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Automatically Positioning the Garment in a Warehouse at the Desired Place using Artificial Intelligence

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Abstract. Considering the cost involved in storing the garment, it is necessary to utilize the space available optimistically. Manually it isn't easy and time-consuming to manage a big warehouse. With the help of the latest technology, working behavior, and business strategies revolution, smart warehouses can be made and managed. The application of Artificial Intelligence has made it possible to make and manage a smart warehouse that includes logistics, management, and coordination where the storage and dispatching can be made automatically. The proposed method of the smart warehouse is based on AI and a machine learning-enabled devise that places the garment automatically in the desired place. The reach of this device is from floor to ceiling which has a turn table that can move in every direction on the floor, in addition to those two types of the station, the floor station and underfloor station are managed. The cylindrical shelves are arranged on the floor and an AI-based carrier is connected to the tracker to track and store the garment.

Keywords: Machine Learning, Artificial Intelligence, warehouse

1. Introduction

In today's era, cost is the critical driving factor for any organization to run. If one can control the cost, one can make a profit. The cost involves two kinds of cost: Variable cost and Fixed cost. Variable cost depends on the product or services to be provided. Space comes under the fixed cost. Warehousing and storage of raw or finished goods consume the space, and if we can optimize the space of warehousing, we can save the cost. Warehousing the goods effectively without making the storage error can help the organization provide the goods "Just in Time," i.e. without any delay and error. Organizations can also minimize the human errors made in the storage of goods in the wrong place. The process-related transaction that includes receiving, storing, fetching, and sending the goods are being done in the garment warehouse. Garment warehousing involves size-wise, article-wise, colour-wise, and destination-wise storage. These factors are also involved while loading the garment in a container to send the shipment. So correct storage is very much important to load the garment correctly and send the shipment without any storage error.

1.1 Why do we need warehousing?

The warehouse is essential for the storage of goods while made in excess or for storing the goods that are made in advance to fulfill the customer's needs.
They are important for quick response to the customer.

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They ensure the faster delivery of goods that are demanded by the customer and also the continuous production and movement of finished goods
Warehouse plays the important role in minimizing the cost of goods
Having a good and spacious warehouse can have many advantages but a conventional warehouse or the conventional way of running a warehouse can have many difficulties and can lead to many customer complaints that can directly impact the business and could be a cause of big chargeback by the customer, and this is a direct loss to the organization. So this necessitates a change in the way of operation of a warehouse. There are many new technologies like the Internet of Things, RFID, sensors, machine learning, robots, artificial intelligence, tag readers, barcode generators, and readers, which can help in changing the operations of warehousing. The below picture shows the functions which are carried out in a warehouse.

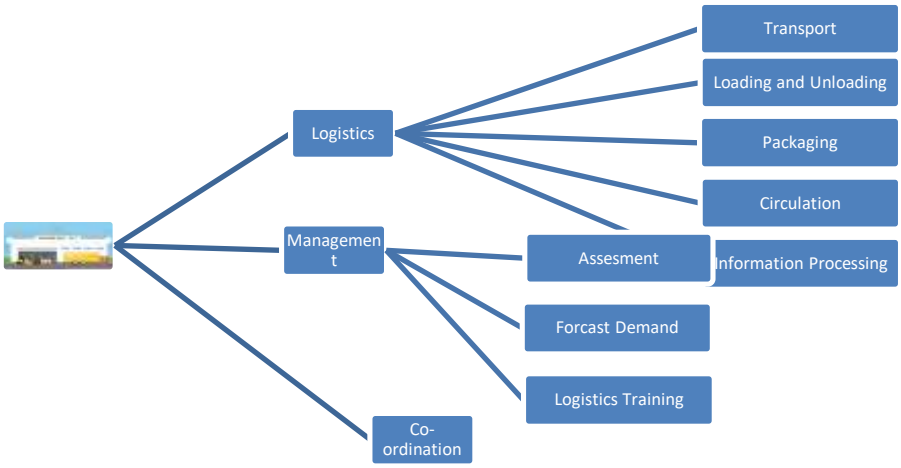

Fig.1: Functions of Warehouse

Nowadays Artificial Intelligence has become an important factor in major industries, garment industry is one of them in which automation is going to start. Industrialists, product developers, logistics service renders, vendors, and marketers, want to implement automation in their field as early as possible. They cause innovation in the field of logistics and supply chains. The picture below represents the drivers which are essential for Artificial Intelligence.

