AUTOMATED PICK AND THROW ROBOTIC ARM FROM CONVEYER BELT

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Abstract- *The goal of our research is to study, analyze and fabricate a Robotic Arm with Conveyer Belt which performs the operation of picking and placing the object from one place to another place. As we know, the production is increasing day by day as the time is passing and it has become a priority of every company to speed up their production rate along with profit. When production occurs on a large scale then problem arrives in the material handling system because of so many factors like counting of products, removing the defective piece etc. due to these reasons manufacturing units are found to be more interested towards automation via robots for their work. The pick and place robot is one of the automation technology in manufacturing zone which is planned and designed in a way that it removes the faults and intervention by human to get more accurate work, it accelerates the operation of picking up and placing the stuff to their required locations and automating this procedure helps to escalate the production rates and profit. It has sensors which sort the products according to its color and one of the sensor counts the product on the conveyer belt. These type of robots are installed in various fields where some repetitive process occurs such as in bottle filling industry, packing industry, brick manufacturing plant, different construction sites etc.*

KeyWords: **Conveyor belt, IR Sensor, Manipulator, Actuator, Gripper, spur and Worm Gear, Reed Sensor, DC motor**.

1) INTRODUCTION-

Today, robotics has become a wide-ranging field of work then it was over the last few years, dealing with research and growth in various multidisciplinary areas, like kinematics and dynamics, planning system, control, sensing, programming languages, and artificial intelligence. At present all the manufacturing industries are going towards innovative ideas, method, techniques for better result and for the growth of industry. Because when in old days production was at small scale it was possible to perform these tasks manually by labour but a present due to increase in production it is not possible to do it manually and it also increases the labour expenditure. So the installation of these types of robots has become a necessity.

As we see, the automation is increasing in the world day by day to make our lives trouble-free, the elementary essence of work is modifying. Requirement of manpower in industries has decreased remarkably due to the reason that most of the tasks are now being done by machines. Simply we can state that human arms are being replaced by robotic arms. Consequently robotic arm perform the repetitive work which was done manually before their installation. And also these automated arms gives better outcome, lessen the injury and guides industry further. Most eminently assisting them has also helped in making operation more efficient, organized and less noisy. Attainability of robotic arms for tedious and threatening work has re-strained human hands for critical and safer work.

1.1 ROBOT ARM KINEMATICS AND DYNAMICS:

Kinematics works towards the analytical observation of geometry of the arms motion with respect to fixed coordinate system without considering the forces or moments that causes the motion.

Dynamics, deals with the formulation of mathematical equations of robot arm motion.

1.2 MANIPULATOR TRAJECTORY PLANNING & MOTION CONTROL:

Before operating the arm of robot, it is important to know if any barrier present in the pathway that the robot arm has to travel.

As per motion control analysis, the motion of arm is normally carry out in two decided control phases. First one is the gross motion control, and the second is the fine motion.

1.3 ROBOT SENSING:

Robot sensor functioning has been split up into two groups: Internal and External state sensors. Internal state sensors manage the observation such as position of arm joint, for controlling the robot.

1.4 CONVEYOR BELT:

A conveyor belt is belt usually made of rubber or fabric like polyester stretched by two pulleys located at certain

distance apart from each other on a shaft or roller which is rotated with the help of power transmission device such as dc gear motor. The one which transmits power is termed as driver and the other one as idler pulley. Many belts have two layers for material handling purpose. The layer giving linear strength and shape is termed as carcass and the other one is termed as cover.

2) LITERATURE REVIEW-

Many industrialists and academic professionals have done a research about this particular topic and it has always been an interesting topic to ponder upon i.e, the material handling system. Many experts have shared their views and regarded material handling management system as the backbone of any production industry. Therefore a following review has been written especially to know about the previous researches made on this very particular topic. Prof. Shubha P and H.G Rudresh (1), Colour Sensor Based Object Sorting Robot was their projects focus in which automated material handling system was main objective. The object moving on the conveyor belt is picked when microcontroller directs the robotic arm by coordinating its movement. Objects are sorted by placing them to their predetermined places after picking them from conveyor. Accuracy and repeatability in the work is achieved when the work done by human is carried out by robot.

Further, Saranya.L Srinivasan.R and Priyadharshini V (2), performed experiments on pick and place robotic arm using MATLAB software as offline surface clustering algorithm. Their study was focused on identifying maximum number of objects picked and placed by robotic arm within shorter period of time. They do so by image processing algorithm using MATLAB software. Dharmannagari Vinay Kumar Reddy [3], He too did research about the sorting of objects by identifying their color and placing them to their desired location. In his project he used microcontroller (AT89S52) and liquid crystal display (LCD) for the above task to accomplish.

Further Marymol.P, Dhanoj.M, Reshma.K and Sheeba.V (4), they have used an embedded system to study the color sensor based object sorting robot. A robotic arm is manufactured by them which does the job to sort different colored cubes in distinct cups.

S.V.Rautu et. al (5), in his project Items are rejected which do not qualify desired attributes and using a flipper mechanism they are pushed away. Different colour items are collected in either of the partitions of circular container in which they are kept. All DC motors in their project are controlled by two conveyor belts. For identifying and segregating items TCS 230 colour sensor, inductive sensors, load cells and Siemens 300 series PLC were used.

