



INTERNATIONAL JOURNAL OF RECENT TECHNOLOGY SCIENCE & MANAGEMENT

“A REVIEW ON AUTOMATIC WELDING ROBOT ARM”

Jaydeep Kumar Patel

Lecturer, Mechanical Engineering Dept., K.J. Institute of Engineering and Technology, Savli, Vadodara,(Gujrat), India

ABSTRACT

Now days in this fast growing industrial age every company needs speed in manufacturing to cope up with the customer's requirements. Every industrialist cannot afford to transform his unit from manual to semi automatic or fully automatic as automation is not that cheap in India. The basic objective of our project is design and low cost flexible welding arm which can be utilized in any industry for welding purpose. Our flexible welding arm is requiring 3 axial programming and controller. Our flexible welding arm can be used in welding process by controller and the structure is designed in such a way that it is flexible for welding process. Our flexile welding arm would be used mainly where May human is not able to work. Ex. underwater and underground

KEYWORDS : Automation, welding robot, robot arm.

I. INTRODUCTION

Robot welding is can be defined as the mechanized programmable tools (robots), which provides completely automated welding process by performing the weld as well as handling the part. Processes such as gas metal arc welding, while often automated, are can be semi automated welding, since a human operators sometimes prepares the materials to be welded. Robot welding is finds its application in resistance spots welding and arc welding in high production applications, such as the automobile industry. The robot is able to weld a pre-programmed position, guided by machine vision, or by a combination of the two methods. Vast benefits of robotic welding makes it important such that industries accept it to make it a technology that helps many original equipment manufacturers increase accuracy, repeat-ability, and throughput. The technology of signature image processing has been developed since the late 1990s for analyzing Electrical data in real time collected from automated, robotic welding, thus enabling the optimization of welds.

II. DESIGN METHODOLOGY

A Robotic arm or say Flexible arm can be designated using two main parameters.

1. Reach
2. Payload

1) Reach

The robot workspace (reachable space) indicates the places that the end gripper can reach. The workspace varies with change in Degree Of freedom angle/translation limitations, the arm link lengths, the angle of work piece to be picked up, etc. The

workspace is depends highly on the robot configuration. To identify the workspace, we have to calculate all locations that the gripper can reach.

2) Payload

- Payload can be defined as the maximum weight that can be lifted or moved by the end gripper of the flexible arm.
- A payload is usually termed as a weight unit kg or Lbs. This parameter is the sum of mass of the end gripper and mass of welding torch moved by the robotic arm.
- Robotic welding equipments should also consider the payload as a parameter for robot selection. For example, an arc welding torch is lighter in weight compared to a spot welding gun, which differs in a different payload total. So, the robot selection could be different for these two applications.
- The weight of arc welding torch is hardly 0.8 to 0.9 kg. So using these two parameters we can say that Reach of robot is far more important than the payload criteria

Flexible arm is made from mechanical links as well as the electronics components. The parts being used to make this flexible arm as listed as follow.

Mechanical parts

- Base plate
- Rigid Links
- End effector
- Bearing
- Bearing Housing
- Shaft
- Spacer
- Spur Gears

Electronics Parts

- D.C motor
- Sensors
- Arduino processer
- Mega at 8085 circuit
- Wirings

This Flexible welding arm is designed by relating it to a specific product. Thus this equipment is product oriented designed. In pressure vessel two shells are used to close the pressure vessel from top side as well as from bottom side. So, to weld these shells with the hollow cylinder arc welding is used. This is the main application of flexible welding arm. The arm is designed such that it can weld in circular manner.

III. CALCULATIONS OF ARM JOINTS

- The requirement of these force calculations is for motor selection. We must make sure that the motor we choose do not only support the weight of the robot arm, but also what the robot arm will carry.
- The first step for calculation is labeling FBD which is drawn with the robot arm stretched out to its maximum length.
- Next step is moment arm calculation, multiplying downward force times the linkage lengths. This calculation must be done for each motor.

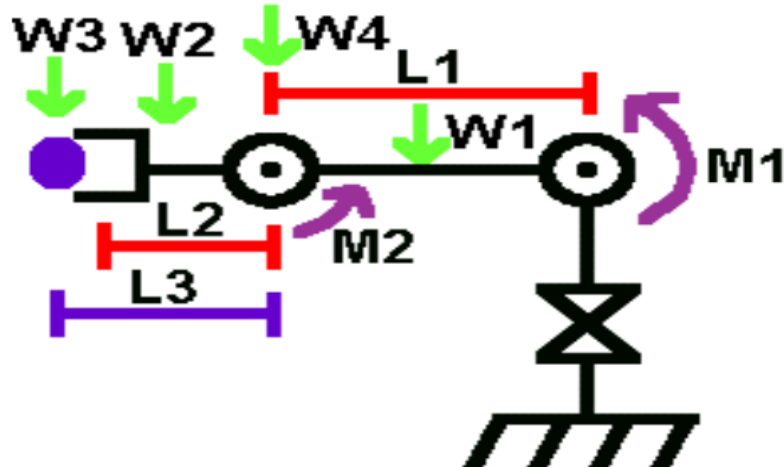


Fig 1 F.B.D of arm Indicating loads applied on it

From The figure the torque at different joints is calculated.

