

IOT BASED AUTOMATED GUIDE VEHICLE

Yogesh Kakasaheb Shejwal¹, Mr. Sasi Kumar Gera²

¹M-tech in Electronics Design and Technology, National Institute of Electronics & Information Technology
Aurangabad, Maharashtra, India

²Scientist-E, National Institute of Electronics & Information Technology, Aurangabad, Maharashtra, India

Abstract – In this paper we are dealing with the demands in the manufacturing industry and industrial 4.0. The AGV automated guided vehicle has immense demand in the manufacturing industry. IOT based AGV, is connecting the AGV through the internet which is part of industrial 4.0. The automated guided vehicle follows given path allocated for it. This happens with the help of Arduino and different sensor configured with it. Which can reduce the human errors, increase efficiency & maintain the quality of the manufactured product or raw material which is carry in the plant. RFID tags is label with this material. RFID tags contain the all information data name, type, size. Through the Ethernet shield we can transmit this data on internet to access anywhere anytime for analysis, which can also reduce the time and the paper work efficiently.

Key Words: Internet of Things; AGV; Arduino Mega; Ethernet Shield; RFID;

1. INTRODUCTION

Iot based automated guided vehicle deals with the material handling in the industry, it includes movements, horizontal, vertical and combination of both. Material handling is an art of science which involves movement, packing, transporting. Material handling is an important activity in the production process. Out of total time spend for manufacturing 20% is for actual process & remaining 80% is material handling[1] moving the material from one location to the another location. The above percentage should be altered according to the plant.

Automated guided vehicle mainly consider as mobile vehicle used in transporting the manufactured product or raw materials. Traditionally AGV was used only manufacturing system, but nowadays AGV can use for many other applications. Used for carrying unit load, large & small load from one location to another location in the plant without any breakage and accidents. The human security is also important phenomena in the industry. While transporting the raw material in the plant sometimes it may cause harm to the workers. The IOT base automated guided vehicle system is fully sensor based, thus it can avoid such accident.

The world is connected with the internet with the various applications. IOT based AGV is connect with internet and get all the information, Such as weight, type, size & dispatch time.

Previous research states that the data or information, like name, type, size, dispatch time of handling material by vehicle is not stored. In this system arrangement with the help of RFID cards we can we can access and stored all the information in the device and this information is transmitted to respective person viz. internet using Ethernet shield and arduino.

2. PRODUCT PERSPECTIVE

The IoT enabled AGV system will generate an all the data regarding transporting material in the plant. The respective person regarding that material should get the all the data in the regular interval without any error. AGV can overcome the human errors like handling, load carry the material in the plant.

1. Proper materials handling without any damage.
2. Increase the safety of worker while working.
3. Stored all the information in the device & send to respective person for analysis.
4. Reduce manpower, increase productivity.

3. HARDWARE INTERFACES

3.1 Arduino Mega 2560

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 with 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller and simply connect it to a computer with a USB or power it with an AC-to-DC adapter or battery to get started.



Fig -1: Arduino Module

3.2 Ethernet shield

The Ethernet shield is part of arduino. Through Microcontroller can access the Wi-Fi network by using the TCP/IP protocol stack. ESP8266 requires 3.3V power and can be pre-programmed so we can hook this up to Arduino device. This is connected with the LAN through this we can access our system through internet in network.

3.3 Bluetooth Module



Fig -3: Bluetooth Module

This system the HC-05 Bluetooth module is used to communication between the department and AGV. Which is required the 5v supply to operate. It can easily configure with arduino.

3.4 RTC Module

RTC (Real Time Clock) DS307 is 8-pin device which uses I2C (Inter Integrated Circuit) interface. Use in system for real time date and the temperature of the surrounding.



Fig -4: RTC Module

3.5 Ultrasonic Sensor

Ultrasonic sensor HC-SR04 is used to detect the obstacle and stop at his position when obstacle comes between the paths. This may avoid the accident in the plant.

