



RFID TECHNOLOGY FOR AUTOMATIC GUIDED VEHICLE

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ABSTRACT

This paper illustrates the use of a vehicle in several industries and is capable of reducing extra strenuous and/or time consuming activities of humans. The main concentration of this paper is on vehicle navigation, tracking, obstacle detection, weight overload, and also to be able to locate the respective service station goods. Vehicle navigation employs RFID technology. The RFID reader is installed in the vehicle and reads the tags which are placed along its route. Whenever a vehicle reaches a service station it sends an alert message to the workers. Upon receiving a message, the workers can collect the respective service station goods using RFID. If the wrong goods are taken out of the vehicle, the buzzer gets activated. The obstacle detection can be done using ultrasonic sensors. If any obstacle in the route is detected, the message is sent to the control station of the industry using the GSM module. The load cell is used to indicate the weight overload to the workers. Authorized workers will receive alert messages through GSM.

Keywords – ATMEGA MCU, RFID reader and tag, Ultrasonic sensor, Load cell, GSM module

I. INTRODUCTION

Several industries have difficulties in transporting goods or raw materials from source to destination. To arrive at the destinations an RFID based way can be undertaken. By using RFID tag, commands to control vehicle movement such as turn right, turn left, move forward and move backward etc. can be given. Commands would be written into the RFID tags and placed on the vehicle's track. The automatic guided vehicle can read the control commands from the tags and carry out its appropriate actions. Vehicle's navigation can also be controlled by the operator from a remote location or control station and when a vehicle crosses a tag, it sends a message to the base station. The RFID has been deployed in different applications and functionalities. The RFID tag contains an epic number, which will be embedded in the controller. If in case a worker takes wrong materials out from the vehicle, the following events are carried out. The controller activates the buzzer and a message is displayed on the LCD. When all the goods have been delivered to its respective service stations, it will automatically send a message to the control station intimating them about the delivery of goods. Obstacle detection can be done by ultrasonic sensors and if an obstacle is detected in its path the vehicle would send a message to the base station and also to the nearest service station workers.

Appropriate steps can then be taken to remove the obstacle. Here GSM for communication between the control station and vehicle with use of AT commands were used.

II. LITERATURE SURVEY

AUTONOMOUS VEHICLE TRANSPORTATION USING WIRELESS TECHNOLOGY

In the paper titled “Autonomous vehicle transportation using wireless technology” [1], explains autonomous vehicle transportation and delivery of goods in industries are effectively performed with RFID technology using PIC16F877A microcontroller. The vehicle can do the accurate identification of obstacle in a path with the help of the ultrasonic sensor.

RFID- BASED AUTONOMOUS MOBILE CAR.

In the paper titled “RFID-based autonomous mobile car”[2], provides design and implement of a RFID-based autonomous mobile car for more extensively used application of RFID systems. The microcontroller of Microchip PIC18F455 is used to control the autonomous mobile car and to communicate with RFID reader. By storing the moving control commands such as turn right, turn left, speed up and speed down etc., into the RFID tags before hand and sticking the tags on the tracks, the autonomous mobile car can then read the moving control commands from the tags and accomplish the proper actions.

DESIGN AND CONTROL OF AUTOMATED GUIDED VEHICLE SYSTEM

In the paper titled “Design and control of automated guided vehicle systems” [3], discusses the design and control issues of AGV systems at manufacturing, distribution, transshipment and transportation systems.

III. DESIGN METHODOLOGY

The heart of the automatic guided vehicle is the microcontroller Atmega32, along with these the main block includes the battery, RFID reader, GSM module, DPDT relay, load cells, ultrasonic sensors, motor drives, LCD display and buzzer. Fig.1 shows the block diagram of the automatic guided vehicle.

