Design and Implementation of multi handling Pick and Place Robotic Arm

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Abstract*:* Robot manipulator is an essential motion subsystem component of robotic system for positioning, orientating object so that robot can perform useful task The main aim of our work is to collaborate the gripper mechanism and vacuum sucker mechanism working in a single pick and place robotic arm. This robot can be self-operational in controlling, stating with simple tasks such as gripping, sucking, lifting, placing and releasing in a single robotic arm. The main focus of our work is to design the robotic arm for the above mentioned purpose. Robotic arm consists of revolute joints that allowed angular movement between adjacent joint. Three double acting cylinders were used to actuate the arm of the robot. Robot manipulators are designed to execute required movements. By using this collaborated mechanism the success rate of pick and place robots are increased.

INTRODUCTION : The past two decades of years has a significant in advancement in the field of robots application. Many more applications are expected to appear in space exploration, battlefield and in various actives of daily life in the coming years. A robot is a mechanical device that performs automated tasks and movements, according to either pre-defined program or a set of general guidelines and direct human supervision. These tasks either replace or enhance human work, such as in manufacturing, contraction or manipulation of heavy or hazardous material. Robot is an integral part in automating the flexible manufacturing system that one greatly in demand these days. Robots are now more than a machine, as robots have become the solution of the future as cost labor wages and customers demand. Even though the cost of acquiring robotic system is quite expensive but as today's rapid development and a very high demand in quality with IS0 standards, human are no longer capable of such demands. Research and development of future robots is moving at a very rapid pace due to the constantly improving and upgrading of the quality standards of products.

Material handling equipment is generally separated into four main categories: storage and handling equipment, engineering systems, industrial trucks, and bulk material handling. In this reviewed work material handling have been designed by the means of pneumatic in order to reduce the cycle time by collaborating both the vacuum sucker and gripper mechanism in material handling robot.

RELATED WORKS

PICK AND PLACE ROBOT

In this paper mankind has always strived to give life like qualities to its artifacts in an attempt to find substitutes for himself to carry out his orders and also to work in a hostile environment. The popular concept of a robot is of a machine that looks and works like a human being. The industry is moving from current state of automation to Robotization, to increase productivity and to deliver uniform quality. The industrial robots of today may not look the least bit like a human being although all the research is directed to provide more and more anthropomorphic and humanlike features and super-human capabilities in these. One type of robot commonly used in industry is a robotic manipulator or simply a robotic arm. It is an open or closed kinematic chain of rigid links interconnected by movable joints. In some configurations, links can be considered to correspond to human anatomy as waist, upper arm and forearm with joint at shoulder and elbow. At end of arm a wrist joint connects endeffectors which may be a tool and its fixture or a gripper or any other device to work. Here how a pick and place robot can be designed for a workstation where loading and packing of lead batteries is been presented. All the various problems and obstructions for the loading process has been deeply analyzed and been taken into consideration while designing the pick and place robot.

A REVIEW ON IMPORTANT OF UNIVERSALGRIPPERININDUSTRIALROBOT APPLICATIONS

In this paper demonstrates the object of this report is importance of Universal Hand/Gripper in industrial Robot applications and will deal exclusively with gripping of different variety of materials/parts by using the Universal gripper. So, that we can easily avoid the using of one type of gripper for each part. The design of the end-effectors is a critical

consideration in the applications of robotics to industrial operations. The end effectors must typically be designed for the specific application. By comparison to the human hand, a robot's gripper is very limited in terms of its mechanical complexity, practical utility and general applications. In order to realize the full potential of future robotics technology, grippers must be designed more like human hand, both in their sensory and control capabilities as well as their anatomical configuration.

AUTOMATION OF MOBILE PICK AND PLACE ROBOTIC SYSTEM FOR SMALL FOOD INDUSTRY

In this paper the use of robotics in food industry is becoming more popular in recent years. The trend seems to continue as long as the robotics technology meets diverse and challenging needs of the food producers. Rapid developments in digital computers and control systems technologies have significant impact in robotics like any other engineering fields. By utilizing new hardware and software tools, design of these complex systems that need strong integration of distinct disciplines is no longer difficult compared to the past. Therefore, the purpose of this paper is to design and implement a microcontroller based on reliable and high performance robotic system for food / biscuit manufacturing line. We propose a design of a vehicle. The robot is capable of picking unbaked biscuits tray and places them into furnace and then after baking it picks the biscuits tray from the furnace. A special gripper is designed to pick and place the biscuits tray with flexibility

AVAILABLE MODELS

MATERIAL HANDLING ROBOT

GLASS HANDLING ROBOT

DESIGN OF ROBOTIC ARM

The mechanical construction in our project is providing to collaborate both the vacuum sucker and gripper mechanism. It has to manipulate on 3 axis to move the material like machine parts, glass etc. The gripper is driven by battery operated motor.

