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Transportation Bot

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Abstract-*As society experiences more demand for rapid order fulfilment and accuracy in supply chain management providers must come up with the demand. The scope of our project is to use an automated-guided path following vehicle to transport goods from one place to another. Robot is operated without wire guidance and controlled by a microcontroller. AVGs are material handling systems typically used for repetitive tasks in distribution centres, storage and warehouse, manufacturing, and assembly plants. Transportation bot can complete more amount of work in less amount of time.*

Keywords-Transportation, cost-effective, AGVs, autonomous, microcontroller, Communication, Line Following.

1. INTRODUCTION

Transportation bot comes under the Robotics discipline which is concerned with building systems that automatically transfer goods from one place to another. A Transportation bot is basically an automated guided vehicle which will transfer goods using dedicated path and it will map the path using various sensing device as well as it communicates with the administrating device using communication device. In recent years a great deal of time and effort has been spent on developing systems to enable an autonomous robot to be used in transporting goods in big godowns of e-commerce businesses. Not surprisingly, the majority of this research has been towards modifying, or designing from scratch, full size robotic vehicle so that it can transport to its defined destination without human supervision. Guided vehicles are unmanned vehicles used to transport unit loads, large or small, from one location to another. Automated the factory floor to another. These vehicles are powered by a computer and can be run with or without wire guidance. The Transportation bot are battery-powered, equipped with manual or automated pick-up and drop-off mechanisms as well as with automated obstacle-detection capability. An on-board computer in a mobile robot stores path and machine function instructions and triggers the drive and steering systems to guide the machine to follow a desired path. A laterally scanning laser transmitter-receiver mounted on the vehicle is part of an enhanced guidance system for holding the vehicle on the specified course.

2. LITERATURE SURVEY

A. Literature Survey on "Line Follower Robot for Industrial Manufacturing Process."

Abhijit Pathak ,Refat Khan Pathan , Amaz Uddin Tutul Nishat Tahsin Tousi , Afsari Sultana Rubaba, Nahida Yeasmin Bithi et al. [1] used line following technique for navigation purposes. For controlling the robot Arduino Uno is used. Motors are a very important part of robots, because the movement system is the main part of the line following. Author used a 4V DC motor due to this it can't take payload more than 2Kg. No communication or tracking devices are used in robots.

B. Literature Survey on "Development and Applications of Line Following Robot Based Health Care Management System."

Deepak Punetha, Neeraj Kumar, Vartika Mehta [2] used LDR; IR Proximity sensor; Microcontroller 89c51 ; Comparator; DC motor; Motor driver for making of the line following robot. LDR is a technique that allows a robot to follow a line drawn on the floor.. IR proximity sensors used to stop the robot when any object came to its path. Comparator circuit is used for setting a threshold value from which it can set logic when it detects the light. Motor driver is used for controlling the motor. An actuator is used to make the system dynamic. A GSM module can be installed in the line following robot so that if anything goes wrong, the device can call the doctor.

C. Literature Survey on "Design and Implementation of RFID Line-Follower Robot System with Color Detection Capability using Fuzzy Logic."

M. B. Nugraha, Rizki Ardianto P, Denny Darlis et al. [3] crafted a line-follower robot that can detect different colour lines that indicate different routes and limit the operator's authorization. This system uses a microcontroller with fuzzy logic implementation, using the Mamdani model inference method. The robot is fitted with an LED and LDR-based colour sensor, as well as an RFID-based identification/authorization device, to detect lines. The system's output is robot movement, allowing the robot to obey the guide lines.

D. Literature Survey on "Design of an Autonomous Mobile Robot Based on ROS."
Murat Köseoğlu, Orkan Murat Çelik, Ömer Pektaş et al.
[4] By considering both the hardware architecture and electronic communication protocols, an autonomous mobile robot (AMR) adapted for robot operating system (ROS) is planned. They have designed a mobile robot for a hard and smooth surface indoor environment. The basic mechanical parts of the designed robot consist of the chassis, two motors and four wheels. The basic components of a power system are a battery and a power control system. They have used a Lithium-Polymer Battery (LiPo). It is made up of two separate computers that operate in tandem and are interdependent. One of the computers is a single board computer (SBC) which is the center of the decision-control system. Different control systems can be run on SBC. The other unit, which uses a 32-bit microcontroller (MCU), is used to power peripherals and sensors. A real-time operating system (RTOS) is embedded in MCU.

2.1 Summary of Related Work

Literature	Advantages	Disadvantages
bhijit Pathak ,Refat Khan Pathan , Amaz Uddin Tutul , Nishat Tahsin Tousi , Afsari Sultana Rubaba, Nahida Yeasmin Bithi et al. [1]	By using the Line Following method, Robot can reach its destination with less error of collision.	No communication device is attached like RF,NRF,ZigBee etc. A 4V DC motor is used, which can carry a payload less than 1kg.
Deepak Punetha, Neeraj Kumar, Vartika Mehta et al.[2]	From the test results can be seen that the optimal conditions for the system is on the PWM value of 100% and a detection rate of 70ms which will result at a speed of 0,083m/s, the robot moves from the starting point to the destination point. This speed will make robot movement when following the line to the destination point success rate at 100%.	System brightness and reflectiveness of some tracks are not usable
M. B. Nugraha, Rizki Ardianto P, Denny Darlis et al. [3]	The system is capable of detecting different color lines with 100% accuracy in 10-bit ADC value. It is also capable to restrict operator authorization in pair with the stated RFID cards with 100% success result.	No details like payloads, motor, communication, battery are provided.
Murat Köseoğlu, Orkan Murat Çelik, Ömer Pektaş et al. [4]	Robotic operating system is used which make this robot advance This Robot can make 2D map of its Working Environment.	Because the map is already made,Collision can occur if something new comes into the working environment.

