guided Vehicle (AGV), Indoor Positioning System (IPS), Servo Motor, Path Select Mode**

1. INTRODUCTION

Indoor automatic guided vehicles (AGVs) are mobile robots that follow lines or markers in houses. They are used for automatic transportation in factories since forty years ago. Conventional AGVs are almost the line-following type that executes instructions to complete transportation using optical or electromagnetic guiding equipments. This method is not flexible and is restricted by these guiding equipments. Laser guided vehicles give flexibility over the line-following type due to their greater sensing range and navigation accuracy; however, those lead to cost increasing. In recent years, global positioning system (GPS) has been widely used in navigation systems. GPS is a powerful device in a positioning system but is vulnerable in bad weather or terrain. Therefore, we are using a servo motor based system in indoor positioning system. This system is proposed to use in the environment where GPS is unable to work well. In this study an indoor AGV which is not a line-following type is developed. Low-cost servo motor system is proposed to replace the high-cost laser or GPS navigation system. The servo motor based system is based on working of servo motor and on preprogram path of the AGV, which also uses coordinate system conversion for indoor positioning.

2. METHODOLOGY

Fig -1: Framework of Indoor architecture in AGV

This paper is organized as follows: In Section II, the framework of SAR retrieval method is described. Section III introduces the proposed SAR retrieval approach in detail. Section IV discusses our experiments, and Section V gives the conclusion and suggests the future work.

2.1 System Architecture

In general navigation systems, AGVs are guided by lasers or GPS during the whole process. Unlike those systems, in our proposed system the motors will have three wires coming out of them. Out of which two will be used for Supply (positive and negative) and one will be used for the signal that is to be sent from the MCU. Servo motor is controlled by PWM (Pulse with Modulation) which is provided by the control wires. There is a minimum pulse, a maximum pulse and a repetition rate. Servo motor can turn 90 degree from either direction from its neutral position. The servo motor expects to see a pulse every 20 milliseconds (ms) and the length of the pulse will determine how far the motor turns. For example, a 1.5ms pulse will make the motor turn to the 90° position, such as if pulse is shorter than 1.5ms shaft moves to 0° and if it is longer than 1.5ms than it will turn the servo to 180°. This kind of architecture can achieve

requirements of low-cost and high-accuracy. The system flow chart is shown in **Fig.1.** Initially, the AGV system will do some start settings and waits commands from the host computer through wireless methods. The server will provide AGV its preprogrammed path and co ordinates according its measured area of indoor positioning.

2.1.1 Proposed Indoor system

In general, the positions of AGVs are computed by using accelerometers, gyros, GPS and other sensors. These sensors do not provide any accuracy in indoor position; therefore, more sensors we use more quantities of errors we get. in our system since Servo motor works on PWM (Pulse width modulation) principle, means its angle of rotation is controlled by the duration of applied pulse to its Control PIN. Basically servo motor is made up of DC motor which is controlled by a variable resistor (potentiometer) and some gears. High speed force of DC motor is converted into torque by Gears.

We know that WORK= FORCE X DISTANCE, in DC motor Force is less and distance (speed) is high and in Servo, force is High and distance is less. Potentiometer is connected to the output shaft of the Servo, to calculate the angle and stop the DC motor on required angle. The algorithm of coordinate system conversion will calculate positions and heading directions of vehicles. To help an AGV navigate it can use three different steer control systems. The differential speed control is the most common. In this method there are two independent drive wheels. Each drive is driven at different speeds in order to turn or the same speed to allow the AGV to go forwards or backwards. The AGV turns in a similar fashion to a tank. This method of steering is the simplest as it does not require additional steering motors and mechanism. More often than not, this is seen on an AGV that is used to transport and turn in tight spaces or when the AGV is working near machines. This setup for the wheels is not used in towing applications because the AGV would cause the trailer to jackknife when it turned.

The second type of steering used is steered wheel control AGV. This type of steering can be similar to a car's steering. But this is not very maneuverable. It is more common to use a three-wheeled vehicle similar to a conventional three wheeled forklift. The drive wheel is the turning wheel. It is more precise in following the programmed path than the differential speed controlled method. This type of AGV has smoother turning. Steered wheel control AGV can be used in all applications; unlike the differential controlled. Steered wheel control is used for towing and can also at times have an operator control it.

The third type is a combination of differential and steered. Two independent steer/drive motors are placed on diagonal corners of the AGV and swiveling castors are placed on the other corners. It can turn like a car (rotating in an arc) in any

direction. It can crab in any direction and it can drive in differential mode in any direction.

2.1.2 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.

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 method is easy to change and set up. A geoguided AGV recognizes its environment to establish its location. Without any infrastructure, the forklift equipped with geoguidance technology detects and identifies columns, racks and walls within the warehouse. Using these fixed references, it can position itself, in real time and determine its route. There are no limitations on distances to cover number of pick-up or drop-off locations. Routes are infinitely modifiable. One of the methods to thrive for sufficient operational suitability is "tracking". Whether a sequence of locations determined form a trajectory from the first to the most actual location. Statistical methods then serve for smoothing the locations determined in a track resembling the physical capabilities of the object to move. This smoothing must be applied, when a target moves and also for a resident target, to compensate erratic measures. Otherwise the single resident location or even the followed trajectory would compose of an itinerant sequence of jumps.

3. CONCLUSIONS

An automated guided vehicle (AGV) needs to have information of its own speed, a direction of the movement, own location and other objects' positions. The position information helps the vehicle to complete movement tasks through a factory floor. This system provides the stability which allows AGVs to work in warehouses by low-cost server motor based system and in efficient way reducing the workers cost and providing help in lifting heavy weights.

The proposed system tries to fulfill the following objectives:

1] Due to the abundant availability of human labour at lower costs, these are rarely implemented in India. The main objective of this work is to design and develop a cost effective Manufacturing system.

2] To provide Flexibility, less time consuming. can significantly reduce production & warehouse costs.

3] To provide help in transforming the materials in industry.

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