



A Study of six axis important in industry;4.0

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Abstract

In the most advance, production six-axis industrial assembly line and martial handling robots are widely use to manipulate production produce in or six degrees of freedom in space. Industrial robots from manufacturers for welding milling assembly and other application material handling can be define as an integrated system that involves activities such as handling storage and control of materials. Handling is a professional activities of modern manufacturing companies. Effective material handling solution can significantly reduce production or distribution cost. In this work the size and design of an industrial robot with six degrees of freedom are describe, which are use to study various method of controlling robotic arms and the future scoop and various shortcomings are discussed.

Keywords:- Production line, assembly line, martial handling, inventory

Introduction

Entering the 21st century “automation industry continuous to grow with the continuous expansion of the market and the hug demand for advance technology development Many industries such as a manufacturing supply chain management agriculture inventory management, today because the market is looking for automation technology instead of traditional method”

In automation technology, flexible automation has created a large amount of demand in the field of automobiles, aerospace, electronics and medical treatment. Compared with fix automation in the field of flexible automation industrial.

Robots have almost spread across all industries due to the number of applications. As a demand of for industrial robot continuous to increase, engineers must use robot visualization software to design simulate and analyze the optimization of manipulator joints and end effectors.

Nowadays, robots are increasingly integrated into work tasks to replace humans, especially to perform repetitive tasks. Generally speaking, robotics can be divided into two areas, industrial robots and service robots.

The international federations of robotics (IFR) define service robots as semi-autonomous or fully autonomous robots that provide useful services for the well-being of humans and equipment, excluding manufacturing operations. These robots are currently used in many application areas, including offices, military missions, hospital operations, hazardous environments, and agriculture.

Additionally, it can be difficult or dangerous for humans to perform certain specific task, such as picking up explosive chemicals, dismantling bombs, or worst case picking up and placing bombs somewhere for containment and repeated collection operations in industry. Therefore, robots can work instead of humans.

The inclusion of industry 4.0 features will help understand the overall business impact and importance of automation. Mechanical components make industry 4.0 critical because it enables manufacturers to better understand how automation can improve process performance, product quality, and safety.

Artificial intelligence will play an important role at this stage in the future. The level of knowledge imparted to the robot varies, such as gripper friction, arm position, motor temperature, or vibration

The future of industry 4.0 is of great importance to the robotics industry due to its changes in production for end users. These views will further improve the performance and reliability of the entire manufacturing chain, from engineering and commissioning to operation and maintenance.

Industry 4.0 simply makes business decisions based on data collected by the network. Engineers must understand the data and implement artificial intelligence to improve the process.

Human feedback and customization are important for industrial energy automation, and industry 4.0 makes it easier. With the help of portable devices such as smartphones and tablets, supervisors can guide robot operations and avoid conventional technology. It encourages manufacturers to remain flexible in the fast-paced world of processing, where they have historically been associated with computers or fixed data systems.

Industry 4.0 is an important step in the growth and development of teams that have experienced pioneering productivity Improvement in the quality of life for hundreds of years. The industry embraces any digital transformation and adds smart manufacturing, smart factories and IoT applications. Machine access to the network has increased, and they are linked to the entire display scheme of the supply chain. The rapid development of automation technology helps to increase productivity and mobile workflow. We have entered the modern era of industry 4.0, which will redefine the promised benefits of the industrial internet of things through smarter robotics and computers vision technology.

Post pandemics situations

This is a topic of special relevance in the field of logistics. The pandemic has caused huge inefficiencies in our previous supply chain infrastructure. Business owners with a single supplier quickly realized their negligence because travel restrictions kept them away from the supplier. Through the ever-changing pattern of consumer demand, all owners are beginning to understand the inflexibility of supply chain practices and the responsibilities that lack of end-to-end visibility brings.

For these and other reasons, robotics is the primary consideration as owners and suppliers are negotiating the new post-COVID19 logistics landscapes. Robot are cheaper and more competent than ever, and they can increase the speed and precision of day- to - day operations, while improving efficiency, safety, and visibility across the entire supply chain practices. Autonomous robots can reduce error rates, check inventory more frequently, optimize sorting time, and simplify compliance practices, and lower cost and long run.

LITTERATURE REVIEW

Design Analysis of a Remote Controlled “Pick and Place” Robotic Vehicleby B.O. Omijeh In this article, the design of a remote-controlled robotic vehicle has been completed. The prototype has been built and its function confirmed. This system will make it easier for people to deal with the risks of handling suspicious items that may be dangerous in their current workplace and environment. Through this design, complex and complex tasks can be performed faster and more accurately.

