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Review on Development of Industrial Robotic Arm

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Abstract - *The use of industrial robots is increasing in areas such as food, consumer goods, wood, plastics and electronics, but is still mostly concentrated in the automotive industry. The aim of this project has been to develop a concept of a lightweight robot using lightweight materials such as aluminum and carbon fiber together with a newly developed stepper motor prototype. The wrist also needs to be constructed for cabling to run through on the inside. It is expensive to change cables and therefore the designing to reduce the friction on cable, is crucial to increase time between maintenance.*

A concept generation was performed based on the function analysis, the the specifications of requirements that had been established. From the concept generation, twenty-four sustainable concepts divided into four groups (representing an individual part of the whole concept) were evaluated.

Key Words: **Robotic arm, Haptic Technology, Motor, DOF.**

1. INTRODUCTION

Nowadays, robots are increasingly being integrated into working tasks to replace humans specially to perform the repetitive task. In general, robotics can be divided into two areas, industrial and service robotics. International Federation of Robotics (IFR) defines a service robot as a robot which operates semi- or fully autonomously to perform services useful to the well-being of humans and equipment, excluding manufacturing operations. These robots are currently used in many fields of applications including office, military tasks, hospital operations, dangerous environment and agriculture. Besides, it might be difficult or dangerous for humans to do some specific tasks like picking up explosive chemicals, defusing bombs or in worst case scenario to pick and place the bomb somewhere for containment and for repeated pick and place action in industries. Therefore, a robot can be replaced human to do work.

1.1 Robotic arm definition

A robotic arm is a robot manipulator, usually programmable, with similar functions to a human arm. The links of such a manipulator are connected by joints allowing either rotational motion (such as in an articulated robot) or translational (linear) displacement. The links of the manipulator can be considered to form a kinematic chain. The business end of the kinematic chain of the manipulator is called the end effectors and it is analogous to the human hand. The end effectors can be designed to perform any desired task such as welding, gripping, spinning etc., depending on the application. The robot arms can be autonomous or controlled manually and can be used to perform a variety of tasks with great accuracy. The robotic arm can be fixed or mobile (i.e. wheeled) and can be designed for industrial or home applications.

This report deals with a robotic arm whose objective is to imitate the movements of a human arm using accelerometers as sensors for the data acquisition of the natural arm movements. This method of control allows greater flexibility in controlling the robotic arm rather than using a controller where each actuator is controlled separately. The processing unit takes care of each actuator's control signal according to the inputs from accelerometer, in order to replicate the movements of the human arm. Figure 1 shows the block diagram representation of the system to be designed and implemented.

2. LITETURE SURVEYS

1. Design Analysis of a Remote Controlled "Pick and Place" Robotic Vehicleby B.O. Omijeh

In this paper The design of a Remote Controlled Robotic Vehicle has been completed. A prototype was built and confirmed functional. This system would make it easier for man to unrivalled the risk of handling suspicious objects which could be hazardous in its present environment and workplace. Complex and complicated duties would be achieved faster and more accurately with this design.[01]

2. ROBOTICS ARM CONTROL USING HAPTIC TECHNOLOGYbyVipul J. Gohil

In this paper the system robotic arm based on real-world haptics. The primary goals of haptic guidance is to facilitate the learning of complex human motion skills by providing haptic cues that are helpful to induce desired movements.

The proposed system is utilized to recognize the human motion..Large potential for applications in critical fields as well as for leisurely pleasures. Haptic devices must be smaller so that they are lighter, simpler and easier to use.Haptic technology allows interactivity in real-time with virtual objects.[02]

3. A Review on Robot Arm Using Haptic Technologyby Prof. A. Reshamwala, R. Singh

In this paper The proposed system is utilized to recognize the human motion. Controlling the robot arm using Haptic technology is discussed in this paper. The concept which is discussed here will be the implementation of 3-DOF based robot arm using less number of resources. The main focus of the implementation is going to be how it will be easily operated by disable people. As literature survey continues more advanced feature may be part of this implementation such as obstacle detection and how the concept of image processing will be used in robot arm is considered to be future work.[03]

4. DESIGN AND OPERATION OF SYNCHRONIZED ROBOTIC ARMbyGoldyKatal, SaahilGupt

In this paper propose The robotic arm can be designed to perform any desired task such as welding, gripping, spinning etc., depending on the application. For example, robot arms in automotive assembly line perform a variety of tasks such as wielding and parts rotation and placement during assembly.The robotic arm can be designed to perform any desired task such as welding, gripping, spinning etc., depending on the application. For example robot arms in automotive assembly line perform a variety of tasks such as wielding and parts rotation and placement during assembly.[04]

