ROBOTICS
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Lecture No-6
Gripper Manipulators

I will briefly recap yesterdays lecturer where we had look at doing the lecture you had seen what are know as parallel manipulators parallel manipulators
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which are essential closed chins   we had look at direct and inverse kinematics of the parallel manipulators the toward platform one of the most popular parallel manipulators the look at that subquently   we had look at   how a manipulator can be use are the measuring device

you know and later an look at the various coordinate system the coordinator system attached to the tool the coordinate system attached end effectors   the coordinate system attached the job   the coordinate system to the base and world coordinate system you adjust to the terminology

okay later i on you find that not dealing that object you know dealing with coordinate system slowly you will get when i say object is sitting adjust particular location whether it is the pen are some thing make know different what mater is what are the coordinators where is sitting how is it orientations

You will later an find that as you procure as we go along you will dealing with coordinate system expression of one coordinative system another will come out of the matches you will be playing with out matches that why i thought i should introduce coordinator also i told you how the robot use the measuring device

now we interest you know why detect touch of on the   being the measuring devices why detect have to touch of on why is that i told you that the why do you highlight it the lecturer robot being the measuring device i said that if few has the robot sitting here and you have and object position here orient this way few line this figure the object you could use this angle since

if you know the length you could determine what is the position orientation of the object of the obviously   with coordinative system in the base of the robot i will define a base coordinative system i define at any way why define factor of the is are any thing doesn't click any in your minds   doesn't any thing click   this is use essentially to beast the robot supposing i want to pick on object from location A and place it in B all i have do it align the figure keep one object is A keep object it A align the finger read of this on coder angle from encoder read of this angle than again bring the   robot to B by holding the end effectors and moving it are by running this motor with

switch   decuple it the computer run this individual motors throw switch just like the grain operator in the factory does are the blunderer operator does are full severely liver bring it to be wake it is properly at bean record those angle them all it have it do this simply the run this motor screw those angles from this angle to this angle this angle and fellow will repeat the going from here to there obscures

we have accelerate rate in the decelerate the motor bring them to stop in order to the release the object say you know they found   way of teaching the robot with out going in to sophisticated vision system and all an the shope floor best way to handle this because vision takes time so for teaching we required robot of the measurement we talk up teaching the robot teaching the robot manipulators you use the simple techniques using the robot measuring devices okay
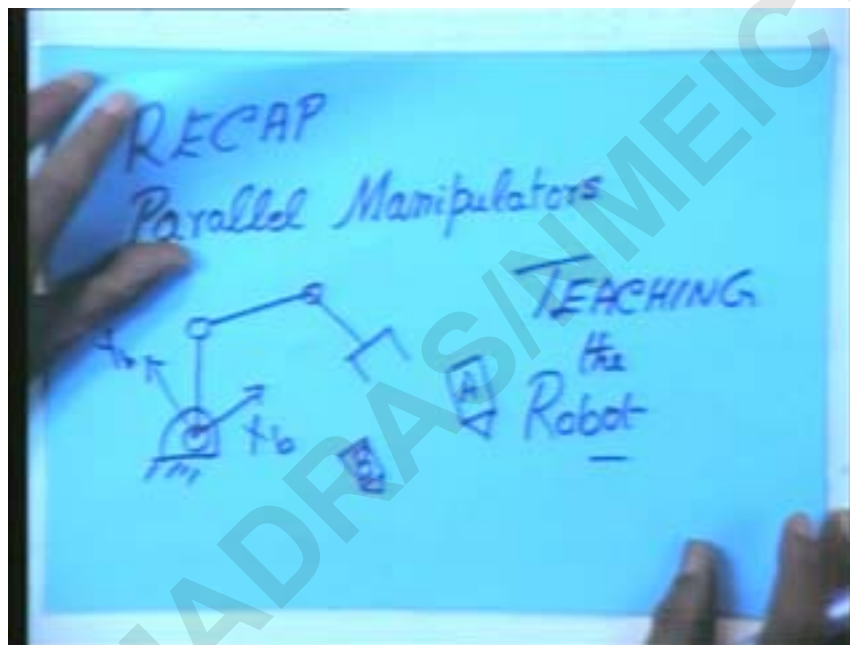
this is what we saw yesterday and i just want sublimated with this statement recording teaching as a robot in everybody wondering you know how can you got robotics you know the object how are going to tell the robot where the object i that going to vision system are you going to sit down measuring tap and tell it know this simplest way insistently

