Hi everyone, I am Aishwarya and these are my teammates. Our project is about making a robot which is much easier to program and control. Thereby the title of our project is ditto the advanced lead through robot. The main goal of the project is to make an industrial robot much easier to program. In the actual scenario, there are many types of robots are used in the industries and all these robots are programmed based on three methods that are offline programming, lead through programming, and teach Pendent. Before that, what is our abstract is, among the three types of programming methods we advancing a method of programming to the robot.

before I am going to explain you in technical manner, let me tell you in a simple words, just imagine you are a person right ok I am going to make a toy which is exactly like you but dimensionally smaller now I am going to control the small toy so that you're going to move like the same as the toy moves. this seems interesting right! It this is what we gonna do in this robot programming.

now in technical, we going to make a pick and place robot which can be used in industries and also we can make a small scale down model likewise the real time robot dimensionally smaller when we control the small scale down model so that huge robot will duplicate the actions performed by the smaller model. not only that through controlling the smaller model the huge robot can be lively controlled also the path performed by the small model can be saved and replayed also can be erased from the memory of the robot.

so it would be much more easy and convenient for the person who don’t having programming skills. so the person who don't have the programming skills can also able to control these types of robots for the specific functions. you can ask whether the company hire a person without programming skills?

of course they are not. but the actual scenario is the robots are been bought from the companies with high cost and Investments these robots are being bought by large scale industries around the world. but our goal is to make the medium scale and small scale industries to make use of robots through the simple programming methods this is much easier and convenient for them to handle specific task in a simple manner without having the programming knowledge in spite of technical knowledge alone. first let us see what are the types of programming methods are being implemented by the industries.

These are the three types of existing system to program an industrial robot. the first type simulation or offline programming method in this method a programmer can program a robot where ever around the world. the programmer may not to be in the location of the robot. the only instructions need as the input to the programmer is, what is the work envelope that the robot in the locality provided also what the work need to be done by the robot . through these two things of inputs he/she can write their own program and can send to the production so that the person in the organization will upload the program into the to the robot and make the robot work. this is a old type of programming method.

next method is called teach pendant or drive through programming. this type of programming is used over 90% of the industries which is appreciated right! just think about a remote controlled car you going to control through a joystick consisting some button right? Likewise, the Robot is going to be controlled through a joystick which is attached with gimbal, potentiometer knobs also some buttons. these are used to give input to the robot these inputs are used to give instruction to perform a joint angles or the end effector position or the trajectory it has to followed. through this joystick method, we can save the program and replay it. so that if this is widely used in high accuracy and Precision applications.

this type of programming is good but it will take more time to program the same function what we needed. for example if you want to move a robot to specific location I want to control each of the joint angles individually to specific angle so I need to control each one of the links in the robot so that it will take more time to attain the position what I needed.

the third type of robot programming is called teach by demonstration or lead through robot. as usual in simple terms..in childhood how we learn to write? mother or teacher will teach us by holding our hand right! likewise we going to hold the end effector of the robot and teach what it has to do so that the robot understand what it has to work next. this method is called lead through programming this as major advantages like

it is easiest way of programming until now why this method is not been implemented widely used is,

it has high accuracy and low Precision when compared to the drive through robot drive or teach pendant type. but it has wide range of applications like painting, welding, drawing, pic on placing,etc…

so these are the three methods of programming which is already existing in the industries to program a robot.

what is proposed system is

Advanced method of lead through robot. simply I am going to update the method of programming of the lead robot. we found that the lead through robot programming method is very interesting and we are about to to make it more useful and efficient to work with and finally we got an idea..like

why we need to move a robot end effector to move to a specific directions for some trajectory why not to use the small scale model in replacement of the original robot?

since the huge industrial robots or resistance to move right so while we need to move the end effector of the real-time robot programmer should struggle lot to move the robot to specific positions also have to strive to make the robot to move flawlessly so unless moving a huge robot a small robot can be easily moved to the specific positions and also the trajectory can be followed by the huge robot means the whole time.

if you consider an industry, if there is a drawback .

for an industry producing a variety of products, the robot has to be reprogrammed again and again. in such case This small type of robot can be very much useful to make the robot programming to perform specific task just know the small model and easily program the use robot right unless we strive to the huge robot moving the end effector and doing the same thing again and again. this is so impressive thing that could change the overview of the robotics.

