AUTOMATED GUIDED VEHICLE

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Abstract— Vision guided robotics plays a vital role in all research areas. The basic idea our project is to increase the visual system of humans. The other major aim of our project is to develop intelligent machines. AGV is one kind of transportation that follows the given respective paths and route. It is widely used industrial fields and community services as well as in dangerous working areas .Nowadays AGV are used in almost all the countries .It has many advantages in our day to day life. IT works just like a robot as it is able to sense and respond in the given environment. Considering that AGVs are used to optimize our work in almost all the fields. In this project we develop a prototype of an AGV which follows a given path on a flat surface with the help of two dc motors and one freewheel. Camera is interfaced with PC for image acquisition and processing is done with the help of Matlab. Path can be determined by the user with the help of GUI application. RF module is used for communication between PC and microcontroller .Commands can be sent from PC based on location of vehicle. Microcontroller will then move the vehicle forward, left, right and stop.

Index Terms— AVR, Microcontroller, IR sensor, RF module

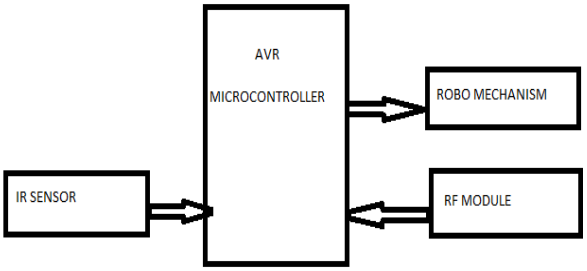
1. INTRODUCTION

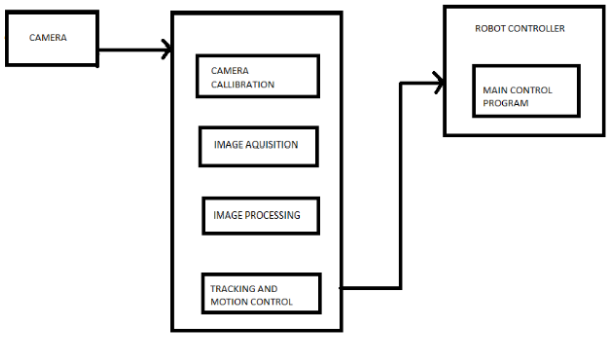
AGV in industries consists of only one partially autonomous vehicle that is directed around a fixed guided path using central PC. The system may be complex, in fact inflexible. Using advances in modern autonomous vehicles and multi robot methodology a decentralized system with multiple free navigating systems may be deployed. Such a system can enable truly flexible material handling. The basic function of AGV are divided into two systems namely navigation and load transfer. The system navigation can again be divided into navigation and traffic management. This project basically concentrates on system navigation. In a decentralized navigation system each AGV decides which manufacturing station has to be given service. The navigation system was developed for investigating the larger projects addressing all aspects of AGV functionality and was adapted for the need of such systems. Traditional robot control methods were used for robot control .But this systems were slow to cope up with dynamic environment and frequent environmental changes. These drawbacks were neglected by adapting responsiveness to stimuli and forgiving the modeling stage.

Robots are smart machines that can be programmed and work more accurately and more precisely used in industrial fields, manufacturing processes medical fields etc. The robots perform hard, dangerous and accurate work in order to make our life easy as they can work for hours without taking rest. They can work without making errors in very less time. The idea of this research is to exploit robotics usage on healthcare field to help mobility disabled people.

2. FUNCTIONAL BLOCK DIAGRAM

BLOCK DIAGRAMS:

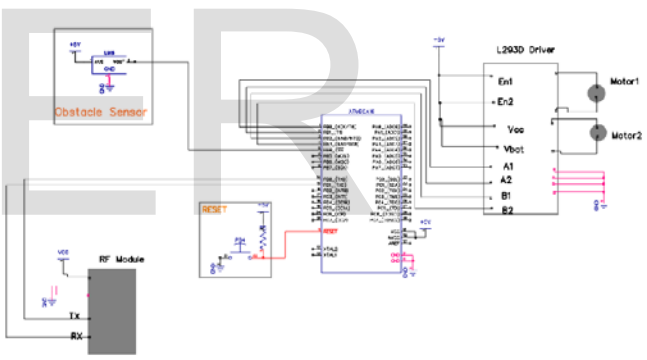




BLOCK DIAGRAM DESCRIPTION

Cameras is placed on the top to acquire a bird eye view image to track the path of the vehicle .To detect the vehicle we will stick a red color strip on the vehicle. Thresholding will be applied to detect the red color and track the motion of the robot. GUI application will be provided to trace the path. One RF module will be connected to PC and other will be connected to the microcontroller which will recognize the command and will move the vehicle forward, left, right.

CIRCUIT DIAGRAM:



CIRCUIT DIAGRAM DISCRIPTION:

In our circuit diagram there are two parts namely robot assembly and PC. We will see both of them in detail:-

1. ROBOT ASSEMBLY:-We are using AT mega 16A Microcontroller from AVR family. It is of DIP-40 package. As it is having active low reset. We have connected reset switch and 10K resistor. 10 and 30 pins are VCC so connected to 5V. Pins 11, 31 are ground pins. Motors cannot connect to Microcontroller directly as they are of high powers, we have isolated motors with Motor driver circuit that is L293D. RF module CC2500 works with serial protocol so connected to TX, RX pins of Microcontroller. IR based sensor is interfaced for obstacle detection.

2. PC:-Image processing will done in Matlab, so PC is used from which commands has to be received. For this purpose we will use

RF module. RF module can connect to PC through USB to serial converter.

3. CONCEPTUAL UNDERSTANDING OF RF MODULE AND IR SENSOR .

RF MODULE: RF module has a low power consumption and high sensitivity. It has integrated data filters. The operating range of RF module is -40 to85 degrees Celsius. It uses the ISM frequency band and operates at frequency approximately equal to 2.4 GHz. Also it has high accuracy.

IR SENSOR:

IR sensor is basically used to detect the obstacle. It transmits the signal in one direction and the signal bounces back from the surface of the obstacle and thus the obstacle is detected. It has adjustable range with a POT. The operating range of IR sensor is 5V. Its sensitivity is 30cm which is adjustable.

ALGORITHM:

1. Start
2. Microcontroller Initialization
3. USART Initialization
4. Motors Initialization
5. Take image from USB camera
6. Image acquisition
7. Image processing
8. Segmentation
9. Location tracing
10. Send signals to robot assembly
11. Move robot in respective directions
12. Repeat steps 5 to 11

4. CONCLUSION

After the prototype implementation, it meets the use of AGVs in industrial fields, warehouses, medical fields and in dangerous working areas where humans cannot go.

REFERENCES

1. R.C. Arkin and R.R. Murphy," Autonomous navigation in a manufacturing environment" IEEE Int. Conf. Robotics and Automation, 1997, pp. 2312-2317.

2. K. Schilling, M. Mellado-Arteche, J. Garbajosa and R. Mayerhofer, "Design of flexible Autonomous transport robots for industrial production", in Proc. IEEE Int.Symp. Industrial Electronics (ISIE'97), vol. 3, New York, NY, 1997, pp. 791-796.

3. Y. Tanaka, T. Nishi and M. Inuiguchi, "Dynamic Optimization of simultaneous dispatching and conflict-free routing for automated guided vehicles", J. Adv. Mech. Des., Syst., Manuf., vol.4, no.3, pp. 701-715, 2010.

4. N. Wu and M. Zhou. "Process vs resource-oriented Petri net modeling of Automated Manufacturing Systems", Asian J. Control, vol.12, no.3, pp. 267-280. May 2010.s