you have you have this you know microscope with allow the measure it dimension object dnn all the called this short of serial chins device it comes where there is a rope at the end and keep on touching the object it record this object dimension in it shown way in record with joints angle convert them knowing the link length computer will convert in to the object dynamic we can capture on object dimension it goes devices having seen that move ahead we look at some again few more concept we all know that all the access of the robot independent manipulators are independent access   right independent access each access is given by a particular okay
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so happened some time these activated become coupled (it noise) you thing there are obviously you know you get you have felling at all independent you suddenly find than they are coupled this happen particularly when you drive all the access the base links we have the look t things before i go to that i just briefly touch up on the drive one of the drive which as been use now most popular drive very heavy robots you know you rear pivoted cylinder mechanism this use in most an moving equipment bullterrier

i will draw the robot here manipulators and cylinder and there is the pistil this pistil and cylinder combination right here we can notices we can see the this links given by this pistil and cylinder combination at the pistil move the cylinder (itch noise) the oil is pumping are what ever it is this arms rotation around this field do drive the next link

we have the similar mechanism very heavy robot hydraulically access i am using it explain coupling later on come to here here i got one more cylinder and that driving this okay one more is it clear i am omitting other access focusing on this things this is will knows rear pivoted cylinder

you could use oil hydraulic or you could use the ball open one of the advantage of the rear pivoted cylinder mechanism why it is favor in the heavy machinery very heavy machinery like ever what you called builders at moving machinery that there is know side pistil and the cylinder there is know sightseer

you know very simple way understand this is you take your cycle pump the one use the pump air in you this let say you got cycle pump like this you know small nipple out here revert on links on here revert one links this end and try to full the pistil and cylinder (appa noise) i mean pistil inside the cylinder

you find that you can not apply the because you see pivoted you can not apply a transfer you will find that this is nose eye the in apply obscures we assume that there all properly may are you just take a ruler make the holes pivot to links hole those to links and try to pent the ruler the you can not bend a ruler this is obscures a shown of the cycle but a simple ruler with you all the measuring scale with use already one hole in it tail another hole pivoted link here pivoted another links here hole these two links and try to apply the four yes you can apply you can pent it you cannot pent the ruler by if you are hold on these two links in the plane am reference so same thing happens know cycles you can not pent it

a similar passion here he can not apply cycle that why these are favors for moving very heavy load the rear pivoted mechanism it become quit popular even for lighter load for use are else now when you design here pivoted cylinder mechanism there are few things you can there are look at are whether you replace the cylinder and pistil with the ball screw there are two thing one has observed as you pi these things i just touch up on that see here i am showing rear pivoted cylinder machination

when the pistil and this drivers we have to is a output okay and the pistil node forward and backward at the pistil node forward and backward is the output that this the S

variable stoke of the cylinder let this theta angle now what is decided essentially if we draw a cure between s and theta you like you should be straight line cure you are pumping oil in to the cylinder okay let say you pump one cc and then arms rotation to the three degrees the next cc also you pump

you will you like it rotate to the same three degrees approximately you don't want to be surface a fourth (leflap) operator using his mechanisms you will be surface if we it push the liver a little and than the fourth lift say by ten centimeter there is pull i again a little more you know same angle may be first pull it five degrees it as call ten centimeter again pull it another five degrees now choose up to twenty five centimeter from the previous position than gone up ten than suddenly five degrees of rotations of liver it is to up to twenty five centimeter he is going to surprise

you wound get the feel of situation like wise so it is some professional it maintain okay how are you going to size the links A B how are you going select all this angle i am in the s in order to get this linearity this is something.. it own get a very sticky straight lines you get a weakly non leaner system but more are less you can assume to be you can use it you wound surprise you don't suite up all are go very slowly when you think some things wrong is the machine are (exthrw noise) yaw both should happens should for first five degrees it go by ten centimeter the next five degrees goes up by two millimeter when you daily going to surprise (ru noise)

