

Analysis on Manufacturing Automated Guided Vehicle for MSME Projects and its Fabrication

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Abstract

Automated Guided Vehicle (AGV) is the material handling equipment that is utilized broadly in maximum manufacturing company, nowadays as it gives more flexibility to system. The fundamental perception of AGV includes driverless & battery-powered vehicles with programming abilities for path selection and locating. They are equipped to navigate a flexible guide path network, which might be simply changed and extended. This project may be concentrating on model, unloading & loading mechanism for AGV have been required to define specific criteria, which is automatic operated, lightweight & capable to transport acrylic. This unloading & loading system worked utilizing ball screw as development system & suction cup with vacuum pump as adhering instrument. The outline and fundamental material to manufacture this AGV model would utilize aluminum to decrease the AGV weight. The AGV application in real world application is support human & decreasing price in repetitive movement transportation actions. This manuscript suggests a survey on control & design of AGV frameworks. We locate many key related problems incorporating guide-path design, vehicle scheduling, assessing number of vehicles, battery management, conflict determination, idle-vehicle positioning, & vehicle routing. Furthermore, we suggest a decision system for design and execution of AGV frameworks, & propose few fruitful study directions. It will be designed for importantly less price & exorbitant efficiency. The expenditure of overall build is Rs.90,000/- which is cost worthy.

Keywords: UGV, AGV, MSME's, Arduino, IOT, Industry 4.0, Fork Lift, genetic algorithm (GA)

1 Introduction

For general, every last one of results would generated all the for the particular provisions that must be advantageous. Every last one of results would make Eventually Tom's perusing the key material. That material may be known as "Raw material". Without crude materials, there need aid no items. These crude materials perhaps different sorts In light of provisions. These crude materials are changed over under helpful items Eventually Tom's perusing those commercial enterprises. There would parts about labors or laborers to machining these crude materials.

Also, there are a number specialists utilized for transporting these materials. There are a significant number rooms for example, such that storage facility or warehouse, different workshops, Furthermore also a few inventories for holding or carrying the completed alternately mostly completed merchandise. A considerable measure about specialists make those helter skelter work cosset to the holder of the business. Percentage specialists must worth of effort there to machining these crude materials that need aid inescapable. However huge numbers specialists utilized for transporting ought to be avoided a direct result it diminishes those work cosset.

The recommended one task might functional for transporting materials starting with one spot then onto the next put without mankind's intercession. Those suggested venture will be constructed straightforward What's more proficient person Toward presenting mechanization there. Those universal methodology of transporting those crude materials and additionally completed items includes no less than 2 alternately 3 laborers in that field. On account of you quit offering on that one individual if detract the materials from the storage facility et cetera someone else ought to load this material of the vehicle which carries that materials and someone else ought further bolstering drive those vehicle of the fitting spots, for example, machine section, cutting section, penetrating section, processing section, work

of art section, gathering section, cleaning area and so on.

So, that manual system for Hosting large portions techniques directing, including mankind's Furthermore takes vast occasion when and likewise here and there mischance happens because of heedlessness and distractions in the mankind's personality. This will be not a container about cake for anyone. Subsequently new business people won't consume this benefits of the business. Henceforth, the essential proposition for this Examine worth of effort is will computerize the material taking care of procedure utilizing minimal effort mechanization strategies. On outline also manufacture An minimal effort AGV for material taking care of On commercial enterprises for taking care of both completed products & crude materials for assistance from claiming Robotic arm for Gripper In its finishes by utilizing Arduino UNO R3 controller.

The AGV have been regularly utilized in facilities like distribution centers, warehouses, manufacturing plants, &transshipment terminals. AGV might be referred as mobile robots owing to their reprogram capability. The AGV reason will be to support decrease prices of manufacturing &expand effectiveness in manufacturing framework. It also included raw material, tools development, & work in procedure among stations. These developments should be accurately, securely, effectively & without any harm to materials. The project team are isolated into 3 diverse specify that is unloading & loading mechanism, AGV control framework and AGV mechanical part.