The objective of our project is to build a robot and to control it by using a small scale Down model. which is smaller than the robot what we actually make and we going to control the future robot with the small model.

just imagine a situation in place of the persons in the nuclear reactors will wear the radio nonradioactive suits to perform the operations inside the cell. what if we can replace them with robots ?

it is not been implemented but just imagine replacing a person from their place and keeping a robot will has drawback in prior methods. if you consider any type of programming, the program methods are not been implemented Right! Is because through any of the old methods, the robot cannot be controlled lively whatever the person wants to achieve the motion.

if you consider the offline programming as to give the inputs of the work environment and what the job has to do in the as a planning right!

also in the teach pendant drive programming we have to program the robot through the joystick buttons and potentiometer knobs and buttons . this is also a need a plan sketch which could not control the robot lively.

On lead through programming method also we have to teach the robot holding the end effector position so that without teaching the robot cannot perform the operation what the person needed right!

In our scenario the person can lively control the robot so that I hope this could be a better solution for the person working in hazardous environment.

we can keep the real-time robot in the radioactive cell and we can control the robot with the small-scale down model through a wireless communication and taking the small model out of the cell.

we can control the robot lively and also we can use the multiple joint angles in a single stack. so this will allow to control robot lively… this is the main future of this robot.

scaling is nothing but the ratio of standard dimension to the model dimension.

Let us see some literature survey that I've gone through to learn about robots.the first “review on design and development of pick and place robot arm” from this paper I learnt about the forward and Inverse Kinematics of a robot or motion

this is that much simple for a robot in forward kinematics we going to provide the angles of the joints need to move on to attend the end effector position.

in inverse kinematics it has formulated procedures that can convert end effector position value to the angles required by robot.

simply in inverse kinematics we need the input as end effector position.

for an forward kinematics we need input of the joint angle to the robot.

this also help me to calculate with the load carried by the robot. for example we know what is torque is nothing but a rotational force right!

the shortest distance will provide more torque so that it will carry more load

if in case if the links are at large distances, torque will be much lower so it can carry only less load.

the load also includes with the weight of the frame of the robot. this study helps me to design a perfect robot which consumes less or sufficient energy without wasting much.

“development of pick and place robot for industrial applications” let me know about the laws of Robotics actually there are three laws of Robotics. the first law is the robot should not injure a person the second law is the robot should obey all commands provided by the person except that causing injury to a person that violates the first law. third law of Robotics is robot should protect its own existence without over ruling the first and second law. Also learnt key components of a robot like links joints grippers Servo and stepper Motors and actuators

the third paper let me know about the the robot configuration types actually there are four types of robot configuration Cartesian, cylindrical, Spherical and articulated. all this configuration are based on the motion followed by the robot. actually the work volume will determine these configuration of robots for example in cartesian robot as a rectangular workspace in cylindrical robot it has a hollow cylinder spherical space in spherical.in order created it as indicated shapes for example it has a spherical shape but in between that it cannot access some specific points were we going for.

the configuration of robot can move to this position could not attain interior wall or interior envelope so it is called as articulated robot configuration and also for basics of electronics I referred books

Going to see the block diagram of a project:

on the left side we can see that we going to provide a manual motion as a input to The Skeleton model and On The Skeleton model I attached a potentiometer that potentiometer is connected to a micro controller.the microcontroller gives signals to motors and gives reading to the display.

to know that what the technical thing happening herem first let us see the small scale down model how it works.

actually In The Skeleton model the joint angles are been determined by fixing a potentiometer actually the Potentiometer is the resistive element which offers varying voltage with reference to supply voltage.

for example,the angle the knob rotates will determine the amount of voltage as to be given as the output from the Potentiometer this output voltage with respect to the angle of knob is determined by the microcontroller and this voltage is converted to angle in degrees so that the potentio metre will give an electrical output in between 0 to 5 volt in binary form the analog values as in the form of 0 2023.

this values are plotted based on the voltage output from the Potentiometer for example if the diameter outputs the 2.5 two microcontroller the microcontroller will take the value as the half the rate of 2023 likewise the angles are been determined from the Potentiometer this range 0 to 2023.these values are been mapped to 0 to 180 degrees this map angles or been given as a input to so a small robot can be controled useing real-time robot with small model.

so lively we can control the huge robot next we need to save the position and to make it play right? so we need action inputs like buttons so we have four buttons actually going to use 3 so the button will record the position of the robot so we can save number of positions that the robot has to follow repeatedly and if the row the memory will take the positions of the robot the button bi is actually a play back button it will play the saved position of the robot on again and again power or we can limit the number of cycles to and the buttons she will stop the motion and erase all the memory that the programs are stored in the memory Write the store position or been removed from the memory of the microcontroller these operations or been performed without visual effects right so we going to provide output to a display and we can monitor each and every motion performed by the robot lively so that through display we can determine the joint angles of each joint angles of the robot .

