Advance Autonomous Robot for Multi-Purpose in Office Works

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Abstract— Automated guided vehicle plays a significant role to enhancing the material handling technique for last decade year. In this project, the development of multipurpose mobile robot for office work. The AAV is embedded into an intelligent material-handling system with multiple autonomous vehicles. That will provide flexibility and re-configurability of the office. The design AAV system is complex task because it contains the complex design circuits, automated coding technique and selection of specific material properties etc. In particular, the design of AAVs is quite challenging for control system and it can be dramatically affecting the system cost and performance. Ergonomic and safety aspects were also considered in the design of the AAV. A wide-ranging safety system is also employed while designing the AAV with high standard. AGV are mostly used in the industrial application for the material handling application. In this study, the development of AGV mainly used for handling of files from one section to another.

Keywords: AAV, AGV, Advance Autonomous Robot, Office Works

I. INTRODUCTION

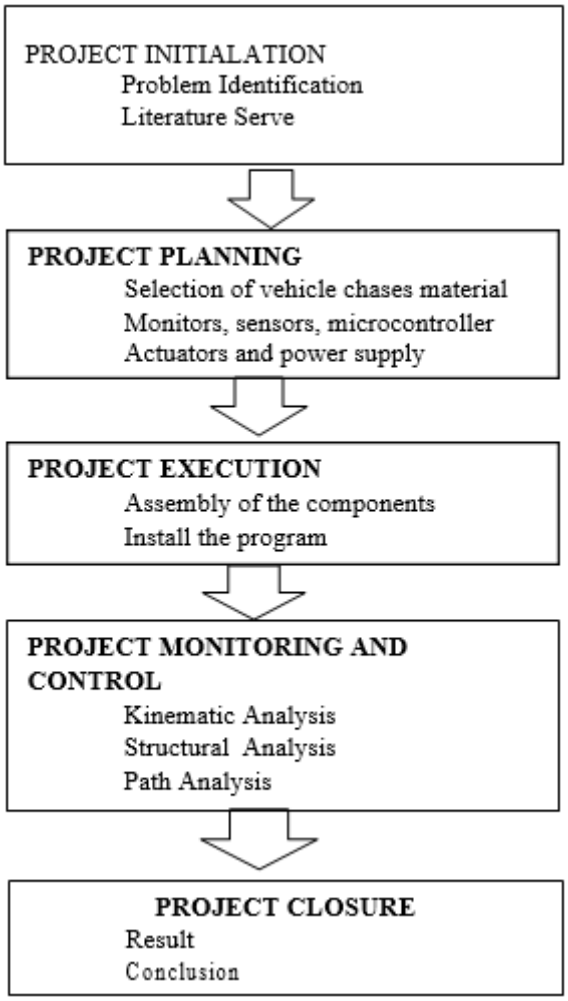
Various attempts to improve material handling techniques have been made to advance technology in the field of machinery. AGV (Automated Geared Vehicle) is one of the most impressive machinery that performs a variety of tasks, including the fork lift, towing, drug transport etc. An AGV works with the simultaneous processing of various parts. The control device is common to both the driving and transferring device. Which is operates the vehicle and sustains the ultimate process of automated guided vehicle. Proximity sensors are helps to detect the vehicle movements which directly control the start and stop process of AAV. Photo sensors used to detect the materials presences in the station. A transmission system entails material loading and unloading by a specific device, in which the electrical connections are interconnected.

He described different available technology for automation in container terminal. The control device receives signal from the transfer device once transferring gets completed and transmits signal to the driving system to move the vehicle to the next destination point. In accordance with the flow path, the coloured tape method is best suited to this vehicle for best outcome. The best flow path is designed considering all aspects. It is a battery powered vehicle in which it charges automatically. Inductive power transfer methods were implemented in the vehicle to enhance better performance. Although, most of the AAVs use some mark or defined path to move on, works are going on to develop such an AAV having artificial intelligence which can be dynamic in the sense of navigation and whose locomotion is not limited to just retrofit workspace.

A. Problem identification

Nowadays in the office, there are a large number of employees working and because of that there will be a lack of coordination in the transfer of files and mail material between the employees which will cause a delay in the work. Moreover, due to large number of employees there will be a difficulty in tracking the files. also, in order to handle the large transfer of files there are a number of office boys employed. which will cause the increase of working capital of the organisation.