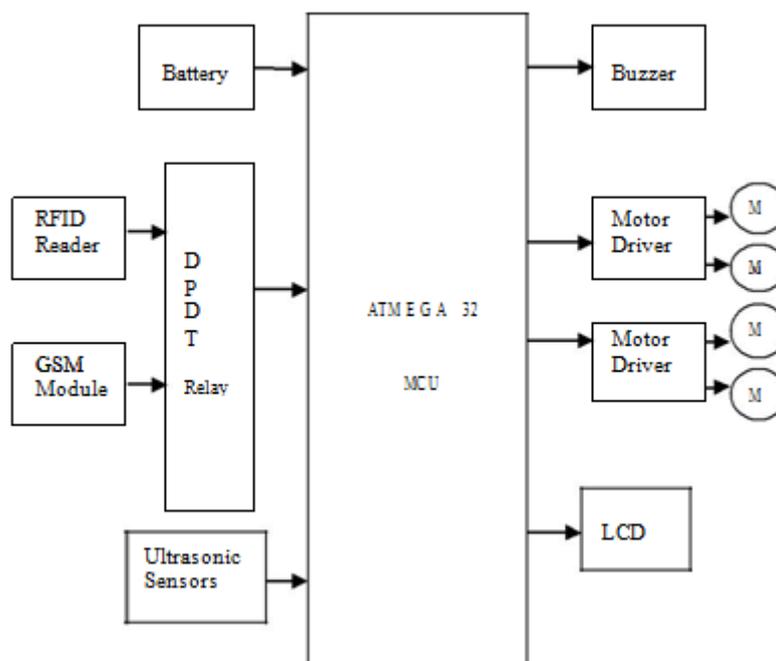


Fig. 1: Block diagram



1. OBSTACLE DETECTION

AGV detects obstacle in the pathway of the vehicle using an ultrasonic detector and to avoid the collision of the obstacles. An ultrasonic sensor from micro sense technologies is used for distance measurement. This sensor has a transmitter and a receiver. They both operate synchronously in the same module.

2. WEIGHT OVERLOAD

Load cell measures the weight overload in many applications, such as electronic scale, price computing scale and digital scale. This is an analog device and consumes 5V power supply. It is transducer technique that converts mechanical force into an electrical signal. The load cell is connected to a microcontroller analog pin. If the weight is above the certain level of vehicle, it can alert the worker with the help of buzzer sound and display in LCD.

3. NAVIGATION

RFID consists of two main components: an interrogator and a transponder. Reader is referred to as the interrogator which sends and receives the RF signal. Tag refers to the transponder which is attached to the object and identifies the objects. This combination fast and reliable. Microchip and antenna are integral components of the tag. There are two types of tags. One is passive and the other, active tag and also there is a wireless communication between reader and tag. There is no line of sight required between the devices. In this paper, 125 to 134 KHz low frequency band is used. Tag having 8 digit numbers, that number is predefined in the controller with the help of the reader to read the number.

4. MESSAGE OVER GSM TECHNOLOGY

GSM is a mobile phone network. It transmits voice and data service in digital cellular technology. This network operates in 900MHz and 1.8 GHz bands. It can transfer the data up to 9.6 kbps, the transmission data service is SMS. AT commands are used to control MODEMs. AT is the abbreviation for "ATTENTION", when connecting to the computer using the serial port and issue AT commands via hyper terminal window.

5. BATTERY

AGV has a 12V/1.3Ah rechargeable battery.

6. MICROCONTROLLER

The AVR is a modified Harvard architecture 8-bit RISC single chip microcontroller. The AVR uses on-chip flash memory for program storage. AVR's have been used in various automotive applications such as security, safety, power train and entertainment purpose.

7. DPDT RELAY

Double Pole Double Throw relay acts as a multiplexer, since ATMEGA MCU has single serial communication port.

8. MOTOR DRIVER

It is an electronic circuit which enables a voltage to be applied across a load in either direction. It allows a circuit full control over a standard electric DC motor. That is, a microcontroller, logic chip, or remote control can electrically command the motor to go forward, reverse and brake. The current provided by the microcontroller is in the order of 20mA and that required by the motor is 500mA. Hence, motor cannot be controlled directly by the MCU (Microcontroller Unit) and there is a need to interface the motor and the MCU.