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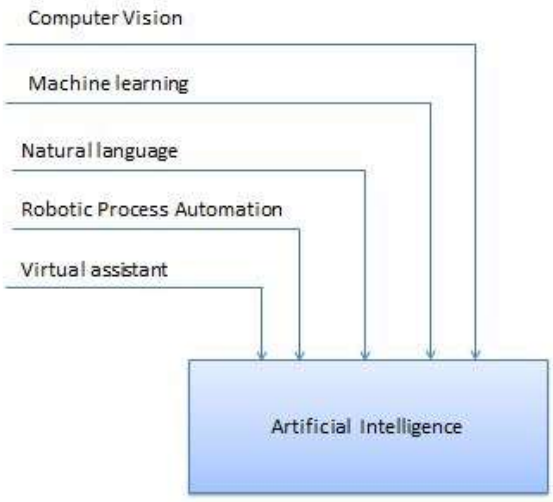

Fig.2:Potential Drivers of Artificial Intelligence

To enhance the operations being done in the garment warehouse paper also put forward the application of AI in the smart warehouse to ensure the error-free and efficient storage and logistics [1].

In the garment industry, the warehouse should be considered the foundation of the business. In a clean room, automatically placing a garment in the warehouse is one of the challenges faced by the garment industry. Using an automated carrier or tracked cart connects the automatic warehouse and a processing device and arranges and place the garments automatically is the need to be addressed. A relatively large running space is required to install unmanned carriers or tracked carts that's why the capability of transferring the garment from one place to another place is limited. Consequently, capability of transferring the garment between the processing device and the automatic warehouse is likely to be insufficient.

Nowadays inventory management is being done manually in the garment industry. Without a proper system in place it is a very difficult and time-consuming process to keep track of the garments inside a big warehouse, it can be difficult for the employees to do their jobs in the identification and arranging of the garments within the targeted time. To optimize the space utilization it is required to categorize the inventory and to use the proper storage methods. This increases the capacity and efficiency of the existing facility.

Artificial Intelligence can give an extra edge to generate value in the warehouse through various other technologies, that includes machine learning, natural language processing, robotics, etc.

Machine learning has an algorithm that learns the decision-making through the data collected by the sensors used, it notices the patterns and actions taken by the human and suggests the action that should be taken in similar conditions. It takes the action such as replenishment of the stock in a particular location, better inventory positioning, and shorter walking routes that optimizes the uses of available resources.

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So, in the current invention, we are coming up with AI which helps in Automatically placing the garment in a warehouse at the desired place.

2. Related Work

2.1 Warehouse Management System

It is studied that the impact of having a "Warehouse Management System" is very important for business growth. It can be adopted through wireless barcodes and an MIS system. It reduces time and cost and makes the system more robust, efficient, and flexible. In terms of time, it reduces the delivery lead time, manpower cost, and orders are available "just in time" and increases customer satisfaction. Customer satisfaction is directly proportional to the order so it increases the business in terms of orders. [2]

Sahuri and Utomo invented a system that can take the real time data based on the entries done in the warehouse and can send the data through SMS (Short Messaging Services) to the management so that they can take decisions on the bases of real-time data. It helps the management to take error-free and faster decisions because of the availability of data on their phones. [3]

Adiono et al. proposed an RFID-based system that is a kind of goods locator system that has an RFID tag attached to the item. This RFID tag has all the information related to the product. When an item is sold out it updates the "Warehouse Management System" data and gives the real-time data. It makes the warehouse more efficient in terms of replenishment of goods just in time. [4]