5. Design of a Robotic Arm for Picking and Placing an Object Controlled Using LabVIEWbyShyam R. Nair

In this paper propose of LABView controlled robotic arm was successfully designed. The robotic arm was found to be user friendly and the integration of accelerometer was much helpful in attaining the feedback regarding the position of the arm. The LABView is designed to input the coordinates of object in the real time environment. To select the real time object, the corresponding coordinate is inputted. The action of picking or placing is also given through the LABView panel. Once the robot gets the coordinates, it uses the inverse kinematics to calculate the required rotation.[05]

6. Design And Implementation Of A Robotic Arm Based On Haptic Technology by A. Rama Krishna

In this paper propose ofvarious aspects to design a robotic arm based on the haptic technology considering various aspects of it, and the basics of machine designing are observed that are explained clearly. These robots have a wide range of industrial and medical applications such as pick and place robots, surgical robots etc. They can be employed in places where precision and accuracy are required. Robots can also be employed where human hand cannot penetrate. The screen shot shows the designed robot and its functionality.[06]

7. Haptic Control Development of Robotic Armby Mohamoud A. Hussein

In this paper proposeA master-slave system with haptic features, especially force feedback, was implemented. This system has a device to measure force when the slave system interacts with virtual model and actuators devices in the master system to exert force on the operator. A position and force control system was developed, creating a bilateral communication between the master and the slave devices. A robotic arm, inverse kinematic model and control was developed using LabVIEW and Arduino. LabVIEW was used to acquire position and force signal from Novint Falcon then send it to robotic arm. Arduino was used to calculate the IK model to evaluate the joint angles of the robot arm. The correct position of the end effector with respect to the base was achieved using the joint angles. The performance of the system is characterized using human input for soft tissues of different stiffness and the results show that system has the ability to display the interaction force effectively.[07]

8. Design of a Robotic Arm with Gripper & End Effector for Spot Weldingby Puran Singh

In this paper propose of This robotic technology makes the spot welding operation more flexible and time oriented. With the help of pick and place mechanism the material handling has been easily carried out. The variation in the mechanical structure and the angle of movement can be changeable. The human hand design forms the basis of this project of developing a robotic gripper and is the source of inspiration to achieve the sufficient level of dexterity in the domain of grasping and manipulation if coupled with wrist and arm.[08]

9. DESIGN AND ANALYSIS OF AN ARTICULATED ROBOT ARM FOR VARIOUS INDUSTRIAL APPLICATIONSby S.Pachaiyappan

using basic formulae from strength of materials. Two possible hollow cross sections, considering the electrical, control and feedback wiring to pass through, is modelled using commercially available 3D modelling tool, SolidWorks, for further study and comparison. The Model is used for analysis using a commercially available analysis tool, ANSYS, taking into account the various critical loads acting on the base arm alone. Since the base arm is the major component in which maximum magnitude of the critical loads considered occur, it is enough to analyze the base arm alone. Considering the shapes, sizes, deflections during working and stresses occurring, both the AIAs are workable comparatively. Considering the manufacturability, ease of transport, assembly, and weight, the circular section AIAs are preferred over the rectangular section AIAs.[09]

10. Design and Development of Search and Rescue Robotby Khalil AzhaMohdAnnuar, Muhammad HaikalMdZi

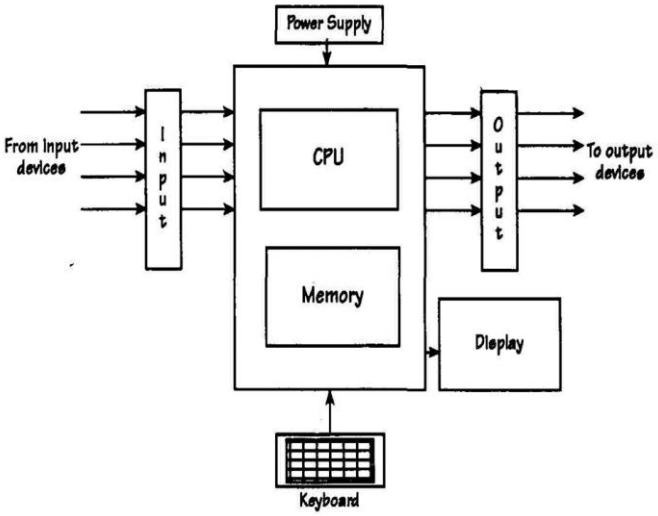
In this paper propose of Based on this research works, this paper presented the design and development of a robotic vehicle controlled by using mobile devices with additional of a four DOF robotic arm robot as assistive robot for search and rescue mission. This system is presented with the Graphical User Interface (GUI) to ease users' utilization.[10]