Rahul Gautam industrial Robot Arm Development Review This Selective manipulation robot control method is necessary to overcome the problem of placing or picking up objects away from workers. The robots' arm is successfully developed is costly, so a design that reduces table friction is essential to increase maintenance intervals

DESIGN AND OPERATION OF SYNCHRONIZED ROBOTIC ARM by GoldyKartal, SaahilGupt In this article, we suggest that the robot arm can be design to perform any required task, such as welding, Clamping, rotating, etc. depending on the application. For example, robotic arms on automobile parts during the assembly process. The robot arm can be designed to perform any required tasks, such as welding, clamping, rotating, etc. depending on the application. For example, robot arms on automobile assembly lines perform various tasks during the assembly process, such as handling and rotating and positioning parts.

Design and Development of search and Rescue Robot by Khalil AzhaMohdAnnuar, Muhammad HaikalMazi in this proposed article based on these research papers, this article introduces the use of mobile devices to design and develop controlled robotic vehicles, as well as a six-degree-of-freedom manipulator robot as a task-assisted robot for search and rescue. The system comes with a graphical user interface (GUI), which is convenient for users to use.

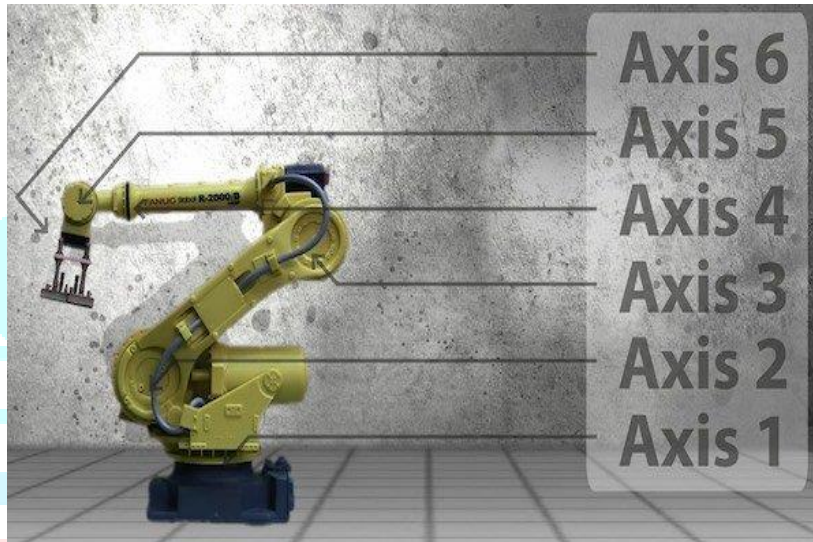
Survey of Robotic Arm and Parameter by Ritu Tiwari on the basis of this research work, the robotic arm is analyzed, and there are different parameters. Understand which factor affects the performance of the robotic arm into an effective working arm. Know how to use multi-axis to change the quality of the arm. DOF is increased by simply adding joints. The working range and space must be determined according to the situation. Better robot's kinematics, different speeds and accelerations of different jobs, accuracy and repeatability are an important factor for any robotic arm. In addition, use the diagram to understand the robot arm. In addition, use the diagram to understand the robot arm correctly. Then we discussed the gaps and problems in the research and them as a guide for future research work. Finally, we made suggestions.....

Sulabh Kumra, Rajat Saxena, and Shilpa mehta describe the design and development of a low-cost, easy-to-use interface to control, 6DOF anthropomorphic robotic arms. The robot arm joints are made by approximately six single axis rotary joints. Teleoperator, master, uses human-machine interface (MMI) to operate the robotic arm in time. MMI has a simple motion capture device that can convert motion to analog voltage to generate corresponding trigger signals in the robotic arm

G. Sen Gupta, R. Paddison, C.H. Messom, and S. Demidenko (2006) describe the effectiveness of the proposed method in a usable manipulator controlled by a 6DOF master unit prototype. The robotic arm mimics the dexterity of a human hand and wrist. The future main control unit is cost-effective and will have a wide range of applications in the fields of medicine, manufacturing, safety, extreme environments, entertainment, and remotely operated ROV (remote control vehicles), such as alien exploration vehicles or underwater upgrades.