Oner et al. designed an RFID-based information system framework for the wool yarn industry to track work-in-progress, count and track inventories, pick, receive, and ship. Oner et al. assessed the cost-saving analysis for the suggested system and found that the workforce that was required to do the things manually is decreased by 20% and also reduced the rate of lost work-in-progress. In this way, the overall cost can be reduced and the overall performance of the wool yarn industry can be improved.[5]

Wei et al. discussed the application of a barcode system in a "warehouse management system" in a pharmaceutical company which helped in managing the inventories very effectively. This has also decreased the cost of labor and the decision-making system becomes very effective. [6]

Qin et al. studied the impact of wrong information about the inventory in the warehouse and he discussed the impact of wrong information on the supply chain and on the end-user. He discussed the bullwhip effect of having the wrong information. This problem can also lead to an increment in labor cost, storage costs, and an increase in the retravel and transport time of goods. Implementation of RFID or computer-controlled warehousing system can speed up the work process, reduce the error rate, increase warehouse productivity and modernize the work process. [7]

Mao et al. designed a framework to eliminate the chance of error and remove the bullwhip effect. The framework is about the intelligent warehouse management system based on a cloud model, this cloud model is based on an algorithm that is based on an RFID and GPS system. This algorithm is a hybrid genetic algorithm based on a bee colony optimization which provides real-time data that can help in taking a quick and error-free decision and can provide the goods just in time. In this way, it is contributing to reducing the bullwhip effect and improving the performance of the warehouse as well as the whole supply chain. [8]

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Han and Zhu studied the logistics system of a warehouse, he studied the existing problem, and to improve the performance of the warehouse the author presented a solution by proposing a smart warehouse management system that can reduce the cost in terms of manpower and can enhance the performance by increasing the space utilization and by making the better co-ordination among the departments to reduce then a chance of error [9-10].

3. Proposed Method

As a solution of the above deficiencies of the prior art, the object of the present invention to enable a automated process with the help of AI to be used for transferring garments and to enable a loading station of an automatic warehouse to be easily installed in a clean room by using AI for automation Process.

The proposed method provides an automatic warehouse which have shelves, a mast, and elevating loading mean for loading garments on a shelf by lowering and elevating along the mast, the mast has the functionality of reaching the underfloor space and the space above the ceiling in a clean room, and garment loading station provided at a position to load a garment on the elevated loading weans.

The proposed method also has the functionality of arranging the garment on the shelves that are arranged only in the floor space available in the warehouse.

In addition, the present proposed method is a transfer system characterized by comprising shelves arranged in the floor space, mast which is responsible for loading the garments on the shelves by elevating and lowering itself, and an extension section that can be obtained by extending the mast through a space above the ceiling and a space under the floor.

Shelves to be made in a cylindrical form so that the elevating loading means can move within the circle by elevating and lowering itself, no rails are required in the automatic warehouse, this simplifies the elevating and lowering of the elevating loading means to the space under the floor and the space above the ceiling along the extension section.

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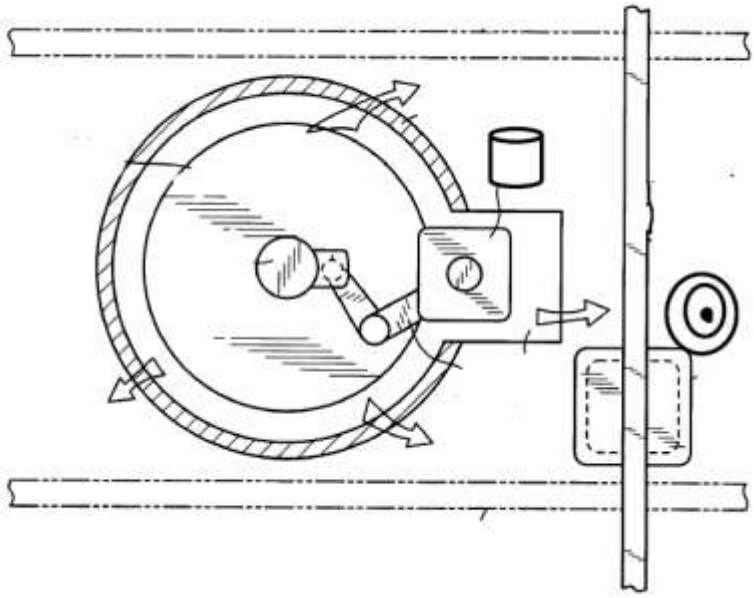