The vital ability of this AGV is exchange loads to locality through way under machine control by programming. The AGV will be a material controlling framework utilized for horizontal movement of materials. The AGVs are suggested in 1955, the utilization of AGVs is enhanced tremendously since their presentation. Many application regions &varietyof kinds have expanded essentially. AGVs might be utilized indoors &outdoors, contributing in tasks like distribution, production, &transshipment. The AGVs have been utilized to transport materials of whole kinds related to manufacturing methodology. The cross docks & deposits, engineering centers have been instances of distribution regions. The AGVs have been utilized in these regions for internal transport as instance, pallets among diverse departments like the storage, dispatch, reception, & sorting regions.

In transshipment schemes, like AGVs, shipping containersdeal with products transport among diverse modes of transport. The very significant variancesamongtraditional and novel application regions have been many AGVs utilized;degree of AGV occupancy, many transport applications, the distances travelled and many pick-up and delivery points while transport applicationsbecomeaccessible. The panic grades have been utilized to carry fewer requests over short distances among selections, delivery points. Different reinforcement methods, many AGVs are utilized to execute a large amount of repetitions, transport tasks to container terminals and exteriors. It was concluded that few methods and novel methods have already provedsuccessful.

1.1 ANAGV

AGV vehicles have been utilized in warehouses to transport products. The AGVs appearancesimilar aslittle cars, which might transfermanagedin warehouse. The managed travel will be ensured by special software. There have been numerous kinds of automatic vehicles generated by many industries. Each of these might be utilized for moving pallets. Few of these automatic vehicles might move shelves with goods to be organized. The AGV's central processing framework problems the steering control along withmovement speed.

A common AGV framework comprises basically of peripherals vehicle on-site modules, stationary control method. The important modules of AGV framework have been oriental way scheme, vehicle, traffic control, and management framework. The faultlesscommunication of these modules ensuring work installation effectiveness.TheAGV will guarantee a secure presentation, load &surroundings.



Figure.1. Pallet Truck AGV



Figure.2. Unit Load AGV



Figure.3. Towing AGV



Figure.4. Forklift AGV

1.2 Vehicle

The vehicle will be main component of AGV due to it satisfies the real transport task. The vehicle is distinctreliant on design, determination& activity environment. They have been utilized in numerous stateslikeAGV intended to enhance the health care method, AGV established as hotel service robot. Amazon has executed KWIA robot for automatic storage and products retrieval in system. The main usual utilizes of these automatic vehicles have been in production region while providing workstations with raw materials. Similarly, they have utilized whileselection up semi-finished or finished goods& bringing them to storage region. The automatic forklifts might be deliberated AGVs;nevertheless, the

normal concept will be AGVs are type of cars, which come under pallet and pick it up. As noted that moment, they have been utilized in production environments because of high prices of buying the systems.

1.3 Oriental Way system

The vehicle guidance framework will be technique by AGVs has been distinct & vehicles are managed subsequent predefined ways. The AGV framework utilizes guide path, it selects a path based on programmed path. It utilizes the information given by sensors & will be compared with value provided by programmer. While AGV methods a decision point, it only has to choose whether to follow path. The maximum utilized navigation methods in AGV are:

- a. Behavior-based
- b. Landmark-based
- c. Vision-based navigation

1.4 Traffic Control and Management System

To work effectively and expansion AGV output, the vehicle must be well controlled & diminish waiting time at loading/unloading station. The traffic control might be handled by AGV utilizing on-board vehicle identification & zone control. Numerous destinations modifying of AGV in adaptable manufacturing environment, utilizing optimization methods, a method for handling traffic in workspace. The GA will be method built on search for natural determination procedure. The ACO method will be utilized to discover the group near optimal program, which fulfills both loads balancing among AGV, rely on time minimization & travel time. For productive control, 2 sorts of control framework are utilized inside workplace:

1. Stationary control framework
2. Peripheral control framework

The AGV efficiency might be calculated by effective actuation time of AGV from loading to unloading cycle. For this, we might assume that AGV transfers at constant speed through environment & disregards the deceleration effect of acceleration & other speed modifications. The time for a distinctive delivery cycle will be defined as AGV framework:

1. Upload to pick up station
2. Travel time to reaching station
3. Unloading at the output station
4. Empty the travel time

2 Proposed Method

Manual Handling Technique

In manual handling technique, all the materials are carried and transported solemnly by the workers and not using any vehicle for carrying those materials. This method is the very ancient method for material handling in the world. This strategy prevails at present in the little commercial enterprises for example, fireworks, and match boxes commercial enterprises and so on. Also this technique costs secondary because of parts of people need aid required to taking care of the individuals materials would overwhelming Also a considerable measure if at whatever.

Manual cart (Transporter) Technique

Manual truck procedure possesses an approach to which materials would made crazy from those storage facility with the assistance of people et cetera they spot these materials in the vehicle which carries and transports it of the end for example, such that workshops and so forth. Person transporter who drives the vehicle which carries the materials that need will make machined. If he loses as much control, it prompts a mischance.

Conveyor Technique

These systems include A percentage lift alternately crane sort system to lifting those items which would greater Previously, sizes Also doesn't convey the mankind's. This strategy will be basically utilized within car What's more auto commercial enterprises such Audi, Ferrari, Lamborghini industries, especially in the lifting of the motor segments for example, motor head, the entirety crankcase, flywheel

What's more hood of the vehicle Furthermore additional need aid lifted Eventually Tom's perusing actualizing along these lines from claiming methodology. And also, this procedure not main lifts the materials as well as transports it to its next area. Yet this forklift system utilized within the just limitless territory done commercial enterprises Also Additionally it is an unreasonable you quit offering on that one. Eventually Tom's perusing examining the existing techniques instigated clinched alongside material handling, those Emulating drawbacks need been identified as takes after:

- The existing system takes more time to lift the materials that have to be machined.
- It involves many human labors which in turn results that high labor cost.

Elementary witticism will be to computerize those whole materials taking care of methodology. Those transform may be robotized toward utilizing sensors What's more actuator associated with Arduino UNO R3 controller. This recommended worth of effort may be not just picking or lifts those crude materials from the storage facility as well as transports of the different segments What's more drops there Also Additionally once more picks the done or semi-finished beneficial starting with those workshop should other work of art segment alternately At whatever. This research may be primarily focused on the prerequisite of little and medium scale enterprises, will offer them with more reliability, secondary effectiveness and the A large portion critical effectiveness and less the long haul utilization.

Playing point for suggested system: Advantage of proposed system:

The advantages of the UGV for material handling in industries project are

- Low price of manufacturing & simple to maintain.
- It is well-suited for picking the materials and dropping it easily with help of Arm with the Gripper mechanism.
- The machine consumes less power.
- Not only picks up the raw materials and also carries them on the vehicle and transports it to its destination easily by the Line follower concept.
- It is compact and occupies less floor space.
- It is easily programmable and controllable by using the servomechanism.

3 Design and Analysis

Wall Shear Stress for pore size of 0.8 mm Diameter:

As the design is developed in CREO software it took utmost capability of creating the model of this AGV base. These two diagrammatic representations are clear which indicates the designation of model so with these representations we can clear view of the AGV structure.

Figure 5 represent maximum WSS in all methods happened at higher velocity (i.e., 1 mm/s) & WSS is linearly lessening while velocity reduces. Undoubtedly, the shear stress distribution is distinctive & relies on scaffold structure.