Conclusion obtained from review-

Material handling is a very tedious and time consuming work especially when it is performed by human, also it is very risky work as it can lead to the loss of item in case of human's fatigue and tiredness etc. These types of work where repeatability of task is required are efficiently done with the help of robots by programming them to do the specified task with precautions. Therefore after analyzing above researches we found that and efficient system must be designed which automatically controls the transmission of material handling using different microcontrollers and sensors and making it fully automated is the future demand. In the era of advancement of technology, manufacturing such machines will reduce the efforts of humans beings and proves to be a boon of technology thus an effective method is required for pick and place and transmission of objects from one place to another. It is easily being done now a days with use of one such system but also it make us curious to discover the possibilities how far we can go in this topic therefore we concluded to fabricate a model which could not only handle the material but handle it automatically and efficiently also it should count and sort the material as our source researchers have made in their project. So the machine learning could of effectively used in practical rather than just reading it in syllabus and forgetting.

3) METHODOLOGY

Our research was conducted with a little survey of biscuit factory near our college and it is followed by different set of questionnaire and interview of the owner of factory. The research used a quantitative methodology based on the approach advocated by factory owner. This study investigated factory workers/staff attitudes towards the continuous work of material handling right from the incoming raw materials like wheat flour, sugar, butter and other additives to packaging of biscuits in different packets and finally packaging them in cartoons for delivering it to stores.

We found out that in every step right from incoming raw materials to semi finished products like dough it is required to handle these materials with care and since it is a repetitive process it requires a lot of patience and hard work. Also we found out that after each successful operation the material is required to be transmitted to a new place for new operation like adding sugar and mixing it finely. The survey was voluntary and anonymous. About 20 staffs including the owner were asked simple questions like what kind of difficulties they face at their work? What makes them tired and feel less interesting at work? What work they want to be done by someone else because it is boring task? And finally how they managed to increase their production rate defeating their last years productivity. Most of the answers were about the material handling since it is repetitive process if a machine is used for pick and place purpose it would ease their job and only

few people will be required for this & this was the secret formula of every production industry now which is no more remained a secret.

This research analysis and literature review set out the need of an automated material handling system which could work on its own with minimum human interventions also a conveyor belt system for transmission and pick and place objects and sorting and segregating of objects like ideas were proposed by different experts in their researches made the team curious to go in more depth of the concept so our team decided to design one such model which can pick and place objects from conveyor belt which itself is made automated which can start and stop on its own for that we collected data we sensed that different sensors and microcontrollers will be required like IR sensors to stop conveyor belt as soon as a product encounters it and then a robotic arm will come to pick an object and place it in a pre determined position. Some people have made a item segregating robotic arm which segregate different objects based on their colour apart from this our team decided to install a product counter sensor to count the number of products passing from conveyor belt this went another step ahead. We analyzed different methods and different perspective of authors of robotics and considering the workspace we decided the manipulators attributes and robotic arm configuration like link length and joint values. Similarly we decided to purchase other microcontrollers and other integrated circuit chips gears and other components after making a list of components required.

We followed the methodology of understanding and evaluating the already existing material handling systems Then we collected the data required such as Phase AC induction motor, Conveyor belt DC geared motor, Different type of sensors, Microcontroller LED display etc. Then we calculated design standards such as conveyor belt length, width stress analysis on the belt, required motor rpm etc based on which selection of parameters were done.
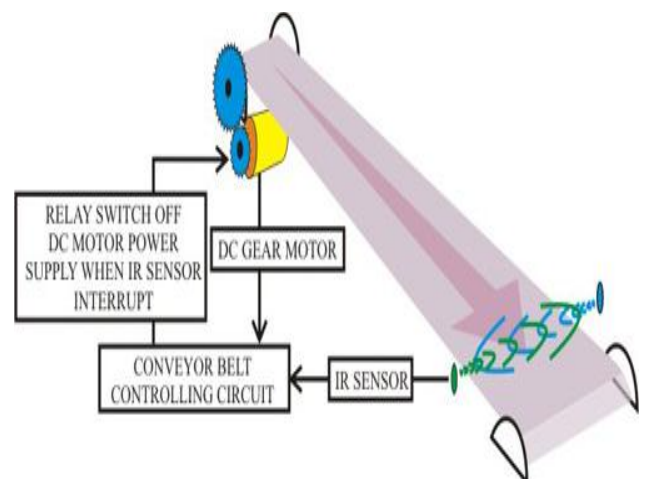
4) WORKING –

