Material Handling System by using Pneumatic Arm

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ABSTRACT-

We applied Reinforcement Learning on a real robot arm, inorder to control its movements. The arm is actuated by twopneumatic artificial muscles that expose a highly non-linearbehavior. To enable a significant speed-up of the learningprocess, an empirical simulation is constructed, based on realrobot observations

General Terms-

Your general terms must be any term which can be used for general classification of the submitted material such as Pattern Recognition, Security, and Algorithms etc.

Keywords-

Robotic Arm, Material Handling System, Pneumatics.

1. Introduction-

The most aged methods of metal engaged procedures are shearing and bending. These are the basic operations that are performed for metal working. Shearing is a mechanical operation, cutting of large sheets of metal into smaller pieces of predetermined sizes. When an operation completes an entire perimeter forming a line with closed geometry is known as blanking. Shearing machines are of different types, but a typical shear generally consists of,

1. A fixed bed to which one blade is attached.

2. A vertically moving crosshead which mounts on the upper blade.

3. A series of hold-down pins or feet which holds the material in place while the cutting occurs.

4. A gaging system, either front, back or squaring arm, to produce specific work piece sizes.

Shearing operation is generally conducted manually, but it can be conducted using mechanical, pneumatic and hydraulic means also. Currently, the operation is performed manually at the industry but at a very high risk. The raw material is collected by the worker and feeding is done into the shearing machine manually till the sheet is induced completely into it. This operation is very hazardous to the personnel performing the operation. Also, there is a fair chance that automating this process might speed up the rate of work when compared to the manual execution.

2. Objectives of Pneumatic Material Handling System-

The main objective of the project is to reduce the time required for material handling in the manufacturing unit at the right time and with the minimum cost and hence project has following some objective System provides proper control over the material without any damage or mishandling which interns leads to increase in quality of the material. Facilitate the reduction in material damage as to improve quality. Easy to use, the system easy to manufacture so that simple operating possible and no skilled labor required for operation. This will result in less complex system

1. Designing, Modelling and Simulation of the pick and place mechanism. We need to have a time study between currently undergoing manual operation and newly designed automated operation.

2. The frequency of this operator, its repeatability, lifetime etc. are to be found out.

3. The choice of the end effector, its design and analysis should be carried out and documented.

3. Design Methodology-

Methodology includes the method to achieve the final objectives of project. Following are some method or sequence of activities used in project to achieve final objectives.

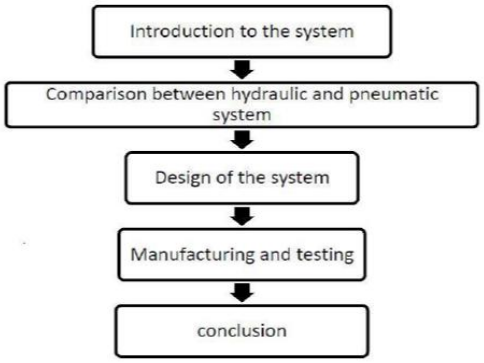


Fig. 1 Flow chart of methodology

4. Proposed System-

The automation plays an important role in saving human effort in most of regular and frequently carried works. The most common work is pick and place of jobs or work piece from source to desired position. Present day industry turned towards computer based program automation as it increase the productivity and delivery of end products. The inflexibility and hard automation is used in highly automated truck in the past have to led used of automated arms which is capable of performing the variety of manufacturing function in a flexible environment and at lower cost. The pick and place mechanical arm is human based controlled based system that detection of object human detect presence of object and move the machine accordingly.

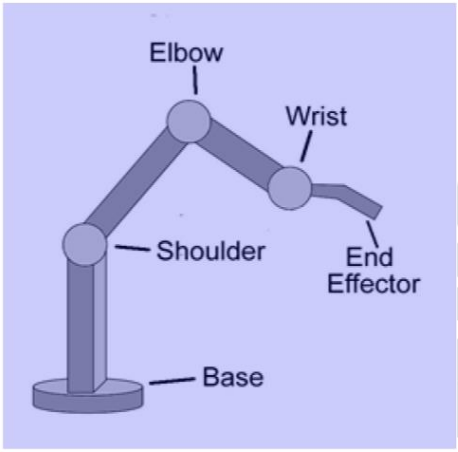


Fig.2 simple robotic arm

This mechanical unit is also comprised of a fabricated structural frame with provisions for supporting mechanical linkage and joints, guides, actuators (linear or rotary), control valves, and sensors. The physical dimensions, design, and weight carrying ability depend on application requirements .It consist of following parameters.

Work Envelop: The set of points Representing the maximum extent or reach of the robot arm or working tool in all direction.

Payload: The ability to carry, continuously and satisfactorily given maximum weight at a given speed.

Velocity: The maximum speed at which the tip of a robot is capable of moving at full extension, expressed in inches or millimeter per second.