3. PROPOSED WORK

The project aims at developing a cost-effective transportation bot which will help organizations in transporting goods from one location to the destination location. Transportation bot can be used in various places such as warehouses, hotels, hospitals, etc... As it is having a dedicated path which reduces the congestion that occurs while transporting. When it comes to reliability, transportation bot uses communication devices to notify the administrator whether goods have reached to its destination or not.

3.1 System Architecture

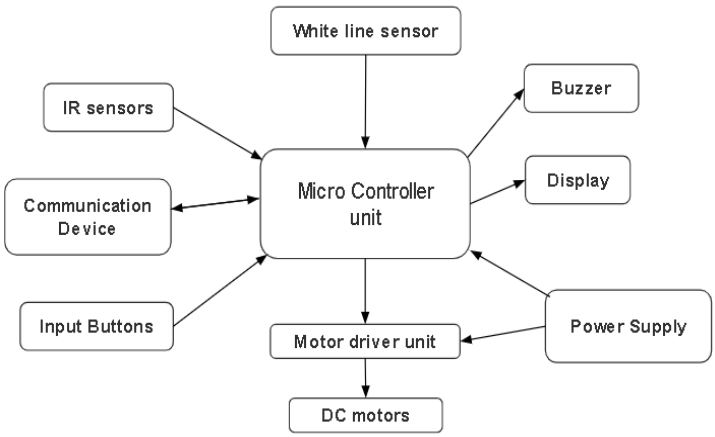

Fig. 1 Proposed system architecture

A. Microcontroller unit

Microcontroller Atmega2560 has 256Kb flash memory. the controller needs 3 things to work i.e. power supply, clock and reset. It is 40 pins. controller. Pin number 62 is grounded. Pin 28 and pin 29 are oscillator pins at which a the crystal oscillator is connected. Two 22pf capacitors are connected to the oscillator and are then grounded. Crystal frequency is 16 Mhz.This will generate a clock. Pin number

9 is reset and 1 capacitor and 1 resistor is connected and power is given to act as a power reset.

Atmega 2560 microcontroller has mainly 3 registers DDRx, PORTx and PINx. DDRx register is used to set port as input port or output port. 1 is given to the DDRx register to set it as an output port and 0 is given to DDRx to set it as an input port. PORTx register is used to send values to the output components and PINx register is used to read the data from external components.

B. IR Sensor / White line sensor

Line following technique,IR sensor module is used. Three IR sensors are placed in such a way that they locate the robot in the middle of the black line and take the bot to its destination without leaving the black line. These three IR sensors are connected to the PORTF of the Atmega2560 microcontroller. Pin PF0, PF1& PF2 are connected to the left, center & right IR sensors respectively. By adjusting the potentiometer on the IR sensor module these IR sensors can distinguish between black and white surfaces easily. For white surface it will send 1 to the microcontroller and for black line it will send 0 as an output.

C. ***Input Push button***

Transportation bot is used to transfer goods to the specific destination location. Destination location can be set using push buttons. Push buttons are connected to PORTA0 to PORTA3 of Atmega2560 microcontroller. Push buttons connected from PORTA0 to PORTA3 define four destination locations respectively.

D. ***Motor***

In transportation bot, four 12V,100 RPM DC geared motors are used with two L298N motor drivers. All pins of PORTC of Atmega2560 is connected to L298N motor driver to drive the motors. PC0 to PC7 pins are used to rotate all motors in different directions.

E. ***Motor Driver***

This L298N Motor Driver Module is a high-performance motor driver for DC and Stepper Motors. An L298N motor driver IC and a 78M05 5V regulator make up this module. Up to four DC motors can be controlled by the L298N Module, or two DC motors with directional and speed control.

F. Communication Device

Nrf module is used to control communication between bot and the administrator side. When the robot has reached its destination Nrf module will send the message to the administrator side "Robot has reached its destination". When any obstacle is detected Nrf module will send "Obstacle detected" message to administrator side. This will Help to track the robot and increase the reliability of the robot.

4. REQUIREMENT ANALYSIS

The experiment setup is carried out on a ATmega2560 microcontroller and a metal chassis which has the different hardware and software specifications as given in Table 4.1 and Table 4.2 respectively

4.1 Software

Table 4.1 Software

Integrated development environment (**IDE**)	Atmel Studio and Arduino IDE
Programming Language	Embedded C

4.2 Hardware

Table 4.2 Hardware

Processor	Microchip 8-bit AVR® RISC-based microcontroller combines 256 KB ISP flash memory, 8 KB SRAM, 4 KB EEPROM.
IR sensor	5VDC Operating voltage. I/O pins are 5V and 3.3V compliant Range: Up to 20cm
Motor	100 RPM Side Shaft 37mm Diameter High Performance DC Gear Motor. Operating voltage 4v to 12v
NRF module	Frequency Range-2.4 GHz ISM Band. Operating Supply Voltage- 1.9 V to 3.6 V
LCD	16X2 LCD display. Operating voltage (4.7V – 5.3V)
Buzzer	Operating Voltage: 4-8V DC Sound Type: Continuous Beep
Li-ion battery	Capacity:2750mAh Rated Voltage:4.20V Maximum 1375mA Standard 2750mA Maximum
L298N	12V input from DC power Source Maximum Power (W): 25W

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