

Lecture 10: Experiment 03: Path and Gait Planning of Six-legged Robot (Contd.)

So, you have seen how to carry out the experiment using this six-legged robot, XR and we have seen how it could solve the six defined tasks. Now, from this particular experiment, a few inferences could be drawn. Now, these are as follows. The hexapod is found to be versatile, we have seen that. We can with the help of this particular hexapod, it can move in the forward direction, it can move in the reverse direction, it can take the turn as the situation demands, it can follow the straight path, it can follow the curve path, standing at a particular location, it can adjust its height and it could also negotiate the staircase, it can ascend the staircase.

So, let me come to the conclusion that this particular the six-legged robot, that is, a hexa is versatile. So, this is actually the first inference, which I could draw. The next is your while controlling this particular hexapod, we could do it very easily with the help of a mobile app. So, we can come to the conclusion that this particular hexapod is user friendly and it has the ability to collect information of the environment with the help of its camera and sensor.

It is able to take the decision regarding the path planning and gait planning and that you could see whenever it was negotiating the staircase. So, the robot had to make some plan and whenever the failure came, it had to replan based on the collected information with the help of camera and sensor and image analysis, sensory data analysis. We have seen that the robot made the replanning whenever it failed and while ascending the staircase, if you see stepwise, there could be a local failure at some of the trial, but it could do a little bit of modification through its path planning, re-planning, gait planning and ultimately, it could maintain its balance, that is more important. So, if required to maintain the balance, the hexapod will have to do the planning, do the gait planning, it will have to do replanning of the path, replanning of the gait with the desire to maintain its balance, that is more important that we have seen while carrying out the experiment on ascending the staircase. So, with this successful ascending of this hexapod robot, we could declare that this particular robot is intelligent also, it is intelligent and it is autonomous.

So, it has the permission to do planning, replanning of the gait and path and act accordingly. So, it is autonomous too. So, it is intelligent, autonomous and at the same time, this particular robot is very handy, I should say and it is very versatile, it is user friendly, it is very compact and we have also seen it has got some facility and this particular robot can also be used in dark environment. So, these are the inferences, which could be drawn from this particular set of experiments. Now, while carrying out this particular experiment, a few precautions are to be taken, otherwise there could be a chance of accident and there is a possibility that this particular robot may not be able to perform its assigned task.

The precautions are as follows. So, we will have to find out one open space for carrying out this particular experiment, there should not be too much obstruction there, there should not be obstacles. So, this particular atmosphere has to be free to carry out the experiment.

The next is we will have to start the experiment at low speed and then gradually, we can go for the medium speed and high speed and the reverse, we should not try, we should not move the robot at the highest speed, then gradually decrease its speed, there could be a chance of accident also. Now, we will have to check whether there is excessive load on the **servo-motor**, because the servo-motors are actually the drive units, which are going to provide or generate the necessary motion, the movement.

So, we will have to check that there should not be any overload or excessive load on the servo-motor and this power of safety between the test. So, one test we are going to carry out, then we will have to be careful before we start the next test and there should not be any overlapping of the two experiments and that may create actually the problem. And, whenever we are running that particular robot, we will have to check whether it is able to maintain the stability of the vehicle and we will have to be careful whenever it is in running condition, whether there is any jerk too much jerky movement at the different joints, whether there is any such sound coming from the different joints. So, we will have to be careful and we will have to ensure the smooth variation of the movement at the different joints. And while carrying out this particular experiment, we will have to be careful that it should be kept away from the water exposure.

Then if the sensor or the lens of the camera is found to be dirty or say dusty one, we will have to clean it properly at regular interval. And while carrying out this particular experiment, we will have to be careful there should not be some young children like in the near vicinity of that particular experiment. So, before we start the experiment, all the wires are to be checked for their loose connection, there should not be any loose connection and due to this overload, there might be some overheating of the motor or the battery that we will have to check. And whenever we are operating that particular robot, we should not lift or move that particular robot quickly. So, we will have to do it gradually.

Some safety features are to be maintained particularly the moment you are going to start a robot before that we should know how to close it or how to power it up, how to stop it at the emergency. So, before we start, we should know how to stop it without knowing how to stop it, it is better not to start. There will be emergency stop. So, that particular button, that particular switch, you will have to know, you will have to be conversant with. And of course, there must be the preventive maintenance for this particular robot controller everything at regular interval, otherwise this particular robot may not be in working condition.

And at the end, another thing, we will have to be very careful, proper training has to be given to the operator, that is a must. Otherwise, there will be a chance of accident while carrying out this particular experiment. Some applications of this type of robot. So, this type of robot we have seen, it can increase its height and while increasing its height definitely, the legs or the feet will be placed in such a way that overall the bounding area is going to decrease. So, if the situation demands, it will have to behave like this, so that it can

enter through the pipes, tanks for the purpose of inspection and cleaning of the large pipe and tanks.

We can also use this type of robot for cleaning the shop floor, for cleaning the lab floor. So, this type of robots can be used extensively, particularly for the inspection, cleaning and for collecting information, which is little bit difficult to reach by the human operator. So, the participant can get some more information from these references. For example, there are some websites, you can have a look to collect information, more information regarding this particular the **hexapod** robot. And I hope that you have learnt a lot through this particular experiment that is on path and **gait** planning of six-legged robot that is a **hexapod**, whose name is Hexa.

And you have seen how it can perform the various task, we have considered six different tasks in this particular the experiment. Thank you.