Innovative Computing and Communication: An International Journal Vol. 1, Issue 2, September 2019

Robotic Arm Control using LabView

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Abstract— The Idea of the paper is to control a robotic arm which could move in multiple directions and probably 360 degree in direction. Such type of robot can be a useful deployment in various industries and manufacturing sector such as auto-mobile industries, textile industries etc. where transfer of a goods are required in confined space. Other advantages of such a robot is to ease the movement over the production line and enhance mobility of goods over different phases of production .The platform that has been chosen for the purpose is LabVIEW, which is a visual programming language and is easy to learn and implement.

***Index terms* — Ease of Mobility, Labview, Robotic Arm, VPL**

I. Introduction

Robots can been defined in very varied ways. From considering their type of motion or nature of deployment to any of the other way that bifurcates the nature of the robots. Considering the nature of motion robots can be considered to be stationary or in motion and those in motion can be further classified on the basis of motion. On the basis of the nature of their deployment, a robot may be an industrial robot, or a military, a social or an interactive robot.

Considering stationary robots in particular, they are further classified as Cartesian, Polar or Cylindrical which defines the nature in which the robot. Robotic Arm in our case, shall be moving it's robotic parts. Further, a stationary robot may also be classified as SCARA or a Articulated Robot. Cartesian Robot has it's movement in all three coordinate axis, while a Polar robots moves in all directions from a single coordinate. Cylindrical has a single fixed cylindrical rod which may have any number of joints.
The Robotic arm in consideration can be considered to be a combination of Polar and Cartesian Robot as the spherical shoulder joint as as a polar robot and cylindrical arm moves in all three Cartesian coordinates.

Our execution of the robot in the Labview consisted of two parts, a front panel part and a block diagram part. Front Panel plays the role of graphically controlling the user interface and provide an interactive platform for user to control the execution and action of our robot. Whereas if we consider block diagram it represents the source code of the robot in the graphical form with the help of varied objects. Moreover, the circuit diagram is also implemented in the block diagram part.

The Front panel of the project consists of two knob which controls vertical and horizontal movement of the arm which to distinguish our robot, color of the robot can be changed which on screen option on the front panel. The robot itself is represented in a 3D picture dialog of the front panel which automatically appears in the block diagram i.e., each control of front panel is correspondingly appears in block diagram which are further configured for their control to make them function as we want them to. The working of the robot is seen in the 3D picture dialog of the front panel and it's movement can be controlled by on panel controls with the identified range.

II. SOFTWARE

The full form of LabView is Laboratory Virtual Instrumentation work bench. It is a type of development environment with various types of control panels which makes it highly productive.and let it interact with real world applications and signals.

Labview runs virtual instruments through as Dataflow model, where the information passes through nodes and execution order is determined by the node order. A node executes data when it receives, processes the output and passes it to the next node in data flow.It is unlike the control flow programming (like C++, VB etc.) where the sequential order determines the execution order of the program elements

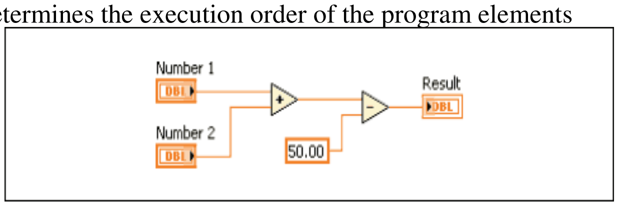


Fig 1: Control Flow diagram of LabView

The Dataflow in the Block diagram occurs from left to right direction. It is so because of logic of Addition and Subtraction function in which subtraction function follows addition function. Hence, it must not be considered to be because of the placements of the objects. As the fig.2 shows, the data is provided to the output terminal when previous executions are achieved

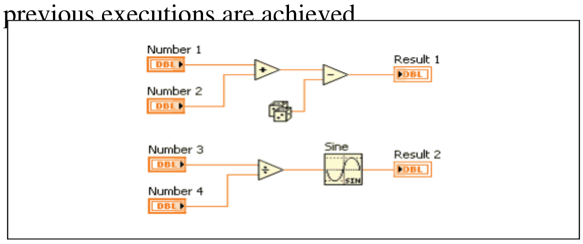


Fig 2:Execution Flow of LabView

Received: 22 July 2019/Accepted 13 September 2019.

The designing of robotic arm has been illustrated in Figure 3.