Cycle: Time it takes for the robot to complete one cycle of picking up a given object at a given height , moving it to a given distance lowering it, releasing it, and returning to the starting point.

Accuracy: A Robot's Ability to position the end effecter at a specified point in space upon receiving.

Repeatability: The ability of a robot to return consistency to a previously having attained that position.

Resolution: The smallest incremental change in position that it make or its control system can measure.

The manipulator: Which is the robot's, consists of segments jointed together with axes capable of motion in various direction allowing the robot to perform work. The end effectors which is a gripper tool, special devices, or fixture attached to the robot's arm actually performs the work.

5. Problem Definition-

In every manufacturing unit the components are manufactured far away from the assembly unit so that, the main task is components should be present in right time, at right place, in right quantity, as every manufacturing system enhancing has motive to reduce inventory. The

problems were, damage to the treatment provided to components during transportation, damage to the physical structure of components during handling which may create delay in assembly unit and directly on productivity. This project deals with designing of material handling equipment for better and organized material flow which will also have ergonomics consideration. The problems arising are as follow

1. Damage of components in transportation from manufacturing unit to assembly unit. Damage to the paint and treatment given to the components.

2. Damage to the component, may lead to problem in assembly also More time is required in material handling, this may lead to delay in the flow of lean manufacturing

To ensure that the right material in the right amount is safely delivered to desired place at right time with minimum cost and control of material by using pneumatic based six axis material handling equipment.

5. Design of Pneumatic Material Handling System

Following figure shows the complete drawing of the Pneumatic Material Handling System. While designing the mechanism physical conditions as well as the requirements both are considered.Hence this machine is able to pick up and place in the required way.

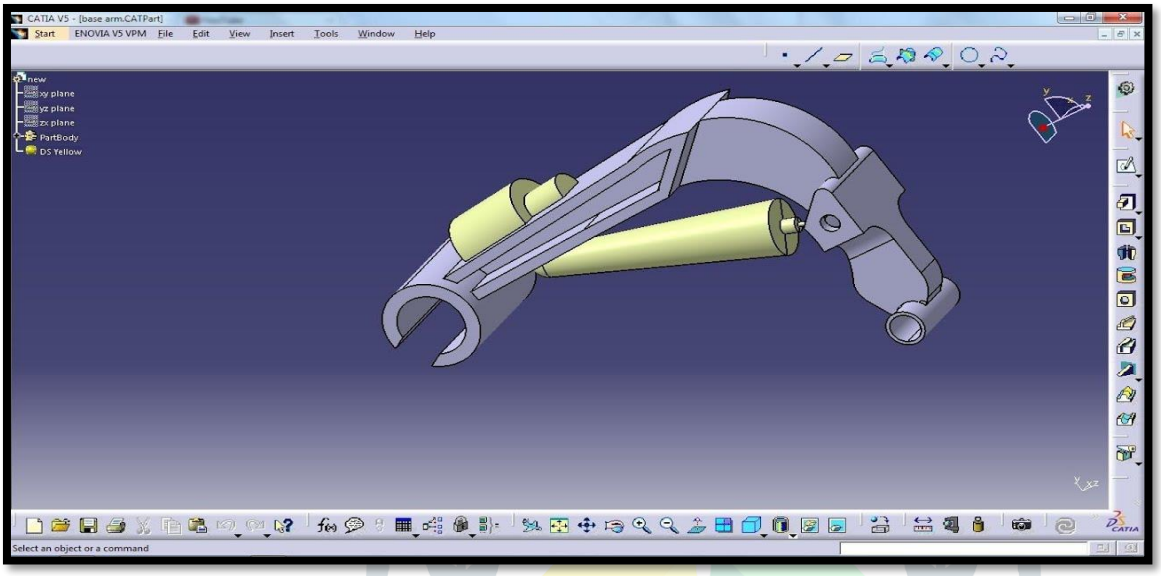
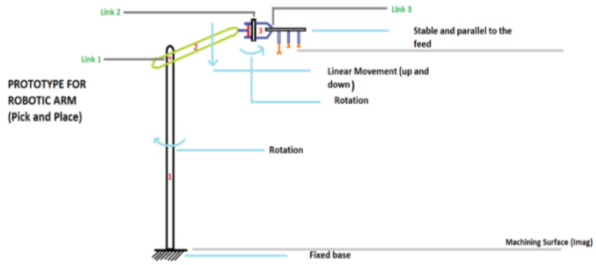


Fig 3: CATIA drawing for the Pneumatic Material Handling System

Following are the main components which are used in this machine

1. Chassis (Frame)
2. Double Acting Air Cylinder
3. Tee Fitting Push
4. Direction Control Valve
5. Flow Control Valve
6. Pneumatic Polyurethane PU Hose Tube Pipe
7. Silencer
8. Air Compressor



5.1 Chassis (Frame)-

We have used the ½ inch square pipe for the chassis of the pneumatic arm. When there are no suspension used in the pneumatic arm to lift the weight so the chassis must be able to absorb some of the jerks and vibrations, also it must be stiff enough, not to break or twist during the lifting of loads. In order to reduce the weight and cost, simple square pipes had been used in this

5.2 Double Acting Air Cylinder-

Double-acting cylinders (DAC) use the force of air to move in both extend and retract strokes. They have two ports to allow air in, one for out-stroke and one for in-stroke. Stroke length for this design is not limited, however, the piston rod is more vulnerable to buckling and bending. Additional calculations should be performed as well.