II. PROJECT METHODOLOGY



A. Advance Autonomous Robot

An Advance Autonomous Robot is a programmable mobile vehicle. The automated guided vehicle is used in industrial application to move material around a manufacturing facility. The AAV are capable of transportation task fully automated at low expanses. AAV have to make the system automatic by doing the decision on the path selection. This is done through different method frequency selected mode, path selected

mode and vision-based mode etc. The central processing system of AAV is issue the steering command and speed command. For the pre-defined environment, the line follower robot is good option for choice.

A line follower robot is a robot which follows a pre-defined path controlled by a feedback mechanism. The path can be visible like a black line on a white surface (or vice versa) or it can be invisible like a magnetic field. Sensing a line and guiding the robot to stay on course, while constantly correcting. Some of the practical applications of a line follower are industrial applications were these robots can be used as automated equipment carriers in industries replacing traditional conveyer belts in automobile. Some recent development of line follower is seen in applications such floor cleaning, guidance in public places, library assistance, office work etc.

A general AAV system essentially consists of vehicle peripheral on site component as well as stationary control system.

The main components of line follower AAV system are

1) Sensor circuit
2) Processor
3) Driver
4) Actuators (Motors and wheels)
5) Vehicle
6) power supply

III. Selection of the Material

For the AAR I had choose the 5052 Aluminium - H32,5052 Aluminium is optimal for sheet metal work and is very easy to form at room temperature. This material is very bendable, and can therefore handle tight radii. A non-heat treatable alloy, 5052 aluminium is readily welded by conventional methods. It has good forming characteristics and good corrosion resistance, including resistance to salt water. 5052 aluminium is also relatively easy to machine.

A. 5052 - H32 Sheet and Square pipe rod

Aluminium alloy 5052 in H32 temper has very good corrosion resistance to seawater and marine and industrial atmosphere. It also has very good weld ability and good cold formability. It is a medium to high strength alloy with a strength slightly higher than 5251 and a medium to high fatigue strength. Thickness of the Sheet and Square pipe rod - 0.2mm to 6.00mm.

Fig. 4.2: 5052 - H32 Sheet and Square Pipe Rod

IV. Structural Analysis

Structural analysis is the determination of the effects of loads on physical structures and their components. Structures subject to this type of analysis include all that must withstand loads, such as buildings, bridges, vehicles, furniture, etc. Structural analysis employs the fields of applied mechanics, materials science and applied mathematics to compute a structure's deformations, internal forces, stresses, support reactions, accelerations, and stability. The results of the analysis are used to verify a structure's fitness for use, often precluding physical tests. Structural analysis is thus a key part of the engineering design of structures. For the AAR I had choose an aluminium chassis as the structure. Ansys 2016 software is used to do the Structural analysis.

A. Analysis of Line Follower AAR

Mathematical model can able to describe the operation of AGV inside the manufacturing/ warehouse unit. Efficiency of AGV can measure by efficient drive time of AGV from loading to unloading cycle. For this mathematical model we can assume that AGV moves in constant velocity throughout the environment and ignore the effect of acceleration deceleration and other speed difference. The time for a typical deliver cycle system of AGV is

1) Loading at the pickup station
2) Travel time to the drop-off station
3) Unloading at drop off station
4) Empty travel time

$$T_e = T_l + L_d/v + T_u + L_e/v$$

Te = delivery cycle time (min/delivery) Tl = time to load (min)

Ld = distance travel loads to unload station v = carrier velocity

Tu = time to unloading station

Le = distance the vehicle travel until the start of the next delivery station

To find number of vehicles inside an environment

$$n = \frac{WL}{AT}$$

n = number of vehicles WL = work load (min) AT = available time (min)

To find total work load time or the total amount of work express in term of time so

WL = Rf Ta

Rf = total deliver constant per hour for the system

AT is defined by available time per hour per vehicle

AT = 60 A T E

Using the above equation, we can find how many AAR can fit in certain workspace. It calculates the time require for completing a task .so by considering this equation we can optimize the ideal time of AAR

V. Conclusion

In this project, for making the chassis of AAR AL5055 is selected. from the structural analysis on chassis can with stand the load up to 15Kg. Kinematic analysis of the AAR is also done. From the analysis it is found that AAR has good dynamic capacity and it can with stand a load of 20Kg. Design and fabrication completed for AAR. It is more flexible operation and reprogrammable robot.

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