Ashraf Elfasahany Low Cost Competitive Four Degrees Robotic Arm Design and Development study this article completes the design, development and implementation of the robotic arm which has the ability to perform simple tasks, such as lightweight material handling. The mechanical arm is designed and manufactured with acrylic material, and the servo motor is used to make the link between the arms. The servo motor is composed of an encoder and does not need to use a controller. However, the rotation rang of the motor is used to make the link between the arms. The servo motor is composed of an encoder and does not need to use a controller. However, the rotation range of the motor is less 180. Which greatly reduces the reach and possible positions of the arm. The robot arm is designed for four degrees of freedom. The end effector is not considered in the design process, because it uses off-the-shelf, because it is easier and cheaper to use commercial fixtures.

METHODOLOGY



This picture are taken from www.robots.com

AXIS ONE - Axis one is located at the base of the industrial robot. With this axis an industrial robot is able to move its arm from left to right for a complete 180 degree of motion from its center. This provides a robot with the ability to move an object a straight line

AXIS TWO – Axis two controls the robots’ lower arm and provides the ability for the movement of forward and backward extensions. This allows a robot to lift an object, move it sideways, up and down, or to set the object down along the x or y panes

AXIS THREE – Axis three provides industrial robots with the ability to raise and lower the upper arm, expanding, their vertical reach. Axis three makes parts more accessible to robots since it allows the same movements as axis two, but along all three x, y, and z planes

AXIS FOUR – Axis four helps control the movements of the robot EOAT and change the orientation of an object through a rolling motion. The upper robotic arm will rotate in a circular motion in the roll movement.

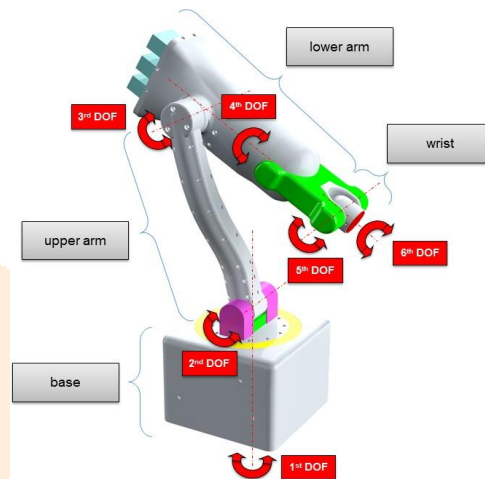
AXIS FIVE – Axis five also controls the movements of the robot end-effector along with axis four. Axis five is responsible for the pitch and yaw movements. pitch movements involve moving the end-effector up and down. While yaw movements move the end-effector left and right.

AXIS SIX – Axis six is the wrist of an industrial robot. This axis is responsible for the complete 360-degree rotations of the wrist. The sixth axis gives industrial robots the ability to change a part s orientation the x, y, and z planes with roll, pitch, and yaw movements.

WORKING PRINCIPLE

The working principle of the robotic arm is the input of electrical energy, and with the help of some automation and program-based operations, it can effectively perform some mechanical work. The pick and place robotic arm consist of major hardware components such as strips and motors, as well as arm clamps, switches, batteries, sheet metal, and other discrete mechanical and electrical components. The project aims to develop a pick-and-place robotic arm with a soft gripper. This soft gripper is used to handle object carefully and safely when grasping and placing them.

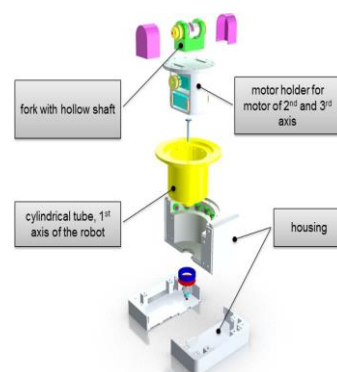
The robotic arm consists of a servo motor, which is used for angular rotation of the robotic arm to grab object (hold objects, loosen, rotate, position). The servo motor used works according to Fleming's left-hand rule and is controlled by an Arduino circuit board.



This picture are taken from design and development of robotics arm generation

Design of the Base

The base is divided into two parts, which are fixed together with screws to provide a single solid base. The base has two cavities to accommodate all electronic components and control boards, thus saving space. Since these openings contain all the electronic and controller components, the robots can be used in standalone mode or connected to a component, the robot can be used in standalone mode or connected to a computer. Another possible use of the lower compartments is to store batteries in case the robot is used in places where there is no power supply, such as in exhibitions or exhibitions. In addition, the battery functions as an additions weight. As shown in figure, the base consists of a cylindrical tube and the rest of the robot. The second and third axis motors are connected to the front fork through two timing belts. The front consists of a hollow shaft that is directly driven by a timing belt assigned to the second shaft motor. The timing belt on the other side of the hollow shaft drives the second pulley in the shaft.