Here in this work we have designed an automated material handling robot. This type of robot counts pass product for robotic arm. We have used one conveyor belt which is rotated by one dc gear motor. After that we have used two pair of IR sensor for counting objects and second pair of sensor stops conveyor belt when object reaches pickup position and then signal from sensor is processed in microcontroller which further controls robotic arm. We have used 3 dc gear motors for one robotic arm controlled by simple program circuit & used buhler dc gear head motor for gripping. Whole work is done on principle of sensor microcontroller feedback system. One reed sensor is also used in rejection counter to identify faulty product.
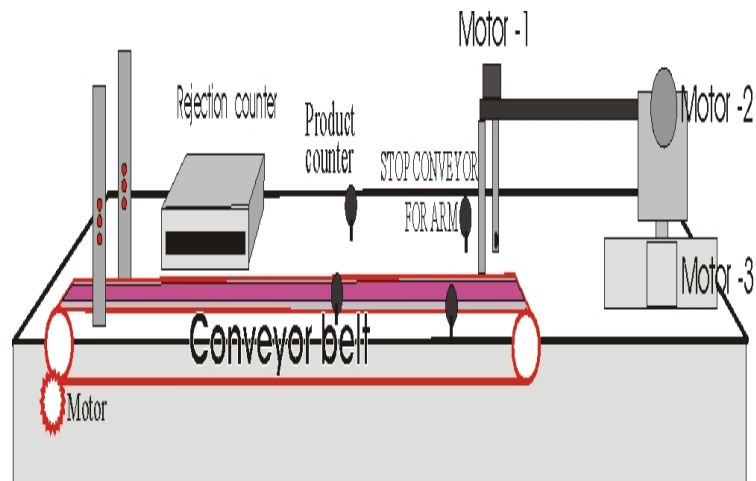
Fig -1 WORKING MODEL OF THE PROJECT
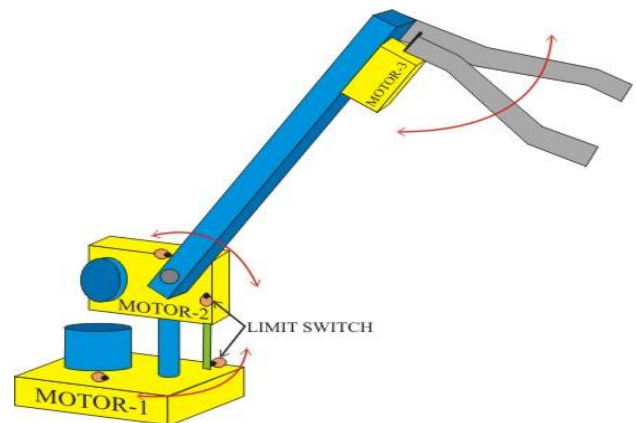
Fig -2 ROBOTIC ARM WITH 3 DC MOTORS

Fig.3 - IR CONVEYOR MOVEMENT CONTROL SYSTEM

WORKING OF ROBOT-

In the beginning of the circle, the operator loads the fixture, clamping the part in place, Signal is sent to the robot controller via an external feedback part. Upon receiving the command, the controller sends the signal to the manipulator to move the welding gun to the first pre programmed point in the welding cycle. Upon arriving at the point, the controller forwards a signal to the welding gun to start the weld. The signal tells the controller about weld has been completed. The memory of the robot addresses the next welding location & the process is repeated till all of the welds are completed. After the last weld, a signal is sent through an external command port to the clamping fixture to release the part. The part is unloaded, and a new fixture is placed in the fixture. The memory of the robot is re-set for welding the further parts
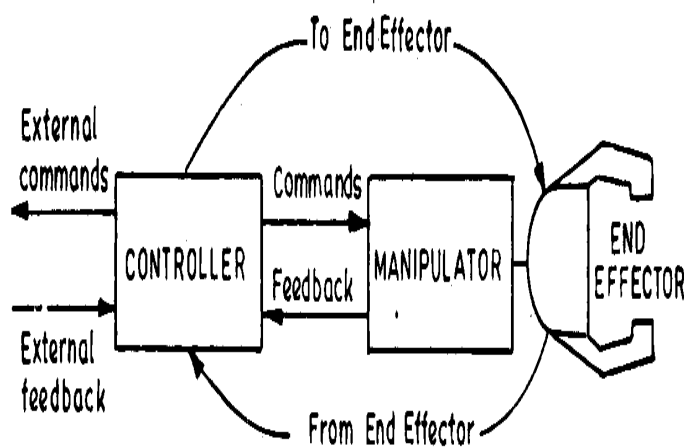

Fig. 4 Working Layout

5) FUTURE SCOPE-

   i.   It can be used for large scale production of heavy items.
   ii.   Portable light weight conveyor-arm arrangement can be made.
   iii.   Usefulness in food processing factories, medical industries and defense industries etc.
   iv.   Voice over prompt modification can be done to it.
   v.   It will work efficiently in pandemic situations where human contact is harmful.
   vi.   It can be equipped with buzzer or alarm if any anonymous object is supplied to it such as alcohol bottle, tobacco product or any harmful weapon such as knife etc.

6) CONCLUSIONS-

This research paper deals with the Aspects of robotics used in Industries. It covers all the program of design as key schedule enunciated earlier in this paper, which broadly consists of designing, fabrication, assembly etc. In present work an effort has been made to reduce human labour and increase productivity of industry. It will increase the probability of successful operation and the working life of the Robotic Arm.

So this can be concluded that this paper helps industries grow by reducing their time consumption in transmission of material, makes material handling easy task and save labor cost in turn increasing their productivity which ultimately lead to profit.

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