

AUTOMATIC GUIDED VEHICLES USING FEEDBACK CONTROL AND SENSOR TECHNOLOGY

Nikhil Nair
Devendra Patkie
Amit Pai
Roby Johnson

ABSTRACT

Since the beginning of the concept of 'luxury', we have been striving to create artificial motion mechanisms to reduce manual labor. But this seemingly unemployment generating action has led to the evolution of the field of 'robotics'. Intelligent systems are being designed and developed to perform deceptively unimportant actions like picking and grasping that hold great significance in developing a completely autonomous machine i.e. the development of artificial intelligence.

As far as the concept of robotics is concerned, the scope is endless. There is no limit to its field of application. To put it in another way, the ultimate aim is, 'to phase out the role of man'. In the present, robots are employed in industries for carrying out functions such as lifting loads, transport of raw materials and finished goods, etc. The main focus today is on the robotic arm and the Automatic Guided Vehicle (AGV).

This report provides an insight to the development and working of an Automatic Guided Vehicle suited for applications involving controlled environments. It begins by introducing the concept of the AGV and its present role in the industry. The constructional scheme includes a front wheel stepper motor drive. The primary objective of the vehicle is to achieve a final destination which is predefined into an ATMEL AT89C51 microcontroller. Sensors strategically placed on its body are used for avoiding any obstacles in its path. This design is innovative in the sense that conventional AGVs employ the sensors only to provide navigation with no emphasis on bodily tracking. The vehicle has been designed as a 'micro mouse' and program logic has been developed which will facilitate its movement through the maze, so as to reach the center of the maze, the co-ordinates of which are pre-determined.

The aforementioned AGV can be used for transportation of heavy-duty components or assemblies on the shop floor without the need for human intervention. Its application describes a concept of an intelligent automatic guided vehicle which is capable of performing the dual functions of a rapid unmanned transit vehicle as well as a mobile platform that can follow a given path precisely and accurately. Various other applications are stated in the text.

The report also suggests improvements and additions to the AGV that will help widen its scope of use. For instance, incorporating a video camera will enable three-dimensional mapping of its surroundings such as adding 'vision'. This will help the robot in estimating its position in the real world with greater efficiency and enable usage of natural beacons in addition to the artificial beacons being used. Thus, as the robot moves through its surroundings, it must be able to gather information from both natural as well as artificial beacons and constantly update its position in the environment.

Attaching a robotic arm will help in picking and deposition of objects, thus enabling collection of rock samples and averting debris in mining operations as well as in space applications. Apart from these - mine detection, reconnaissance and military exploration are just to name a few applications of this driverless wheel based load carrier. In a nutshell, this dissertation provides the reader with the means to build a Fully Autonomous System with the use of 'sensor technology' and 'artificial intelligence' that help lift or trail any type of load from one place to another with zero human intervention.