Inventory Load Carrying Mapped Rover

, [1]Keshava K, [1]Manikanta B, [1]Pavan Bhargav K, [1]Sandeep V, [2]Raju B S Gowda
[1]UG students & [2]Professor
School of Mechanical Engineering, REVA University

Abstract— AGV's are automated guided vehicles, which are used in many manufacturing plants where they are employed to transport, collect and handle material or any required items over a predetermined path and this is where it's important to understand how a AGV guides itself around this busy space of material handling. Here is where our projects is to determine if using RFID to guide helps in maintaining a low cost also not lose out on the accuracy of the guiding of the AGV. The RFID system works by identifying the RFID hotspots to give directions along with a ultrasonic senor used to find obstacles. The Agv can be further developed to work with modern technology such as iot and cloud data transfer.

Index Terms— RFID, RFID hotspots, Material handling, Low cost, AGV, IoT,

1 Introduction

Automated guided vehicle (AGV) is a rover or a robot that is used to move and transport objects like tools assembly pars as such. AGVs are generally found in places where there is a need of less human interaction or none at all; AGVs are a main part of modern material handling system solution. An AGV is nowadays most seen in fully autonomies production plants as well as in semiautonomous plants. in plants where there is a hazard to humane life AGV plays an important role in working in such environment not only in such circumstances AGV can be used in high precise plants of manufacturing where every component has to be delivered in the right station at the right time without any latency. Automated guided vehicles are more and more used in the warehouse and logistics industry to provide smart and flexible material handling based on indoor localization technologies. To use vision and pathfinding technologies at their full potential in these vehicles, a mechanical system able to move within the designed layout. The purpose of this project was to develop the mechanical structure of an AGV. The structure is composed of chassis and electronics required. To satisfy the needs, the vehicle had to be able to carry heavy loads while being compact. It also had to be cheap to be competitive on the market. The calculation was done for motor selection. From the previously designed models, the structure of the vehicle has been designed.

What we have worked on and studied is to develop an AGV that works on RFID tag which is a very different approach then what is available in the market. RFID was chosen to keep the cost low and on how simple the working of this system. AGVs-based Material Handling Systems are widely used in several Flexible Manufacturing Systems installations. The approach of using RFID is unique compared to traditional guiding techniques used in the AGV market. As of now, the AGV market is dominated with either sonar based or magnetic strip guided AGV.

The advantage of AGV over any other material handling system is that none come as close to being flexible for change in plant layout modification and can be adjusted very simply by changing the path flow. The other advantage that AGV's have now compared to the past is that with the increase in the technology space like using IOT and cloud data management most the AGV can be used to manage a large plant by itself.

2 Design

The chassis is to be fabricated from Aluminum profile with T-slot and sheet to cover the body. This is done for ease of fabrication. It was designed in solid works. The chassis was designed to take a static load of 20kg minimum.

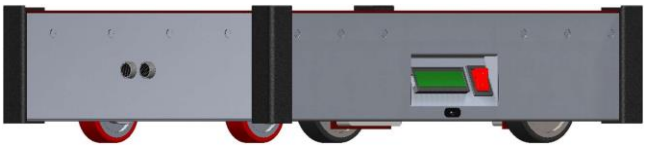

Fig 1: AGV

There is sufficient ground clearance provided along with considering the RFID sensor working distance for optimal design.

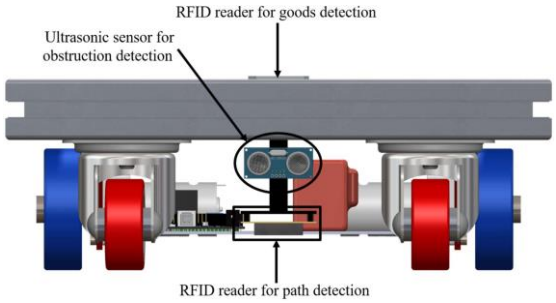

Fig 2: sensor positions

The top part of chassis has a weigh load cell which reads the

- *Dr. Raju B S Gowda, Professer, SoME & Special officer (Evaluation), REVA University, INDIA, PH-9880655105. E-mail: raju_bs@reva.edu.in*
- *Keshava k, School of mechanical engineering, Reva University, INDIA, PH-7892477099. E-mail: keshavaknaik17@gmail.com*
- *Manikanta B, School of mechanical engineering, Reva University, INDIA, PH-8880344088. E-mail: manibutta24@gmail.com*
- *Pavan bhargav k, School of mechanical engineering, Reva University, INDIA, PH-9148847888. E-mail: bhargavpavan36@gmail.com*
- *Sandeep V, School of mechanical engineering, Reva University, INDIA, PH-8880117660. E-mail: sandeepv1599@gmail.com*

load applied and works according to it. The dimensions are 502x362 mm and stand at a height 162.75mm giving it a low CG point and reduce the chance of topple

