Autonomous Robotic ARM for Industrial Application

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Introduction

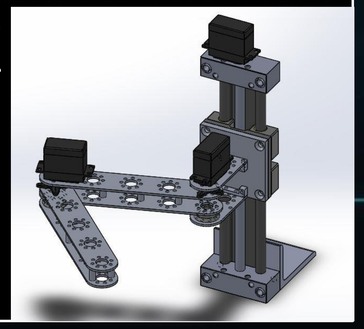
Robots are used widely for performing commercial and industrial tasks with great accuracy and tasks that are repetitive in nature. The project is inspired by the need of reduction of human labour. The contrivance aims to make a standalone autonomous system which will hardly need any human intervention. This project aims to build a prototype of an industrial pick and place robotic arm.

Tools used

LabVIEW:
LabVIEW is a proprietary product of NI which offers graphical programming platform through which simply build blocks and execute them sequentially.
LabVIEW has an inbuilt compiler that translates the graphical code into machine code.

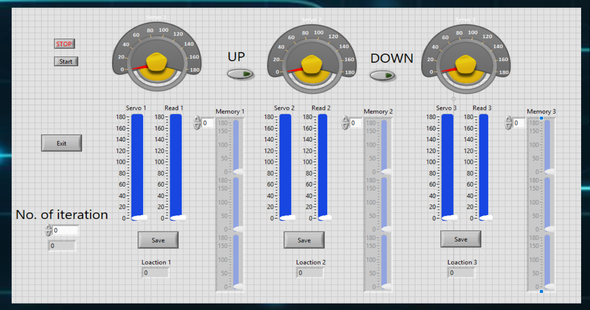
Arduino UNO:
It executes the machine code generated by LabVIEW and acts as a bridge between hardware and graphical interface of LabVIEW.

Solidworks:
The tool helps to create a 3D model which is used to fabricate parts of the Arm. Structural analyses and simulations were performed to check the overall strength and endurance.



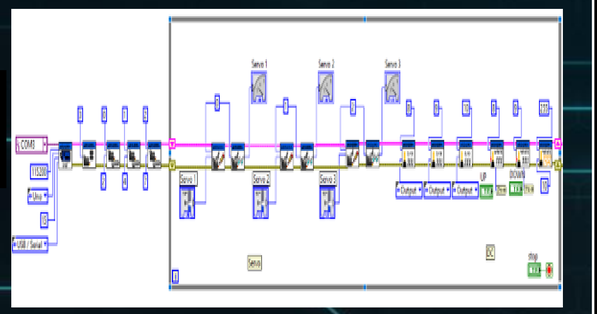
Flow Chart

Front Panel



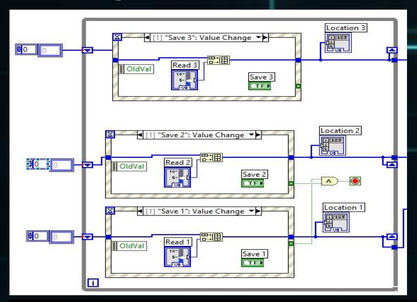
The Front Panel is the Human Machine Interface (HMI) used to control the Arm and give commencing positions.

Control



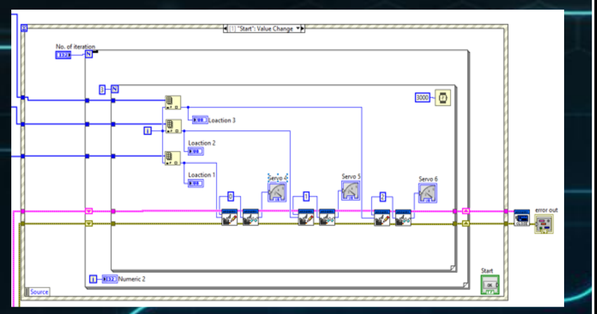
In this unit all the initialisations, controls and indicators are connected to the functional blocks and arranged sequentially.

Training

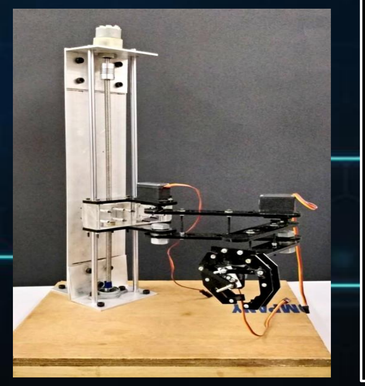


All the positions are saved in the array and the angular readings can be monitored when required.

Iterations



Robotic Arm

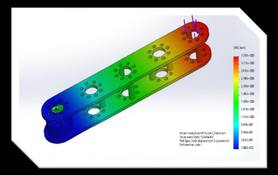


Hardware

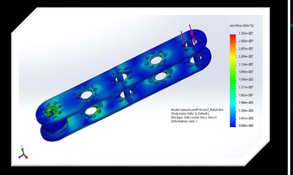
It consists of main support or the back bone of the Arm built of aluminium with wooden base.
The Arm is an Acrylic Laser-cut Articulated Robotic Arm.
Servo motors SG-5010 are driven by motor driver L293D.

Conclusion

- This project is a prototype of industrial level pick and place Arm.
- Using Solidworks, motion study of the entire 3D model of the robotic arm were performed.



Displacement



Stress

- Based on the simulations, the arm can withstand a weight of 1 kg with 3mm of deflection.
- The Arm has 3 Degree of Freedom (DoF) and a rotational movement of 300°.
- The Arm can be trained for multiple tasks and can be used for diverse applications other than pick and place.
- The front end-effector claw can be replaced based on the application like soldering, welding etc.
- The Arm can be trained for discrete positions and can execute it number of times.

References

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- http://www.ni.com/academic/students/learn-labview/ [Accessed 1st, April 2018].
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