EMBEDDED BASED INGENIOUS GOODS TRANSPORT VEHICLE USING AUTO ID TECHNOLOGY AND ANDROID APPLICATION

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Abstract - AGV is a robot used in a wide variety of applications to transport many different types of materials and goods around a factory autonomously.
It can operate in two environments, unguided, Guided. In Existing Method, Guided mode, traverse shorter distance and Tape should be maintained periodically. There is no android application for controlling the overall system. Obstacles cannot be avoided. For path determining antenna is used. These drawbacks are overcome in our project.
In this project it can be operated in both Unguided and Guided mode. Robot traverse in predetermined path. RFID is used to traverse the robot in predetermined path in a wide variety of applications to transport many different types of material. Android app is created for controlling robot in manual mode, automatic mode and for storing data. Ultrasonic Sensors are used to avoid collision. In this three ultrasonic sensors are used for avoiding obstacles in 180^0. Database is created for collecting the overall information.

***Key Words*: AGV, Collision Detection, Database, RFID, Un-Guided and Guided Medium.**

1. INTRODUCTION

Recent days we are facing much difficulties and utilizing major manual power to transport the raw materials, finished products and materials in and around in the campus in major factories, industries and companies. To overcome the difficulties AGV is now proposed in all sectors. The AGV (Automatic guided vehicles) is a portable robot used for transporting materials, foods, finished goods, medicines and products in the smart factories and major companies. AGVs are engaged in every industry, including pulp, paper, metals, newspapers and general manufacturing. (AGV) play a vital role and used in industrial application to lift and convey the materials around a manufacturing facility or warehouse. To facilitate the easy access and function in the AGV, the channel for navigation**, markers or wires** in the floor or **uses of vision, magnets or lasers** are followed. **Wired navigation, wireless navigation and Magnetic tape on the floor** are different types of selection. These types of navigation perform the function of **guiding the AGV** and also to issue **steering commands and speed control.** Indeed, they are being used almost and frequently in factories, major industries to convey finished products, raw materials from go-down and or warehouses to the manufacturing point. Due to advanced technology and developments in industrial, alternative scope suitable for the existing circumstantial situation considered necessary to cope up with the modern trend and economical point of view. To eliminate the difficulties and disadvantages in laser navigation in automated vehicles and to curtail maintenance cost in all sources, the new method is proposed. This will suit in all leading Automotive industries, Food industries, Autopilot technology, Transportation in smart cities and Medical Field.

2. EXISTING METHOD

2.1 INTRODUCTION

In the existing method, AGV uses tape for comfortable environment.
The AGV uses Magnetic tape and coloured tapes to make path decisions. For identifying and following the path of the magnetic tape, Guide sensors is used. Though the Coloured tape is considered less expensive initially, in high traffic areas both the type of tapes may get damaged and dirty and become unserviceable. Besides, the disadvantages are High maintenance cost, less durability and cost of materials are on the high side.

"However, this system has no obstacle avoiding support and it does not contain android application for controlling overall system. Also, in the proposed system we have incorporated

both the Guided and Un-Guided mode within the single system."

2.2 Advantage

- Maintenance cost is high
- Less durability
- Material cost is high

2.3 Disadvantage

- Manual Operation
- Low efficiency
- Not reliable

3. PROPOSED METHOD

In the proposed method, due to no usage of magnetic tape, the formation of path and laying of magnetic tape in all sources and allied works in the navigation are completely avoided. The traffic control using sensors and engagement of software for control also avoided. In this method, **Radio Frequency identification (RFID)** is used which ultimately having ability to **assist in decision making**. It is otherwise known as Auto-ID technologies Widely used in industrial applications like, Item tracking, logistics tracing. The new method curtails **markers or wires in the floor, or uses vision, magnets, or lasers for navigation**. By way of this, a huge amount involved on this installation and maintenance has drastically reduced. The advantages of RFID **Noncontact sensing, anti-dust pollution, multi-identification capability**. In our project RFID is used to traverse the robot in predetermined path. **Android app** is created for controlling robot in manual mode, automatic and storing data. **ultrasonic** sensors are used to avoid **collision.**

3.1 BLOCK DIAGRAM

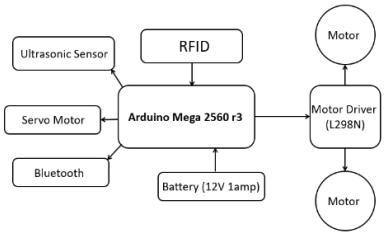

Fig. 1 Block Diagram of Automated Guided Vehicle

3.2 BLOCK DIAGRAM DESCRIPTION

The Block diagram exhibits the entire structure of the project and components utilized.
Arduino Mega 2560 r3 is a developed board which controls the entire system for proper performance. Ultra Sonic Sensor is used for identifying the obstacle, if any on the path. Three ultrasonic sensors are used so as to scan 180^0. The Servo motors takes a vital role in rotating at precise angle and turning at the appropriate place to avoid obstacle. The RFID used to traverse the robot in predetermined path. To power up the Arduino rechargeable 12 V I A lead acid battery is used. For easy access of rotating the wheel properly 12 V 300 RPM DC motors are used. Because of back emf, the Arduino could not be connected to motor directly so motor driver L298 N is used. Bluetooth is used for connecting the android mobile for communication of command and for sending data.