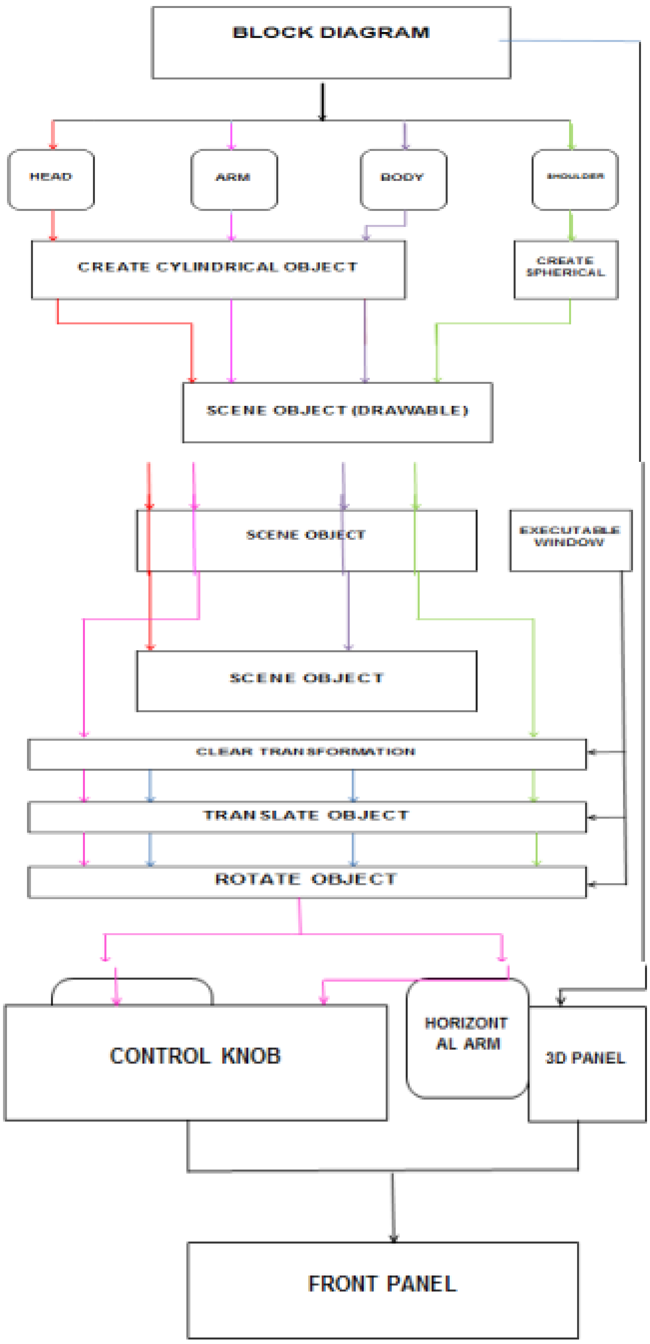


Fig 3: Flow Diagram of Robotic Arm

The Robotic arm is capable of being controlled and programmed differently on different requirements. The movement of arm can be done by actions programmed in labview by the mean of various objects. Hence, it gives the robot the capability to pick and place goods in any coordinate of space, as programmed. It makes the repetitive task of manufacturing industry such as auto mobile and textile streamline and this automation optimizes the production process and helps in maximum utilization of resources. Hence, reducing the wastage and redundancy of the process.

The best use case scenario of this robot is where the complexity and sophistication are less.

B Experimental Set-up

The real time set up of control of robotic arm in LabView is shown in Figure 4(a-b)

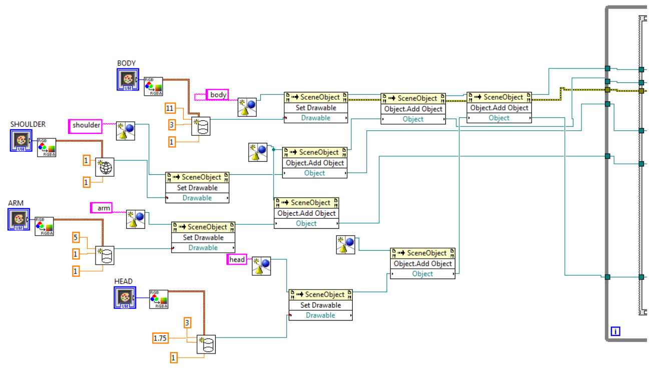


Fig 4. a

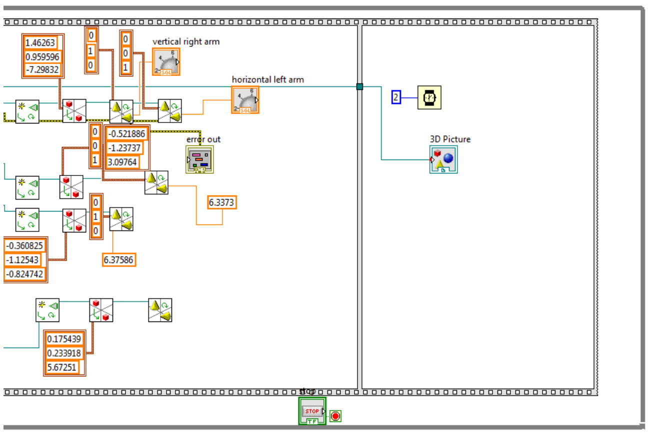


Fig 4. b

Fig 4: Real Time Control

The block diagram panel contains various geometrical objects in Fig 4a which are responsible for giving shapes to the body, head, shoulder and arm of our Robotic arm. Further, scene objects determine the role these body parts plays, which through these lines which are actually a connecting wire connects these physical descriptions to the execution window. Within this execution window the the rotate and translate object determines the motion, which makes our robot a polar and Cartesian type of articulated robot. Also, the tri values mentioned in orange boxes determines the Cartesian coordinates of these body parts.