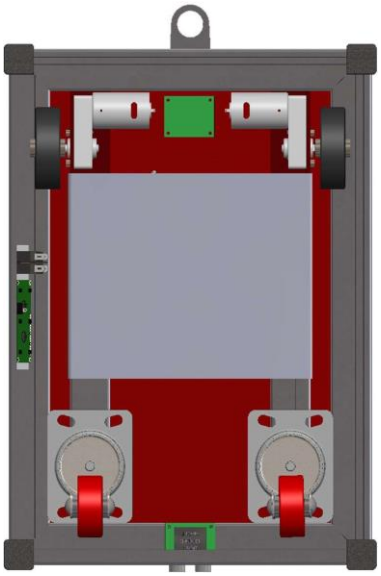

Fig 3: Bottom view AGV

A mini display is provided at the side to view information about batter percentage and the weight by which AGV is loaded. In the front, the sonar sensor is installed to detect any obstacles in case of any.

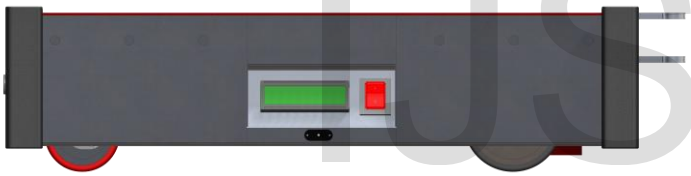

Fig 4: AGV side view

The front wheels are of caster mechanism, which help steer the vehicle at high turn radius. The wheels are placed inside the panels to give a tight package.

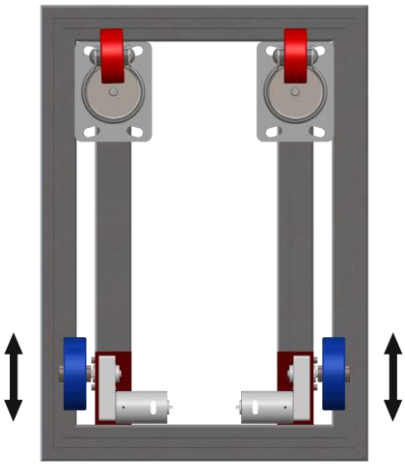

Fig 5: AGV side view

3 WORKING

The fig. illustrates the basic working logic of the AGV , as soon as the system is booted all the components receive power and undergo a system diagnosis , this is the first step of the booting process where it's done to make sure all components are working properly . If not the system communicates that there is an error with the help of led lights blinking red for a no go otherwise all lights blink green. The system diagnosis is done after which the system checks if it loaded with any weight or goods if yes then it checks if its same item with the reference RFID as loaded in the program if not the AGV stalls and doesn't move until the correct item is placed.

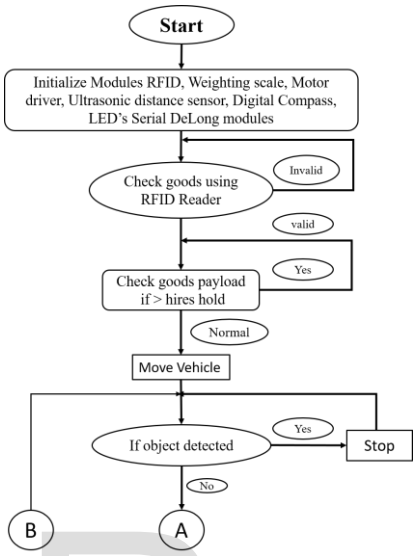

Fig 6: flow chart

This is now all clear for the system and its next step is to make sue the item loaded is within the safe loading capacity of the AGV , if all these parameter are met then the system sends command to move the AGV. While moving if the ultrasonic sensor detects any obstacles it shall move to avoid it.

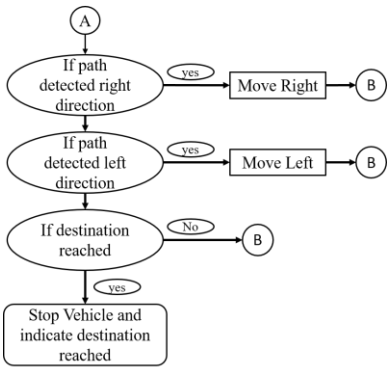

Fig 7: Flow chart 2

The system decides either right or left to turn only after scanning the side of the path and then only does it conclude to decision. The system recognises it destination depending on the RFID hotspot.

4 VARIOUS COMPONENTS

The various components used in the system are listed below

4.1 The EM-18 RFID Reader

The em-18 is the RFID reader we have opted for it works a frequency 125 kHz and has a close working range of 20mm.em4110 is the card format we will e operating with

hence this is compatible with it.