3.3 FLOW CHART

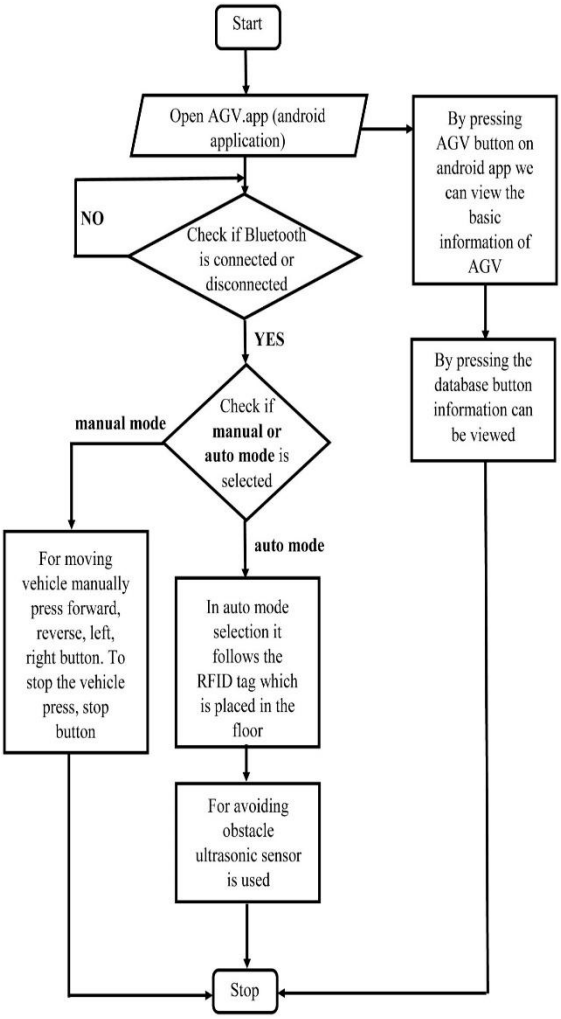

Fig. 2 Flow Chart of Proposed Method

3.4 Advantage of Proposed Method

- The whole system controlled by Arduino development board.
- It can traverse longer distance autonomously
- Ultrasonic sensor is used to avoid collision
- Without human interaction
- Low computational requirements
- High Efficiency
- Simple technique used

3.5 SOFTWARE TOOLS

Arduino IDE – It is an Integrated Development Environment (IDE), which is a cross platform written in the programming language Java.
If a program written with the IDE for Arduino is called a "sketch". It also supports the languages C and C++ using special rules to organize code.

Android Studio – It is officially developed by google for designing android operating system and android Application. Using this software AGV application is created.

3.6 HARDWARE TOOLS

Arduino Mega 2560 r3 – It is a development board controls the entire system for proper performance.

Ultrasonic Sensor – For avoiding collision in the path ultrasonic sensors are used. In this project three ultrasonic sensors are used to scan 180^0

LEDs – LEDs are used for indication purpose. During left and right turn orange LED is used and for stopping red LED is used.

DC Motor – For rotating wheel 12V, 300rpm DC motor is used.

Motor Driver – we cannot connect motors directly to Arduino due to presence of back emf. So we are using motor driver(L298N).

Servo Motor – The Servo motors takes a vital role in rotating at precise angle and turning at the appropriate place to avoid obstacle.

RFID - RFID means radio frequency identification. It is used to traverse the robot in predetermined path.

Bluetooth - Bluetooth is used for connecting the android mobile for communication of command and for sending data.

4. RESULT AND DISCUSSION

4.1 EMBEDDED SYSTEM OUTPUT

AGV robot can be operated in two different cases,

Case1: Un-Guided Medium
In this medium AGV follows predetermined path using RFID tags. Ultrasonic sensor is used for deciding collision free path.

Case 2: Guided Medium
In this medium using android application movement of robot is controlled. Database is created for storing the time interval between starting point and destination.