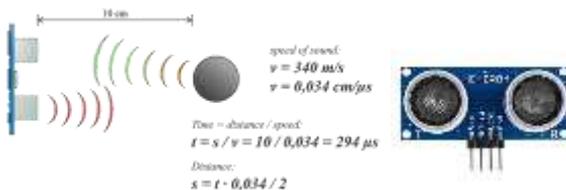


Fig -5: Ultrasonic Sensor

3.6 RFID Reader

Heartbeat sensor provides a simple way to study the function of the heart which can be measured based on the principle of psycho-physiological signal used as a stimulus for the virtual- reality system. The amount of the blood in the finger changes with respect to time. It provides a direct output digital signal for connecting to a microcontroller. It

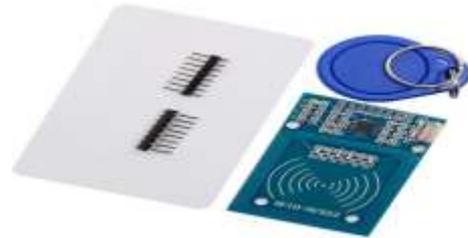


Fig -6: RFID Reader

3.7 Dc Geared Motor



Fig -7: Dc Geared Motor

Dc geared motor is use to automated the wheel of the AGV. Two dc motor is connected to the back wheel of AGV. According to the command it can rotate and completing given path distance. The dc geared is 30rpm, 12v. As rpm increasing the load carrying capacity decrease.

3.8 LI-PO BATTERY

LI-PO battery is use to power on agv. Li-po is better than the lead acid battery with respective parameter of working. 12v and 5ah battery is use to supply for agv.



Fig -8: Li-Po Battery

4. SOFTWARE INTERFACES

4.1 Arduino Software (IDE)

Arduino Software has text editor which is used to writing code and the programs, called as sketches. These sketches along with the extension '.ino' are stored in a standard place called sketchbook. After complete the program writing the IDE software compile it upload the program on the controller. IDE also used as simulator for some application.

5. PROPOSED SYSTEM DESIGN

The IOT Based Automatic Guided Vehicle system consist of number of sensors with the controller (arduino) and motor driving. The system is battery operated. Communication between the different department and the agv with help of Bluetooth. After receive the signal the agv follow the given path with the help of IR sensor.

As shown in the path according to requirement department send the request through the Bluetooth. Once the agv received the signal it follows the path with the help of IR sensor and the motor. When agv reached at respective department the material loaded on agv and with the help of RFID reader it scan the RFID tag on it and store the all the information of that material. Once the material reached at destination the task is complete and agv take its position.

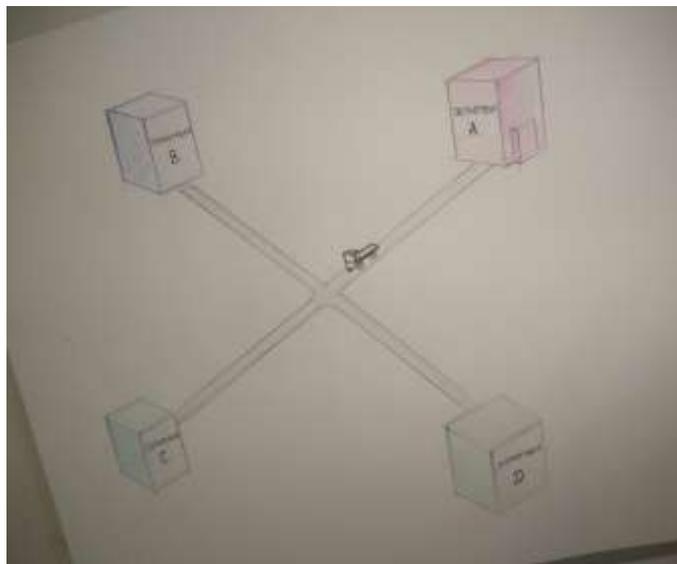


Fig -9: Path of AGV in Plant

Same process can follow AGV continuously work in the plant to carry the raw material/manufactured Martials. All the information regarding the material send to respective person the internet/ Bluetooth operated device. And the performance regarding to the working totally monitor and store it data using the IRMM (integrated remote manufacturing management)

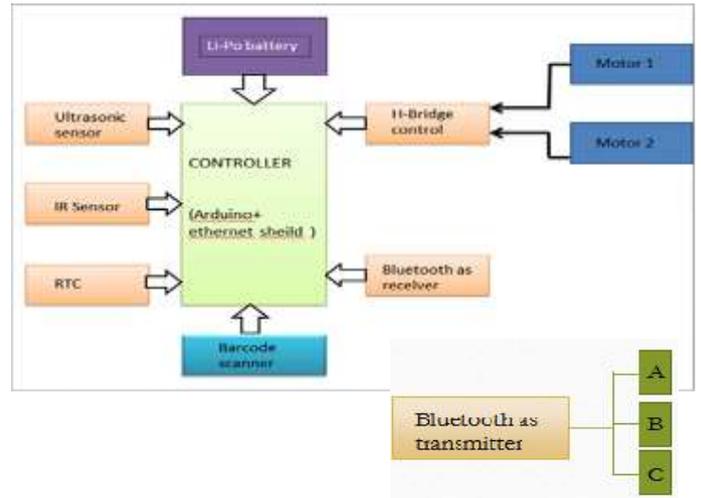


Fig -10: Block diagram of proposed system

Bluetooth module is used to for communication. Form the department side it can transmit the command signal to call the AGV & at receiver end it accept the command and process accordingly.