5.3 Tee Fitting Push-

Union push-to-connect fittings are available for use with 5/32, ¼, 5/16, 3/8 and 1/2 OD tube. Tubing connection and tightness are made possible by a stainless steel gripping collet and O-ring inside the fitting. Once inserted to the bottom of the fitting, the stainless steel collet grips the tube and prevents it from being disconnected until the release button is pushed.

5.4 Direction Control Valve-

Directional control valves are one of the most fundamental parts in hydraulic machinery as well as pneumatic machinery. They allow fluid flow into different paths from one or more sources. They usually consist of a spool inside a cylinder which is mechanically or electrically controlled

5.5 Flow Control Valve-

Port mounted flow controls are ideal for adjusting the speed of extension and retraction for virtually any actuator. Most double acting applications are best served with meter-out style flow controls, which control the flow of exhaust air as it leaves the cylinder. By reducing the exhaust air flow rate, the flow control reduces the speed of travel of the cylinder rod.

5.6 Pneumatic Polyurethane Tube Pipe-PU Hose-

The pipes are suited for use in oil and fuel lines and petrol tank, breather pipes, for pneumatic controls as lubrication lines and others. These pipes have properties of handling the wide range of temperature changes, thus making these suitable for use in different climatic areas.

5.7 Silencer-

It used to reduce dynamic noise of the pneumatic components or device exhaust Easy installation and high nose reduction result, Quick and Reliable connections Used with: Cylinders, Valves, Crank cases, gear boxes, oil tanks, reservoirs, air tools

5.8 Air Compressor-

In both home and commercial applications, one of the main roles of an air compressor is to provide power for pneumatic tools. Pneumatic tools include drills, impact wrenches, riveters, sanders and more in fact, almost any conventional powered hand tool is available in an air-powered configuration.

6. Scope

The technology of pneumatics has gained tremendous importance in the field of workplace rationalization and automation from old-fashioned timber works and coalmines to modern machine shops and space robots. Certain characteristics of compressed air have made this medium quite suitable for used in modern manufacturing and production industries. It is therefore important that technicians and engineers should have a good knowledge of pneumatic system, air operated valves and accessories. A pneumatic system consists of a compressor, pipe lines, control valves, drive members and related auxiliary appliances. The air is compressed in an air compressor and from the compressor plant the flow medium is transmitted to the pneumatic cylinder through a well laid pipe line system. To maintain optimum efficiency of pneumatic system, it is of vital importance that pressure drop between generation and consumption of compressed air is kept very low.

7. CONCLUSIONS-

Low weight system. The system weight minimized at every point and reduce the material required hence achieve low cost automation. Overall manufacturing time by designing efficient material movement reducing. Production rate increases and manufacturing time is reduced as the material flow is continuous and efficient Creation and encouragement of safe and hazard-free work condition. Safety must be given first priority and proper measures should be taken to improve safety conditions. The parts are placed such that it considers human capabilities and limitations which will reduce human effort while loading and unloading. The cost of equipment will be reduced by 15% of existing equipment and become for flexible than existing pneumatic based material handling system. System provides proper control over the material without any damage or mishandling which interns leads to increase in quality of the material. Facilitate the reduction in material damage as to improve quality. Easy to use, the system easy to manufactured so that simple operating possible and no skilled labor required for operation. This will result in less complex system.

8. FUTURE SCOPE-

Pneumatic based materials handling equipment's are used Materials handling problems involve surveys, plant and equipment layouts, routing, packaging and storage of materials. It is also used for handling the bulk material such as gases, liquid semi-liquid etc. It is also used in heavy construction projects, there is now a choice of special methods and equipment's of materials handling. It influences the civil engineers in project planning. For the extraction, handling and transportation of coal and ore in case of both underground mines and open pit operation Cost of extracting the materials has been reduced to the minimum. For handling of material such as fuel and ash. The design of many processing machines is influenced by the need for integrating various material handling features or attachments to modern

machine mechanisms. The automotive engineer develops trucks and trailer as efficient materials handling vehicles, designed for speedy loading and unloading, ensure cargo is secured properly, and safe transportation of a variety of materials.

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