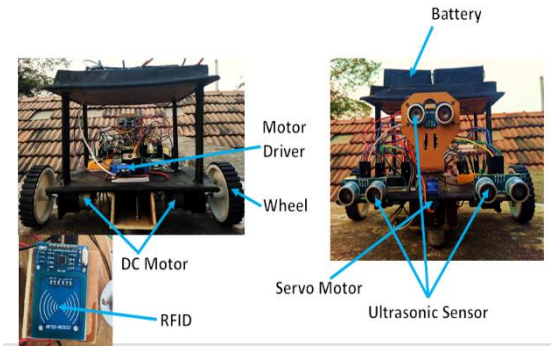

Fig. 3 Final System

4.2 ANDROID APPLICATION

Android application consist of two main buttons.

1. AGV
2. Auto/Manual

By pressing AGV button we can know the information of AGV which include steps for accessing the robot, tools used, etc.,
By pressing Auto/Manual button we can operate the robot in manual and automatic mode. Using Bluetooth button, we can connect the robot and android mobile after the Bluetooth status will be change into ON state now time will be started by pressing the stop button after reaching the destination timing will be stored as a document file.

Fig. 4 Main Screen

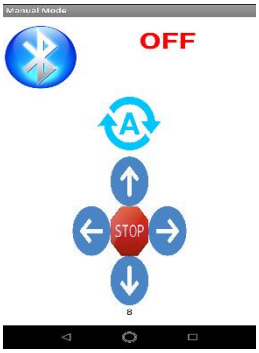

Fig. 5 Auto/Manual Screen

5. CONCLUSION

In the existing method, guided mode is used which traverse shorter distance and the tapes should be maintained periodically which ultimately consume huge installation and maintenance cost.
In the proposed method unguided mode is used. Besides, Radio Frequency identification (RFID) is used to assist in decision making and Android app is created for controlling robot. Sensors are used to avoid collision ultrasonic. The present method now proposed will suit in all leading Automotive industries, Food Industries, Autopilot technology, Transportation in smart cities and Medical Field.
Though the disadvantages and cost of maintenance are considerably reduced, it may not fulfil the requirement of modernized situations in later dates. However, innovation of advanced technology in this field may bridge over the gulf, and attain the remarkable position, to suit the prevailing circumstantial situation in future by interfacing Arduino and MATLAB using path following algorithm, we can completely eliminate the magnetic and colored tapes etc. This method can be put into use in anywhere without formatting any path.

6. REFERENCE

[1] Chen Xu, Ray Y. Zhong, Shaoping Lu, "An Active RFID Tag-Enabled Locating Approach with Multipath Effect Elimination in AGV", IEEE Journal: TRANSACTIONS ON AUTOMATION SCIENCE AND ENGINEERING (TASE), 2016

[2] Aki Mäyrä, Andrei Vatavu, Annette Krengel, Cesare Fantuzzi, Christian Stimming, Christoph Reinke, Cristian Secchi, Davide Ronzoni, Elena Cardarelli, Fabio Oleari, Kay Fuerstenberg, Lorenzo Sabattini, Markus Boehning, Massimiliano Magnani, Mika Aikio, Patric Beinschob, Robert Varga, Sergi Castells Lopez, Sergiu Nedevschi, Szilard Mandici, Valerio Digani "Advanced Automated Guided Vehicle Systems for Industrial Logistics", IEEE Journal: ROBOTICS & AUTOMATION MAGAZINE (RAM), 2017

[3] DANIELA PERDUKOVÁ, FRANTI.EK. UROVSKÝ, JÁN BA. ÍK, KAROL KYSLAN, MILAN BIRO and SANJEEVIKUMAR PADMANABAN, "Pathfinder Development of Automated Guided Vehicle for Hospital Logistics", IEEE Journal 2017

[4] Tamas Sziranyi and Zoltan Rozsa, "Obstacle Prediction for Automated Guided Vehicles Based on Point Clouds Measured by a Tilted LIDAR Sensor" IEEE Journal: TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS (TITS), 2018

[5] Juan Chen, Peijiang Yuan, Qing Guo and Zheng Zhang, "Collision-Free Route Planning for Multiple AGVs in Automated Warehouse Based on Collision Classification", IEEE – Journal 2018

[6] Jing Yan, Lingxi Li, Shihua Li, "Automated Guided Vehicle: The Direction of Intelligent Logistics", IEEE Conference 2018

[7] Angga Rusdinar, Nugraha R, Riesa Krisna A.S, Sigit Yuwono, Silvirianti, "Speed Control System Design Using Fuzzy-PID for Load Variation of Automated Guided Vehicle (AGV)", IEEE Conference 2017

[8] Aniket K. Kar, S. S Farhad Nawaz, Narendra K. Dhar, Nishchal K. Verma, Rashi Chandola, and, "Automated Guided Vehicle Navigation with Obstacle Avoidance in Normal and Guided Environments", IEEE 2016