Power to any system is most important phenomena in this system I can power the AGV through 12v 5ah li-Po battery which is rechargeable.

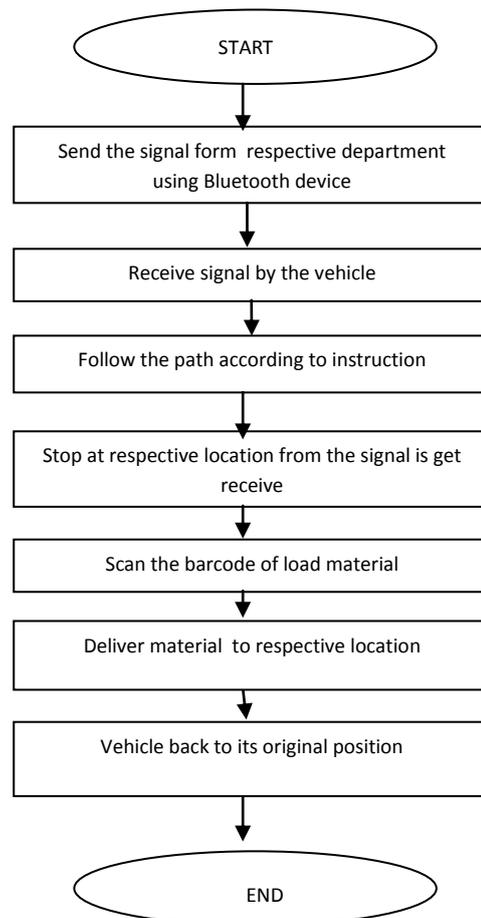


Fig -11: Flowchart for the System

6. CONCLUSION

This system can eliminate the human interference to reduce the error like handling, damage. Through AGV we can easily access the raw or manufacturing materials in the plant & also through the connectivity of the IOT we can store the information such as material type, weight, dispatch from which store and deliver to which store. This can reduce the paper work and we used this information anytime anywhere for the analysis.

ACKNOWLEDGEMENT

Any accomplishment requires the effort of many people and this work is no different. I find great pleasure in expressing my deep sense of gratitude towards all those who have made it possible for me to complete this project successfully. I would like to thank my Guide Mr sasi kumar gera. for his inspiration, guidance & support. I am sincerely thankful to her for providing resources in laboratory and I am very much thankful to all teaching and non-teaching staff who were directly and indirectly involved in my project work. Lastly, I wish to thank my parents for having raised me in such conducive and loving environment, for teaching me to work hard and persevere which has enabled me to come so far.

REFERENCES

- [1] Manali pohare, Ashok Shinde and Prashant Borkar, "Automated Guided Vehicle". International journal of scientific & engineering research, volume 6, issue 4, april-2015 192 ISSN 2229-5518.
- [2] Lothar Schulze, Sebastian Behling, & Stefan Buhrs, Automated Guided vehicle system: A Driver For Increased Business Performance.
- [3] Faieza AA*, johari RT, Anuar Am, Rahman MHA & johar A, " review on issue related material handling using automated guided vehicle. Faieza et al. Adv Robot Autom 2016, 5:1 DOI: 10.4172/2168-9695.1000140
- [4] Prof. A.V.Gauri, Prof. Dr. M.S. Pawn, "AGV Based material handling system: A Literature Review", Volume III, Issue IA, January 2016 IJRSI ISSN 2321-2705.
- [5] K. Kishore Kumar, M. Siva Krishna, D. Ravitej, D. Bhavana, "Design Of Automatic Guided Vehicles", volume 3, issue 1, January-April(2012),pp.24-32.
- [6] Zhao, L. D.; Schulze, L.; Ma, X.L., "impact of automation technology on logistics systems", in proceeding of the international conference greater china supply chain and logistic.

- [7] N. Wu & M. Zhou. " Process vs resource-oriented petri net molding of automated manufacturing systems", Asin J. Control, vol.12, no.3, pp.367-280. May 2010.

BIOGRAPHY



Yogesh Kakasaheb Shejwal
M. Tech Electronics Design Technology
NIELIT, Aurangabad.
B.E (Electronics & Communication).