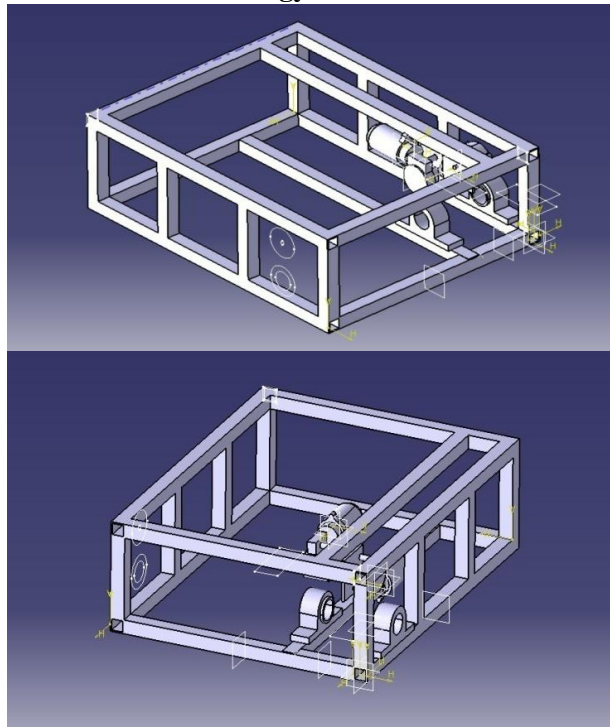


Figure.5. Represent maximum WSS in all methods happened at higher velocity

4 Results and Discussions

And, these AGV model is specialized in ball screw movement which it works on coding structure and defines in a way in which if any object come across the way in which material handling is done it stops automatically in which it is programmed like sensors. Any environment & inexpensive between autonomous robots might be implemented. There is a main change among practical & theoretical time value of work cycle being optimized by implementing a diverse technology. Moreover, one might think of a symbol relaxation holding necessities in traffic control framework, thus many vehicles might leave diverse crossing areas concurrently, thus, the AGV system presentation might be enhanced. Many researchers neglect AGV battery management issues. In the instance of long travel distances, battery charging becomes a problem & requires being deliberated as well.

5 Conclusion

A new system for material handling is designed and established. The whole automation of framework is attained & proves to be price effective as well. Furthermore, objective of this system is to pick, to carry and to transport the materials with the help of AGV without any human intervention and reducing processing time is taken by human is successfully accomplished. The display AGV carries the load for those ability from claiming dependent upon 3.5 kgs since that ability of the gripper lifts up to 200 gram for every lift. Relies on the requirement, those limit of the gripper What's more dc engine could be transformed. Thus, the model can a chance to be utilized to taking care of overwhelming weight materials additionally. We have deliberated numerous main problems in AGV method plan & execution. These problems incorporate guide-path design, assessing the essential amount of vehicles, battery management, vehicle scheduling (dispatching), idle vehicle positioning, conflict resolution, & vehicle routing. The main significant problem while designing AGV methods is guide-path design. In normal, we might separate guide-path frameworks into 3 classes: single-loop, conventional & tandem methods. Everyone has its individual benefits & drawbacks, and will be appropriate for particular applications. Attaining a best evaluation of vehicle empty travel under few better dispatching guidelines is key issue here. Further problem will be how to handle AGV method effectively. This problem incorporates many sub problems: idle vehicle positioning, vehicle scheduling, conflict resolution, battery-charging, & vehicle routing. The scheduling method also decides that route a vehicle must take to reach its target without collisions.