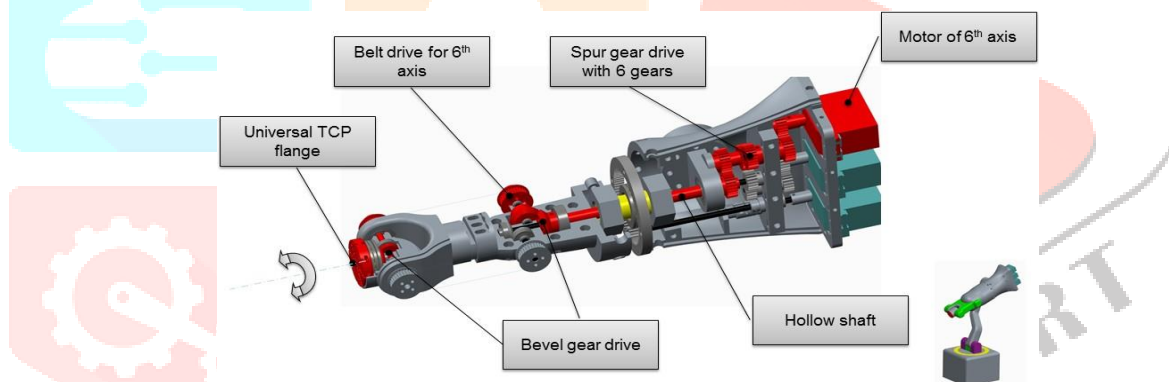
This picture are taken from design and development of robotics arm generation

Design of the upper Arm

In order to reduce the weight of the arm and maximize the manageable payload, the third axis motor was moved from the elbow joint to the base, in order to transmit the torque of the third axis from the elbow joint, an arrangement of rods and universal joints is used in the upper arm assembly. The upper arm assembly consists of two main parts of the housing. It consists of a timing wheel in the upper arm assembly, which is connected to the road assembly through the bevel gear, and them to the lower arm assembly.

Design of the Lower Arm

In order to provide counterweights for the manipulated payload and simplify the design of the transmission system, the engines for the fourth, fifth and sixth axles are located at the third joint. The challenge is to place the three motors side by side, but still have third joint, The challenge is to place the three motors side by side, but still have their drive shaft coaxially placed, because the parallel position of two or more shaft will block at least one of the three shafts. This spur gears and a hollow shaft that holds the other shaft inside. The super gear links the two-dimensional displacement of the motor shaft from the coaxial position. Each of the two mating shafts in the upper arm assembly drives the bevel gear driver gearbox in the TCP head to drive the fifth and sixth axes. of the robot. Assemble is adjusted by longitudinal displacement between the arm bottom and wrist. The wrist is correspondingly held in this position by the cover surrounding the lower arm assembly and the exposed belt drive.



This picture is taken from design and development of robotics arm generation

Different robotics variants for industry 4.0 employments at ground level

There are several robotic variants that are used especially while performing an industrial culture 4.0 at various levels. Some main areas are welding robots, material processing, types of selection and game, and other application robots. Collaborative, distributed, plasma, point welding robots, vision, press robots, assembly, paint and routing robots are some examples of examples of several robots that allow several needs to implements the implementations of industry 4.0.

Assembly and inspection are the main fields of application for industrial robotics. For high costs of manual work for these activities, it is expected that the robotics of the assembly grow. Since the robot can be scheduled, a technique in the assembly task is to manufacture batch robots and multiple-style reprogramming. An alternative approach is to combine the type of border DI FF product in a single mounting cell required by each robot. Digital computers are used to guide the process of manufacturing processes in the control of the computer process.

IMPORTANT OF 6-AXIS IN VARIOUS INDUSTRIES

Major potential capabilities of robotics in different fields/industries

Advanced robotics and their connections to machine vision are important to the progress of industry 4.0 initiative and influence every step in the production process.

MANUFACTURING

SUPPLY CHAIN MANAGEMENT

AGRICULTURE

INVENTORY MANAGEMENT

COOKING AND HOUSE HOLD

MANUFACTURING



This picture taken from www.geneses-system.com

Welding

Welding has long been the leading robot application in the automotive industry because every car requires a lot of welding before completion. Given the high value of the finished product, the productivity of automation is enormous.

Assembly

in many automobile factories, robots assemble smaller parts, such as pumps and motors, at high speed. Robots generally perform tasks such as windshield installation and wheel installation to increase performance.