Fig.3:An Automated AI based garments arranging device with the embodiments

The proposed automatic warehouse system has a unmanned carrier, which is called a tracked cart. This is connected to the two types of station which are floor station and the underfloor station. These stations are the part of the automatic warehouse. This cart which is connected to the floor station and the underfloor station provides the two types of garment transfer routes. Thus for example for the short distance transfer between the processing device and for the automatic warehouse, the unmanned carrier for floor running is used. For long distance transfer for the garment between the pre-processes and the post processes, the tracked cart is used. So to improve the capability of transferring the garment, the short distance transfer and the interpose transfer can be distinguished form each other, whereby the automatic warehouse can be used as a buffer that corresponds to both type of garment transfer. Although the embodiment above shows that a mast is extended through the underfloor space, the same effect can be achieved by extending the same mast through the space available above the ceiling where the running rail and the underfloor station are installed. The model discussed here has a table installed on the floor.

The platform does not need to have movement in the underfloor section and no rotative movement space is required for the platform. Thus according to the embodiment shown in the figure 3, to allow the warehouse to penetrate through the floor without interfering the beams, the cross-section of the underfloor can be reduced. Consequently, by only removing the floor plate the automatics warehouse can be easily installed in a clean room, thereby it eliminating the need to move the beams.

The platform which s there in the underfloor station can be rotated by any degree, the area which is required to make the setup is one in which the turn table and the

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underfloor station should be installed and the area in which the garment or the goods and be loaded on the scaler arm which is located at the underfloor station. The layout should be designed in such a way that the gaps between the beams should have the setting of cross-section od the automatic warehouse in the underfloor space, in this case if there is a need to change the layout of the warehouse, it can be changed without the need to move the beams. With the help of running rail installed therein, the tracked cart can be moved not only through the underfloor space but also through the space available above the ceiling, and th extension of the warehouse can be done through both the underfloor space and the space available above the ceiling, where a loading station can be provided to load the garment on the cart to move through the automatic warehouse.

4.Results Discussion

A warehouse in a garment unit is the backbone of the entire supply chain. The proposed system of designing a warehouse in which the application of AI with "Machine Learning" with the help of specially designed infrastructure can help any organization to reduce the cost of manpower, to increase the utilization of space available, can decrease the time to retrieve the garment with 100% accuracy, to store the garment as per the loading plan of the container, can reduce the time to load the container as the garment are kept in the warehouse in the desired manner, can reduce the customer complaint regarding the wrong size loading or wrong sequence loading. In a way the proposed method put forward an effective method that can reduce the procedure and time in storing and retrieving time of the goods from the warehouse, if done manually. Research shows that if a warehouse is getting 10000 men's suits per day for storage from the production house, it requires at least 10 manpower to store the garment in the desired place but if it is being done automatically with the help of the above-proposed system, it needs only 2 manpower to store those garments. Same is the case of space also, automatic method can increase the space utilization up to 30% as we can use the height of the warehouse but in manual method utilization of height is not as good as compared to the automatic method. Many models are well-defined for different ML algorithms. Certain usually implemented models contain multiple linear regression, linear regression, vector machines, and neural network models with varying kinds of Logistic and arbitrary forest gathering. For localization in the network, the regression model is used. It treats localization difficulty as a gathering or organization problem that is insincere in its environment.

5.Conclusion

The proposed method is the combination of AI, Machine learning, and mechanical engineering to embed the system. Artificial intelligence is for collecting the data, analyzing it, and taking the decision on the bases of previous data. Machine learning includes the learning of decisions took by the operator in some special cases where human invention is required. This gives the real-time data of the warehouse which can help to make the decision about the inventory and replenishment time. It helps in reducing the cost in terms of manpower cost, fixed cost in terms of space as the use of space and time can be optimized. The number of errors can be reduced and in a way, the profit can be increased by saving time, space, and manpower.

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