Lecture 04: Experiment 01: Teaching of Serial Manipulator (Contd.)

We have carried out different experiments related to the teaching of the serial manipulator, that is, UR-5. Based on these particular experiments conducted, we are going to draw some inferences now. Participants, you have seen how we did the experiments using UR-5 to carry out the three tasks. Now, while carrying out this particular, the experiment, you have learnt a few things. For example, we could come to know the different components of a particular robot, how to connect them, how to generate movement at each of the joints and so that we can get the overall movement of the end-effector or the gripper of the serial manipulator with respect to its base coordinate frames.

So, I am just going to discuss the inferences drawn from these particular experiments. You have done the experiments using a teach pendant, which is nothing but a remote controller. So, with the help of this remote controller, you can manually control this particular serial manipulator to perform a particular task. That means, you can give the necessary instruction or you can teach this particular robot how to perform a pre-assigned task using the teach pendant in manual mode.

You have also learnt how to write down the program using the various facilities available on the teach pendant to perform the task like the pick and place type of operations, the task like drawing some shapes like say rectangle, square or some other types of shapes on the 2D plane with the help of a marker mounted on the end-effector or the gripper of this particular robot. Now, all such things you have learnt, you have seen the experiment and you have seen how to give the necessary instruction to the robot and once that particular instruction has been given to the robot, the robot will be able to perform this particular task as accurately as possible. Now, this particular robot whenever you do experiments, some precautions are to be taken. What are those precautions? These precautions could be related to taking some safety measures like you will have to use some safety glasses, gloves, hard hat to be on safe side. We will have to be sure that the surrounding is free, there is no such obstruction, no obstacle, nothing whenever you are going to conduct that particular experiment.

The third thing is very important that is called the safety features. All of you be careful whenever you are going to start a robot, before that, you will have to know and understand how to stop it on emergency basis. So, without knowing how to stop it, do not start any robot, ok. So, what you will have to do is, you will have to see the way this particular robot can be stopped on emergency basis, that is, the moment it reaches some limit related to the generated or the required force and how to stop it that is called the E-stop sort of thing, all such things, you will have to know, in details. Whenever you are using a program say written on the teach pendant, you will have to be careful and you will have to test that this particular program is error-free, that you will have to ensure otherwise there could be a chance of accident also.

And, whenever the robot is running, you will have to keep a close watch, whether you are getting any vibration at the different robotic joints or not, whether it is creating any extra sound because if there is a problem, there will be some jerky movement at the different joints of the robot, there will be some vibration, it may also create some sound, you will have to be very careful whenever you are running that particular, the robot. And, this manufacturer of the robot, at a regular interval, they actually update some software. So, those updated software, you will have to use at regular interval, you will have to do the updating. So, that is also very much required. And, another thing is the preventive maintenance at a regular interval that you will have to do to the robot, otherwise there could be a failure of the robot while executing the task, there could be a chance of accident also.

And, moreover all the operators, who are going to conduct experiment of the robots are to be trained enough to carry out that type of experiment on the robot. So, there must be a proper arrangement to provide the proper training to the operator, ok. So, all such things are must, all such precautions are to be taken while carrying out this particular the experiments. What are the application areas of this type of robot? There are many, nowadays, if you see in modern industries, if they purchase only one robot, it is actually the serial manipulator they purchase first because using this serious serial manipulator, you can perform a variety of tasks. For example, you can do some sort of drilling operation to make some drilled hole on some steel plate, you can perform the grinding operation, milling operation, you can do the spray painting nowadays Maruti cars, their spray painting is done using this type of robots only.

You can do some sort of pick and place type of operation, it is also going to help us during the assembly, you can assemble the different components to make say one setup, you can use this type of robots. You can also do some sort of operations related to the packaging industry or supposing that you have got one printed circuit board and where the different small electrical, electronic components are to be put before going for the soldering. So, you can take the help of this type of serial manipulator. It can also be used for loading and unloading purposes, palletizing and depalletizing the products, ok. Now, one very interesting task has come, which we will have to solve recently like it is more or less related to the palletizing and depalletizing task and we are also planning to use this particular robot to perform that particular task.

It is related to some sort of capsules manufacturing for the medicines. So, these are the possible applications, there could be a few other applications also. So, participants if you want to get more information, you can see these references related to this particular experiment, that is experiment 1 related to the teaching of serial manipulator. Now, before I end, let me tell you one fact, the purpose of teaching is to provide instructions to the robot to perform a particular task, but not to make it intelligent. If you want to make a robot intelligent, so robot cannot be made intelligent to teaching, ok.

There are some other ways, those things we will be discussing in some other experiments, ok. So, let me repeat the purpose of teaching of a robot is to give instruction to the robot to perform a few tasks, but not to make it intelligent and to conclude the taught robot, the robot which has been taught, the taught robot is not the intelligent robot, ok. So, today in this particular experiment 1, whatever we showed and discussed is how to teach it, but not how to make it intelligent. How to make it intelligent autonomous, those things, we will be discussing in other experiments, which are also there in this particular NPTEL course, ok. So, with this, let me conclude your experiment 1. Thank you.