Painting

Professional painters are difficult to find and their works are poisonous. This makes it very suitable for robots, because the paint job requires a high degree of consistency over large areas of paint, and reducing the amount of material wasted can save a lot of money over time.

Material removal

The high consistency and repeatability make the robot ideal for material removal processes such as trimming and cutting. This can be cutting fabric, trimming plastic trim and die-cast parts, or even polishing molds.

SUPPLY CHAIN MANAGEMENT



This picture is taken from www.geneses-system.com

Machines can move faster than human workers and can transport goods from one place to another without any intervention. In addition, they are not limited to the weight limit that a human worker may be able to lift. Moving goods from one place to another may be a simple task, but in the end it will be better automated.

AGRICULTURE



This picture is taken from www.geneses-system.com

Robots automate slow, repetitive and boring tasks for farmers, allowing them to focus more on improving overall yields. Some of the most common robots in agriculture are used for: harvesting and gathering. Weed control, automatic cutting, pruning, seeding, spraying and thinning, sorting and packaging, practical platform.

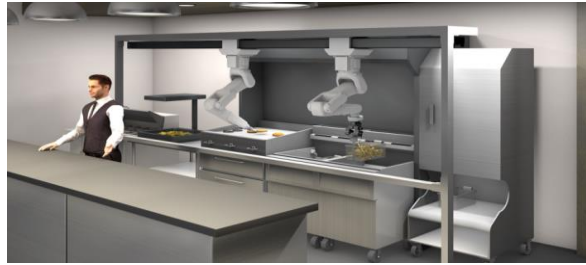
INVENTORY MANAGEMENT

Warehouse robotics refers to the use of automated systems, robots, and special software to transport materials, perform various tasks, and simplify/ automated warehouse processes. In recent years, robotics has achieved a prominent position in the fields of supply chain, distribution center and warehouse management, and continues to play an important role in warehouse automation.



This picture is taken from www.geneses-system.com

KITCHEN AND HOUSE HOLD



This picture is taken from www.geneses-system.com

It allows you to save time, free your day from regular cooking, plan and adapt your menu according to different diets and tests. It is used to cooking, sweeping, wet mopping, iron, clean floor.

ARTIFICIAL INTELLIGENCE – 4.0

There are many different uses for AI in modern scenarios. The industry is using AI to automate processes. Better AI algorithms are being developed every day to speed up processes /chores in various industries.

Various advantages of AI including automation, speed, accuracy, exportation, data collection and analysis.

AI helped convert spoken language into digital text. Speech recognition has many uses, including voice messaging, content-recording voice-controlled remote-control devices. Speech recognition is used for authorization and validation.

AI enables a natural language processing (NLP) system or machine to understand human text.

The AI image recognition helps production lines with the help of previous working images.

FUTURE SCOPE

For a long time, the factory of the future has begun to take shape: artificial intelligence systems are used, people and machines work in daily work, and product innovation becomes more and more efficient. In addition, increasingly automated processes require creativity in internal logistics. Only when manufacturing and logistics systems are effectively connected can industry 4.0 play its best role. In the future, robotics automation will enter various industrial applications. Welding, manufacturing, distribution, raw material processing, assembly and packaging will be efficiently completed by robots. Robot automation will grow with the development of large number of suppliers for a wider range of applications. The technology will be widely used in the automotive industry and has become an indispensable function in many production processes, industrial robots will allow multiple challenging activities to be integrated into the production line while enhancing the versatility of operations. By applying these technologies, the nature of people's work will change. Electronic machines will perform manual labor and demanding tasks to improve the health and safety of employees.

SUGGESTION

The incredible variety of gripper types is due to the huge variety of objects that robots can handle from textiles to electronics to automotive parts. For direct handling of sensitive foods, for example a small, soft forceps should be the best option. But for packaging and palletizing operation that require stacking boxes of product, a bulky gripper with large suction cup is probably a better option.

COCLUSION

It is concluded from the above discussion that the six-axis is a very important factor in industry 4.0, which has the ability to perform tasks such as material handling, assembly line and inventory management. The robotics arm is designed and manufacturing using aviation-grade aluminum materials, and the servo motor is used to perform the movement of the robotics arm. The application of robots in the manufacturing industry has bought more protection, quality and sustainability to the company. The system will provide people with unparalleled risks of handling suspicious objects that may be dangerous in his current environment and workplace. Through this design, complex tasks will be completed faster and more accurately. Therefore, factory robots have become the best option for assembly automation. Therefore, in the coming days, automation will bring considerable profit opportunists for the manufacturing industry.

REFFERANCE

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