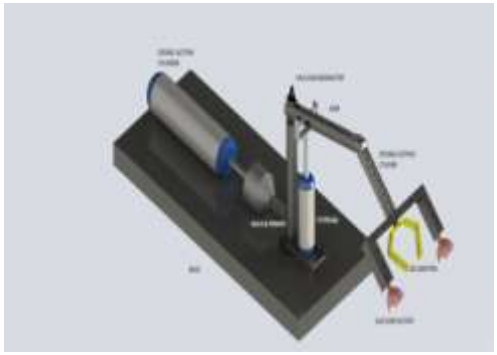
DESIGN CONSIDERATION

DESIGN OF BODY:

The hole of the collaborated robot arm is constructed by using mild steel . It consistof rack& pinion setup and twodouble acting cylinder for the actuation of robot arm. The rack & pinion arrangement is provided at the center of the base, in order to convert linear motion into rotator motion of robotic arm.

ROTATION OF THE ROBOT:

For the robot to each location and performed the task it has to rotated own axis depend upon the rack and pinion movement which is associated with the pneumatic cylinder. The actuation of the gripper is controlled by using battery operated motor. The vacuum sucker is operated by using vacuum generator and The entire robot is controlled by using 3/2 hand lever valve.



Design Overview of Robot.

MATERIAL SELECTION:

The most suitable material to fabricate the structure of the arm has to be light and strong. Among the materials that can be considered to fabricate the structure are Mild steel, Plastic gripper,and rubber vacuum suction. In choosing the fabrication materials, the aspect of availability of the materials, the overall cost and the flexibility to be shaped, should also be taken into consideration. Thus among the three materials considered, mild steel is the most ideal material to be chosen as fabrication material.

Working Principle

The rack and pinion is welded with piston of the double cylinder, by actuating the hand lever valve the vertical arm will attain its 360^0rotary moment.While

the angular moment of the horizontal arm is actuated by the double acting cylinder and 3/2 hand lever valve.The material handling equipments such as gripper and vacuum suction cup are mounted over the arm.The to and fro movement of the gripper is actuated by a separate double acting cylinder and gripper is operated by using BO motor.The robots contain two vacuum suction cups which generate vacuum with the help of vacuum generator.Compressor continuously delivers the air to the cylinder with help of the cylinders all the parts of the robot were operated.By using gripper and vacuum suction cup both the flat and irregular shaped materials were handled.

ADVANTAGE AND LIMITATIONS

ADVANTAGE

- It is mainly invented for simplifying the car assembly lines.
- It gives the smooth operations as well as reduced time consuming process.
- This robot will eliminate the human works in material and glass handling section.
- To reduce the cycle time.
- To reduce the idle time.
- To reduce the cost of operation.
- This robot will eliminate the space consumption.
- It is user- friendly, i.e. It wills not emitting any type of harmful gas and this will not affect the environment.
- Handling materials maximize safety.

LIMITATIONS

- Noisy operation.
- It can be operated manually.
- It needs compressor

APPLICATIONS

- This robot can be applicable in the automobile industry
- Specific application (in front axial glass pasting area and glass handling.)
- This type of robot can also be helpful in the home usage such as picking the needed objects.
- If possible, it can also be applicable in shopping malls.
- This type of robot is used in the developed multi- national companies and manufacturing industries

CONCLUSION AND FUTURE WORK

CONCLUSION

The effective Design and Implementation of multi handling Pick and Place Robotic Arm has been performed. The operation of various arm linkages and the robotic arm has been extensively tested and the required corrective measures were taken. Hence the objective of designing and manufacturing of a pick and place robot at low cost was successful and It's been proved that running cost of the robot is also very less. This will help to cut down labor and improve profits at very low initial investment. Theproposed model is demonstrated through an application ofexample of real world.

By considering the above advantages and also by looking at various benefits, this project can be employed in the assembly industry.

I hereby, conclude by saying that this project can be a factor for creating an impact on assembly sections.

7.2 FUTURE WORK

Since it is the prototype of this project, in future can also done with the full forced system i.e., completely finished robot. That is completely finished robot with micro controller and sensors. This type of the robot should be kept as robots in assembly line of automobile industry, glass handling industry, material handling industry, shopping malls, etc., for easy completion of any work with less time consumption

REFERENCES

[1] B.O. Omijeh, R. Uhunmwangho, M. Ehikhamenle, "Design Analysis of a Remote Controlled Pick and Place Robotic Vehicle", International Journal of Engineering Research and Development, Volume 10, PP.57-68, May 2014.

[2] Elias Eliot, B.B.V.L. Deepak, D.R. Parhi, and J. Srinivas, "Design & Kinematic Analysis of an Articulated Robotic Manipulator", Department of Industrial Design, National Institute of Technology-Rourkela.

[3] Sanjay Lakshminarayan, ShwetaPatil, "Position Control of Pick and Place Robotic Arm", Department of Electrical Engineering MS Ramaiah Technology, Bangalore, India.

[4] Mohamed Naufal Bin Omar, "Pick and Place Robotic Arm Controlled By Computer", Faculty of Manufacturing Engineering, April 2007.

[5] Ankit Gupta, Mridul Gupta, NeelakshiBajpai, Pooja Gupta, Prashant Singh, "Efficient Design and Implementation of 4-Degree of Freedom Robotic Arm", International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-2, June 2013.