References

- [1] Carullo and M. Parvis, "An ultrasonic sensor for distance measurement in automotive applications," in *IEEE Sensors Journal*, vol. 1, no. 2, pp. 143-, Aug2001.
- [2] Egbelu P.J "Characterization of automated guided vehicle dispatching rules", journal from international journal of production research,1984.
- [3] GolgenBengu "An assignment algorithm for dynamic picking systems", Institute of industrial engineers,1995.
- [4] Govindaraju K, Boopathi S, Parvez Ahmed F, Thulasi Ram S and Jagadeeshraja M "Embedded based vehicle speed control system using wireless technology", International journal of innovative research in electrical, electronics, instrumentation and control engineering, volume 2, issue 8,2014.
- [5] HorandI. Gassmann and BjarniKristjansson "The SMPS format explained", IMA journal of management mathematics, volume 19, issue 4, 2008.
- [6] Jean K. Miller "Computer assisted circulation control at health sciences library a description of circulation system", State university of New York, 1972.
- [7] Khalid M. Altasa "Cycle time models for dual address storage and retrieval systems", IEEE international conference on systems, man and cybernetics,1997.
- [8] Krishna Raju, Ramkumar R and Lenin V.R "Design of three fingered robot gripper mechanism", "International Journal on Mechanical Engineering and Robotics", volume 3, page18-24.
- [9] Kurt E. Clothier "A geometric approach for robotic arm kinematics with hardware design, electrical design, and implementation", Journal of robotics,2010.
- [10] Maurice J. Freedman "Circulation system past and present on library automation", school of library service, Columbia, New York City, page no.279, vol.14/4,1981.
- [11] Mehul V. Gohil, Jignesh Patel "Design of lead screw mechanism for vertical door wrapping machine", International journal for scientific research and development", issue 02, volume. 2, page no 185,2014.
- [12] Michael R. Foster "Review of programmable logic controllers in control systems education", a review of programmable logic controllers in control systems education,2010.
- [13] Pounraj P. Periyasamy, Winston D. Prince, Cynthia Christabel S. "A Continuous health monitoring system for photovoltaic array using arduino microcontroller", circuits and systems, volume 7, page 3494-3503,2010.
- [14] Robert J. Gaskins and Jose M. A. Tanchoco "Flow path design for automated guided vehicle systems", International journal of production research, volume 25, page 667-676,1987.
- [15] Robert J. Gaskins, Jose M. A. Tanchoco, Taghaboni and Fataneh "Virtual flow paths for free ranging automated guided vehicle systems", International journal of production research, volume 27, page 91-100,1989.
- [16] Sukumar Manda, "Standard requirements for integrated library system", Asian journal of multidisciplinary studies, vol.1, issue 5,2013.
- [17] Thomas landers, Malik Sadiq and Don Taylor G "An assignment algorithm for dynamic picking systems", Institute of industrial engineers, volume 28, issue 8,1996.
- [18] Tingting Yu, Ahyoung Sung, Witwas Srista-an and Gregg Rothermel "Using property based oracles when testing embedded system applications", IEEE international conference on software testing, verification and validation", page 100-109,2011.
- [19] Vaglica J.J and Paul Gilmour "How to select a microcontroller", IEEE Spectrum, IEEE Journals & Magazines", volume 6, issue 3,1990.
- [20] Vahid Araghi, Nima Eslaminasab and Golnaraghi M "Friction induced vibration in lead screw systems", Journal of Vibration and Acoustics", volume 131, issue 10,2009.
- [21] Yanbo Li, Florent Della Valle, Mathieu Simonnet, Ichiro Yamada and Jean-Jacques Delaunay "High performance UV detector made of ultra-long ZnO bridging nanowires", Book of nanotechnology, volume 20, issue 4, 2008.
- [22] Yoon Sang Kim "Development of a sensor network based SMPS system, a smart LED monitoring application based on wireless sensor network," international of distributed sensor networks,2014.
- [23] Zenhai Chen and Luo R. C. "Design and implementation of capacitive proximity sensor using

microelectromechanical systems technology”, IEEE transactions on industrial electronics, volume 45, page 886-894,1999.

- [24] I.F.A. Vis. "Survey of research in the design and control of automated guided vehicle systems," European Journal of Operational Research, 2006, vol. 170, pp.677–709.
- [25] T.Ganesharajah, N.G. Hall,and C. Sriskandarajah. “Design and analysis of operational issues in AGV-served manufacturing systems,” Annals of Operation Research, 1998,vol.76,pp.109-154.