11. Survey of Robotic Arm and ParametersbyRitu Tiwari

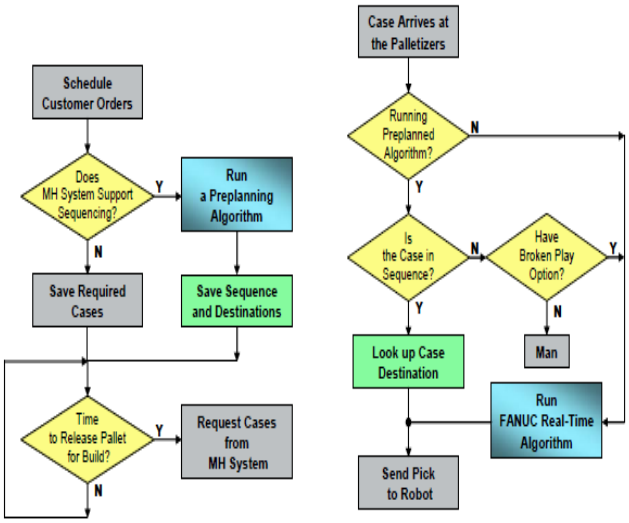
Based on this research worksDiscussed robotic arm and there different parameters. Understand which factor affect the performance of a robotic arm and how it change a robotic arm in work efficient arm. Know how multiple axis uses to change the mass of an arm, DOF increased by simply by adding joints, working envelope and space should decide according to the situation, kinematics improved movement of the robot, speed and acceleration vary in different works, accuracy and repeatability is the important factor for any robotic arm. Also, use diagrams for making proper understanding of robotic arm. Then discussed gaps in research and issues, its use as a guideline for future research work, at last give suggestions how we try to improve a robotic arm by working on effective algorithms and simulations.[11]

3. MATERIAL OF WIND TURBINE

3.1 Block Diagram



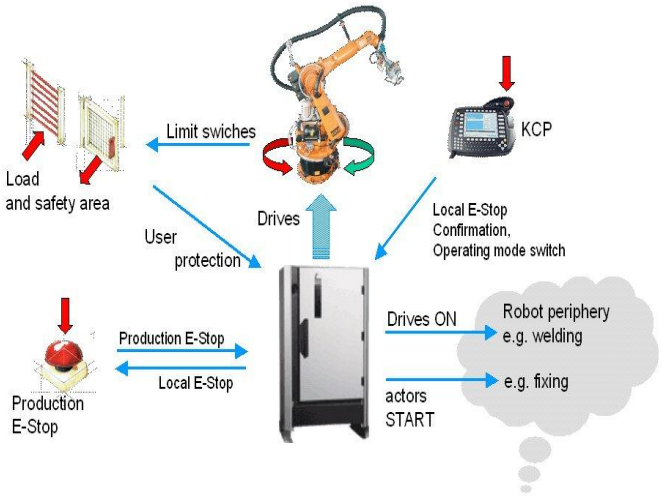
3.2 Flow Chart



3.3.3control state diagram of Reconfiguration

As noted previously, the key to competitiveness in today's global market is the ability to respond quickly to change while maintaining stable system operation and efficient use of available resources. In the manufacturing domain, there has been a considerable amount of interest recently in distributed intelligent control solutions to address this issue. In particular, research in this area has moved away from traditional, monolithic, centralized solutions, towards distributed approaches where the architecture of decision makers ranges from hierarchical to non-hierarchical.

Distributed intelligent control involves matching the control model more closely with the physical system. This is particularly relevant to manufacturing control systems that are required to control widely distributed devices in an environment that is prone to disruptions. With this model, control is achieved by the emergent behavior of many simple, autonomous and co-operative entities (i.e., agents) that "decide locally not only how to act (as subroutines do), and what actions to take (as objects do), but also when to initiate their own activity".



CONCLUSION

The objectives of this project has been achieved which was developing the hardware and software for an accelerometer controlled robotic arm. From observation that has been made, it clearly shows that its movement is precise, accurate, and is easy to control and user friendly to use. The robotic arm has been developed successfully as the movement of the robot can be controlled precisely. This robotic arm control method is expected to overcome the problem such as placing or picking object that away from the user, pick and place hazardous object in a very fast and easy manner.

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