Fig 8: EM-18 READER

4.2 Digital Compass

Digital Compass Sensor. Digital Compass Sensor is actually magnetometer that can measure the Earth's magnetic field. With the use of 'Hall Effect' and by calculating the ultralow frequency signals coming from the North or South direction

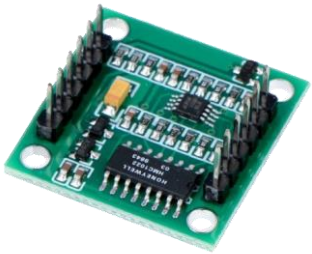

Fig 9: Digitial compass

4.3 Microcontroller

We have chosen the audrino microcontroller as its best suited for our application of sustaining a heavy accessory for woring the ATmega2560 achieves throughputs approaching 16 per MHz, allowing the system designed to optimize power consumption versus processing speed.

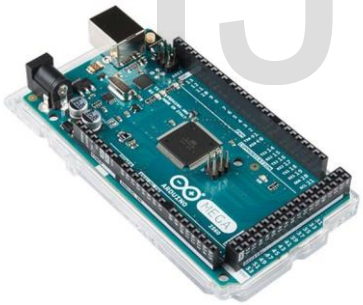

Fig 10: Microcontroller

5 Circuit Diagram

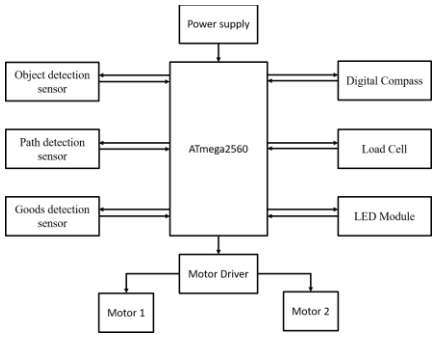

Fig 11: Circuit block diagram

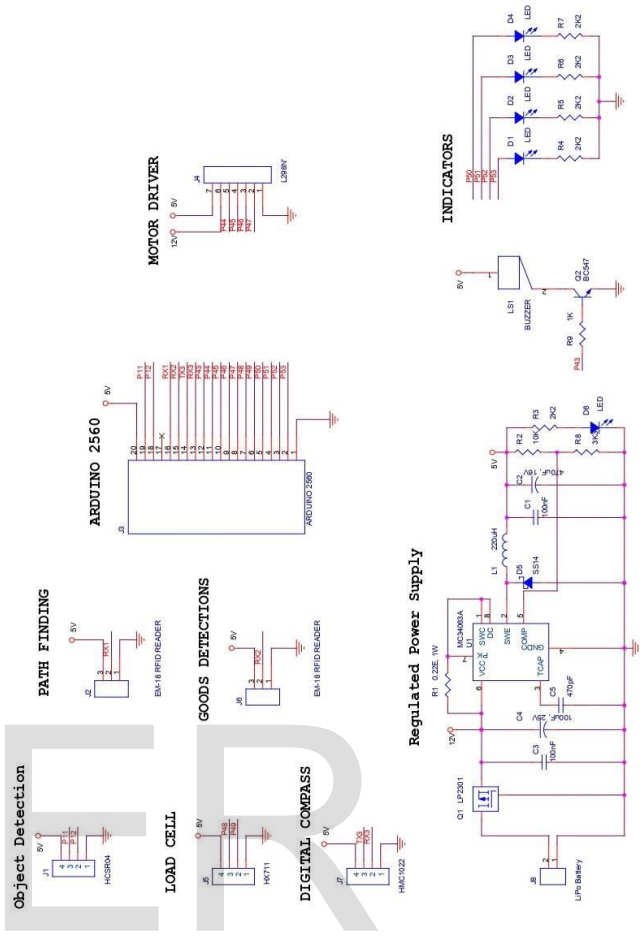

Fig 12: Circuit diagram

Circuit diagram developed for the the RFID AGV we are working to developed

6 Conclusion

The prototype was developed with the designed features and has performed as per expectations os the design and features.

References

[1] Chuda Basnet and Joe H. Mize "Scheduling and control of manufacturing systems: a critical review" International Journal of Computer Integrated Manufacturing, Vol.7, Page. 340-355

[2] Min-Hong Han and Leon F. Mcginnis "Control of Material Handling Transporter in Automated Manufacturing" IIE. Vol.21, Page. 184-190

[3] Thomas J. Schriber and Kathryn E. Stecke "Machine Utilizations Achieved Using Balanced FMS Production Ratios in a Simulated Setting" Annals of Operations Research, Vol.15, Page. 229-267.

[4] Ihsan Sabuncuoglu and Don L. Hommertzheim "Experimental Investigation of FMS due-date Scheduling Problem: Evaluation of Machine and AGV Scheduling Rules" International Journal of Flexible Manufacturing Systems, Vol.5, Page 301-324.

[5] Ram Rachamadugu, Udayan Nandkeolyar and Tom Schriber "Scheduling with sequence flexibility", Decision Science, Vol.24, Page. 315-241.