In the workflow simply we going to move The Skeleton model the Potentiometer will give the reference voltage and output voltage will become that two angles this has to be given to the Servo Motors the control to convert a tier two angles also we can save the data obtained from the microcontroller in the system that in this data we can use it for future reference as a log directory

These are the softwares and hardwares used we going to see that all in brief first Uno it developer microcontroller board which has 14 digital pins and 6 analogue pins that can be programmed using uSB type b using type b USB cable or using external TTL converter second thing is a Servo Motor yeah so motor is nothing but rotary yes I will work based on a closed loop system actually a gear motor is attached to the case of the sore motor thereby through number of gears the speed of the motor is reduced and the torque is incremented the final the gear is connected to the Rotary encoder that is attached at the bottom of the motor bottom of the frame so that the motor will rotates the gears the end year is attached to the court also rotates the Potentiometer will use a varying voltage outputs that can determine by microcontroller what is the actual position that the Servo Motor holds on so there by the angle holder by the so motor can be determined by the Potentiometer the next step is we going to give some angle as a input to so motor to rotate to that certain degrees right for that we use was with modulation digital pins or through unlock means in this type for example let us consider the robot is going to move to 90° the home is going to move about 90° first case in a 90 degree robot robot arm is the first case is the if the server or is at 90° the motor will stop rotating in case if it is less than 90 degree it will switch on to specific polarization if it is more than 90 degree it will switch on two opposite to the specific polarization order performed likewise as a closed loop it will perform the on switching operations into millisecond time gaps the pulse width modulation technique will provide the motor the sufficient power to hold down the loads rotary potentiometer the next thing is these are the components which provides of varying voltage output to respect to then angle it has two element inside the case and Viper to move around in a circular path so the viper removes the resistance changes that by the output voltage values as output the next thing is USB to TTL converter these are used to program the microcontroller or some interface or some components or module to interface with computers these as the following Prince like transmitter receiver power supply for 5 volt and 0 volt power supply this is used as a external programmer for the arduino UNO the next thing is 5 volt adaptor this adaptor will convert the 230 volt AC power supply from home line to 5 volt dc which is required by your project some following functions like what is production for current and voltage protection and low ripple land high efficient adaptive the next thing is printed circuit boards these are the boats which will support the electronic components mechanical good and electrically conductive covered with the copper plates and we can make the tracks through lED by the tracks of conductive and the other points on a not or not to be conductive pin header and female to female jumper cables we saw some connectors that we going to used in the cycles to solder and can transfer the signal to module to arduino for adding two servers and accept loss the next pushpa we know already register is Electronic organ which of resistance to flow of current so that it will reduce the current that flows through the conductor right and while we remove our hand It will be act as a open circuit the pick and place robot frame is to provide a mechanical stability also to carry the electronic and some components like Motors this is so Agile and very useful in carrying loads and components that are needed to support the robot then the software used is arduino IDE 1.8 13 this is open source program software which only supports to order no type of boards through this we can program and compile also to out so we can upload it no but this also can that was also can be viewed through the serial monitor what does this program software does is it converts the human understandable language to binary values and it upload the binary values to microcontroller thereby the my control perform the operations that we constructed as a program in a software what is your current work status is we can read all the Potentiometer all of the small scale on so that a child is studying the parent has to work on this is the program used to take readings from the small scale on the starting starting from the starting we are sending the princess analogue right from the unlock Prince we take integer values which is which are not float right so it will take as you 2022 2023 it goes to void setup which will perform the operation just once and just skip to the void loop in the void setup we will assign what type of penis that actually input or output and also the serial monitor also can be mentioned right here search the wide look look will consist of set of program which we need to enter that loop will continuously floor again and again it is a ka function call technique so must be going to call out A grade in this page the pin values or read through analogue read function and it is stored in variable is called print value 12345 and these values for been read read through serial monitor from the system there is also another type of function calling for mapping mapping I told you write the five all the potassium uses 0.23 output that we need to change it to 0 to 180 degrees of angle that angle can be obtained as a output and void mapping function so from the program we can take the angles of children model inactive is going to make a real-time robot Sophia robot this is the result you what kind this these are the values of the pot of small scale on model with this has to be duplicated to the original robot these are the references that I came across in learning process of robots technique For the opportunity thank you we will update the status of the robot