At end, the outer rectangle represents a sort IF loop, which makes the control of our robot continuous. The 3D Picture object provides a type of playground to display our robot upon. The stop control object between the inner and outer rectangle is the play/stop functionary button, which resets the time object to stop the execution. The colour palette is made by the colour object tagged along the shape objects which helps us give any colour to our robotic arm.

Received: 22 July 2019/Accepted 13 September 2019.

C. Simulation Results

The front panel shows the robotic arm and is colourfully visualize. It can rotate around it's cylindrical body and can also lower or raise it's arm. These functions are controlled by the dial knobs visualized on the left of 3D Picture and on the right is colour palette visualized. It is termed as 3D Picture since the robotic arm can be moved in all direction and can be seen from all sides.

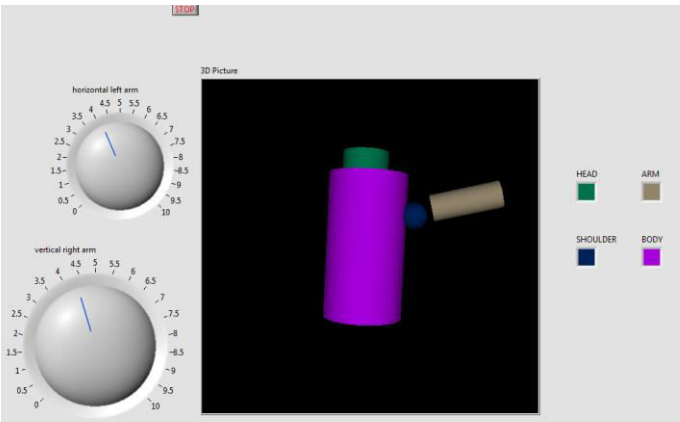
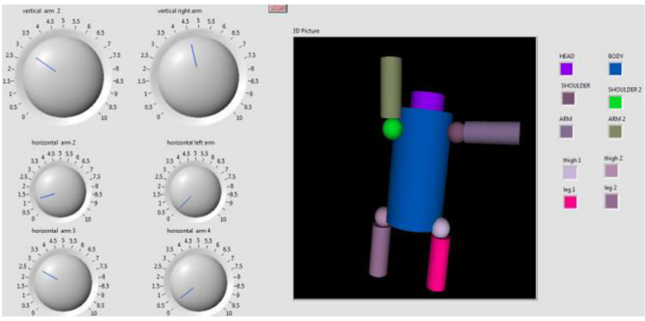


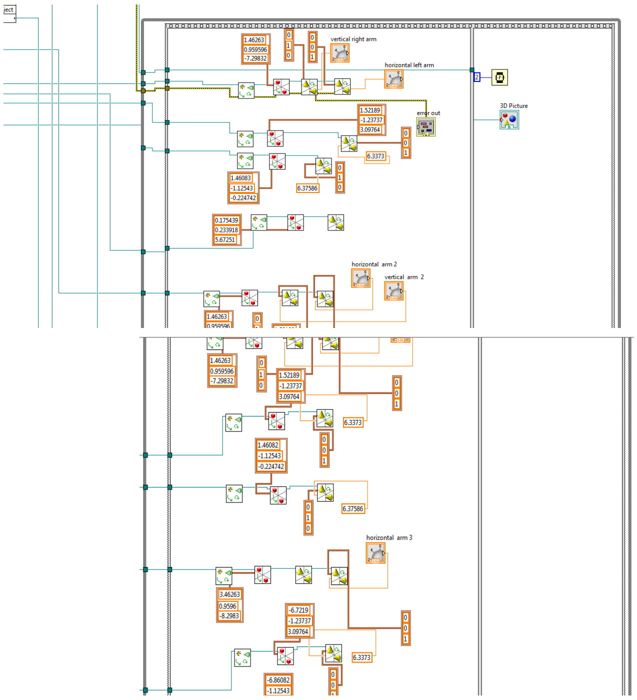
Fig 5. Front Panel Control



The Idea of robotic arm was originally based on to visualize the most basic robot that find deployment in manufacturing sector in large number. The application selected for this purpose is LabView. It provides us with wide range of tools and visualization capability. It also provide us with the Quantitative Methods to control our visuals. On one hand, it let us act on electronics methods and theorems and on the other hand let us explore the graphical options. Hence, it lets us equally weigh our technical and artistic aspects unequivocally. Further, Labview also provides us with the extension capabilities of our project, which are explained in next section.

IV. RELATED WORK

The robotic arm can be further deployed to form full fledged robot, annexed to one more arm and 2 legs. These added body part require further controls, increasing the complexity of the robot. Fig 6.a shows the visualized robot and 6.b it's block diagram panel. The robot is capable of moving both of it's arms in all directions, both horizontally and vertically. Also, the legs can be moved in around the circumference of the waist, simplifying the moving around.



The main aim for the project has been achieved, which was to develop a robotic arm capable of moving in all direction in order to move the goods and simplify the complexity of production line. The designed robotic arm is ready to be integrated with the real hardware and provides an easy control for the same.

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