To Calculate torque following parameters are used,

- I. weight of each linkage
- II. weight of each joint
- III. weight of object to lift
- IV. length of each linkage

Torque calculation

- Torque about Joint 1:

$$M1 = L1/2 * W1 + L1 * W4 + (L1 + L2/2) * W2 + (L1 + L3) * W3$$

$$= 45/2 * 1.69 + 45 * 1.12 + (45 + 30/2) * 1.69 + (45 + 0) * 1$$

$$= 38.025 + 50.4 + 101.4 + 45$$

$$= 234.4 \text{ kg.cm}$$
- Torque about Joint 2:

$$M2 = L2/2 * W2 + L3 * W3$$

$$= 15 * 1.12$$

$$= 16.8 \text{ kg.cm}$$

IV. MAIN DESIGN

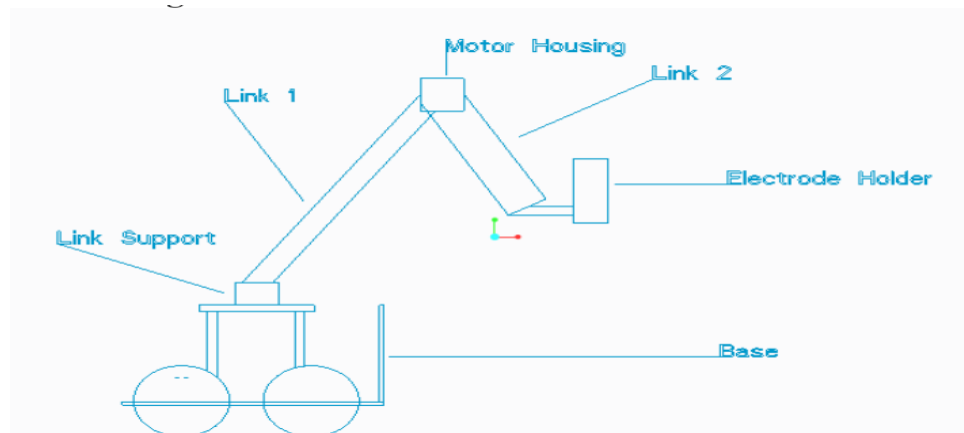


Fig. 2 Line Diagram

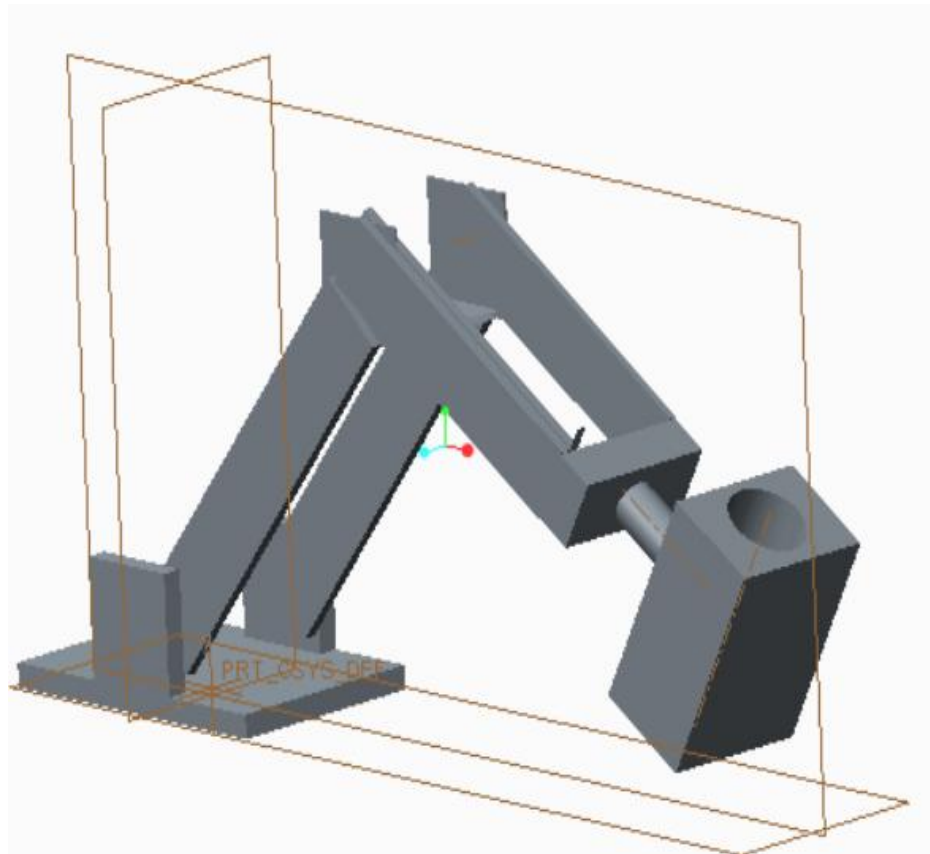


Fig 3 Robotic Arm

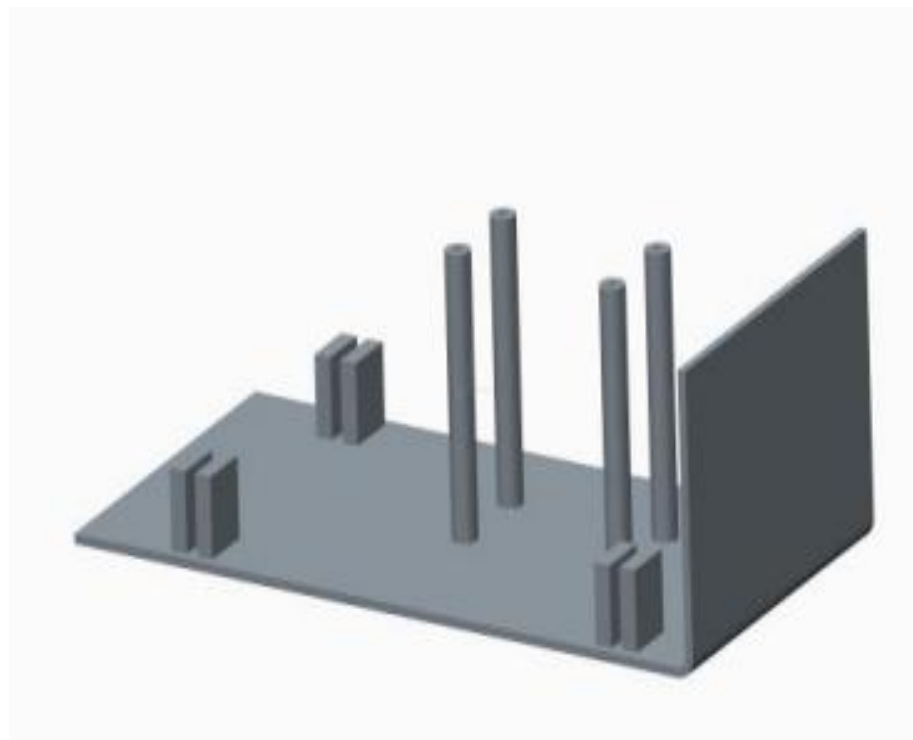


Fig 4 Base Plate



Fig 5 Assembly

V. CONCLUSION

- The purpose of flexible arm is for limited mobility. A schematic design of the each component is given in Design Chapter. A brief description is given for function and construction of each component. Research papers, related patents and devices which have working principle similar to this flexible welding arm was conducted and is presented in this report.
- The flexible arm would be able to confront routine challenges occurred in welding every day. This flexible arm is designed to fulfill the tasks with less difficulty and reduce defect cause by worker. The Flexible welding arm reduces the effort required.
- Same products are available in the market but with bit high cost. Flexible welding arm is designed to perform special purpose task. Flexible welding arm is designed in terms of product data and shape.
- According to research, flexible Arms are designed to overcome individual challenges which have proven to be valuable. No matter what type of impairment is being faced by the consumer, anyone who has the capability to use a keypad and controller can control the device.
- The device will prove beneficial to the production line manager and workers since it has the ability of ease understanding of the device quickly along with an operation.
- Flexible arm increases productivity significantly and safety advantages, even for small operations. It is possible to get fastest return in the industry by implementing automation investment

REFERENCES

1. S. Arora and A. Gupta, Industrial automation and Robotics, Laxmi Publication Pvt Limited, 2009.
2. M. P. Groover and M. Weiss, Industrial Robotics Technology, Programming and Applications, McGrawHill International.
3. J. Magar and R. Shelkikar, "Implementation of Robots in Spot Welding Process," IOSR Journal of Electronics and Communication Engineering, vol. 5, no. 3, April 2013.
4. P. Singh, A. Kumar and M. Vashisth, "Design of a Robotic Arm with Gripper & End effectors for Spot Welding," Universal Journal of Mechanical Engineering, pp. 9297, 2013.