IV. RESULTS

Fig.2 shows the overall structure of the automatic guided vehicle. It takes the goods from one service station to another service station without the help of humans. Fig.3 shows the overload condition of the vehicle and an overload indication to the worker. Fig.4 shows obstacle detection in front of the vehicle using ultrasonic sensor and the obstacle detected message send to the respective worker to help of GSM module in the vehicle. Fig.5 and fig.6 shows the screen shots of messages sent to authorized workers.

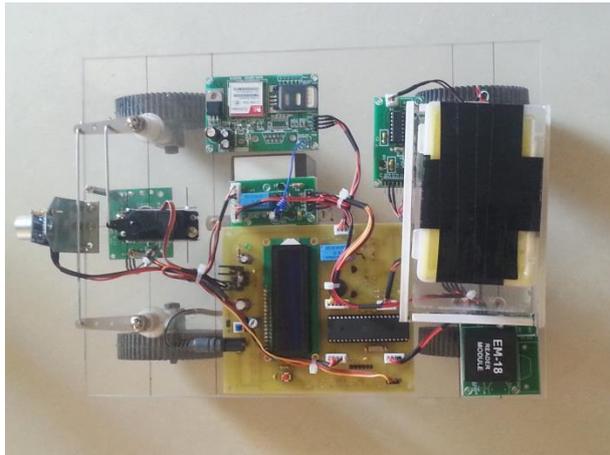


Fig. 2: Overall view of the vehicle



Fig. 3: Testing the load



Fig. 4: Obstacle detected

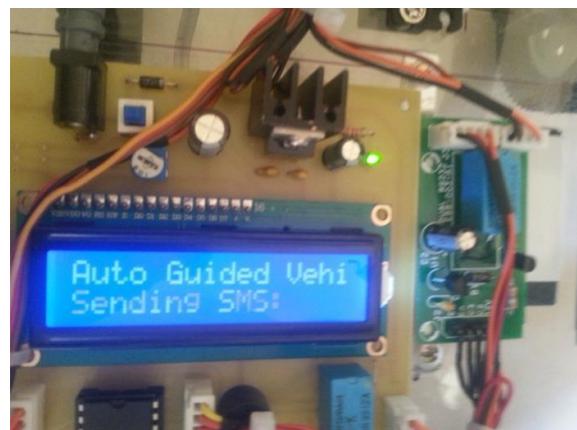


Fig 5: SMS Sent to authorized mobile

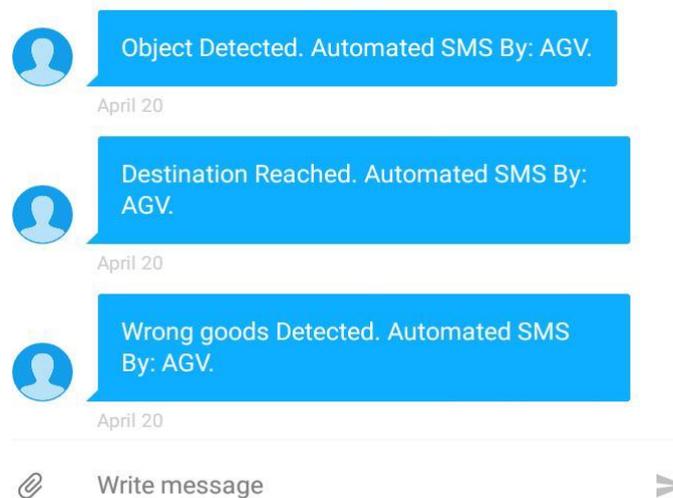


Fig 6: SMS received by authorized workers

V. CONCLUSION & FUTURE SCOPE

Automatic guided vehicle with delivery of goods in industries are effectively performed with RFID technology. The vehicle can do the accurate identification of obstacle in a path with the help of the ultrasonic sensor. Finally vehicle transportation systems are linked to a control station through messages by using a GSM modem. This unmanned vehicle system is capable of real time operation and take goods from one service station to another service station. The results were experimentally verified. A future enhancement of the work involves the usage of cameras to identify the obstacle and take appropriate measures to tackle it.

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