these are the devices centimeter find the important devices that why x y and touch up on it okay in designing this you have to this length ab bc as well as the store where do you want this store how much angle is rotate a critical points here is what is know as transmit analysis
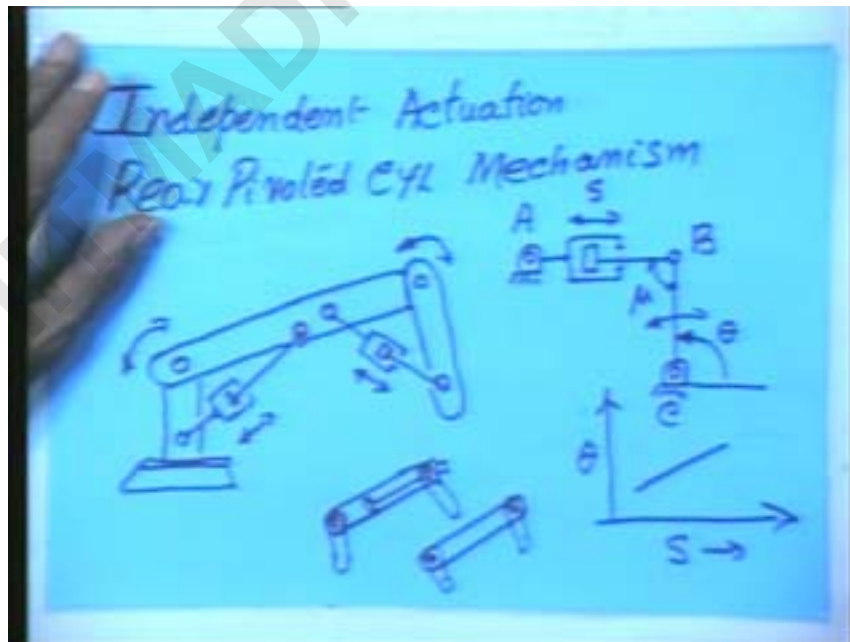
we look at that little more in the day so this how this who before i go to the coupling just i go touch up on this because there are think with usually when you are few you are designing a robot manipulators some thing   else these are use full concept you frequently encounter than in manipulators let as look at this so called transmission so what is know important okay

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 now you have a liver is your familiar with this i am repeating sack those whoever not mechanical engineering   if you have a leaver the fest way to push that leaver it is ask it is rotating in this favors (u noise) is in this is i will call it push use the best push the best push in this there now same leaver this is the worst push right the leaver is not going to the rotate

you are only going to compares the leaver is the way it push it do the work one but usually machine end of with pushing it   some what in this directions so you know this force densonsaning   the leaver as well moving it component moving it obviously if all the forces is in the direction which in the leaver tip where your apply the point of application naturally moves you are all you are utilizing force the maximum value right the natural motion of the skip is the circular R this as center   at this point draw the tangent along the tangent if you are pushing as i am doing here here using utilizing

you are push best right so this angle we see here is when i come to the rear pivoted cylinder mechanism we have the okay the cylinder draw i will draw the cylinder is very large is the pistil look like made whole things volute   look is it okay you know what i have done it so have for you showing the cylinder provided to the ground in this case i have pivoted to the cylinder by mistake the cylinder back

i have pivoted this is it ok it make own different right should not   only thing is oil pipe will have to closed around in if i pivoted to the ground the oil pipe but pivoted and this you know they will be floating may be this i unintentionally do this your oil pipe (ikm noise) so at the pistil and cylinder move this fellow an this angle which is like keep as close the ninety possible during the entire motion okay now we trick is you select these distances is a b c such that for the range of motions

you want the theta equal to this the range of motions is angle of twinkle of theta and the stock s of this follow you know you get the rear pivoted cylinder   readied from the sash some from several company manufacturing you going to passion it you have to decide various length AB length BC comma AC location of this stock where do you want to begin the stock and (n noise) such away that mu lise between difficulty you will shape or forty five   than part of push is obscures utilize in either tension this rod are compressing but other part

you cant have ninety degrees slow the motion linex case   it case is revert is redundant you should meaning know the transmission angle will later on when you design mobile robot also so in this case you want   mu   to between ninety plus one forty-five the transmission angle let same time like that linearity so some where you have   strike a

balance between the two look at this look at that the transmission angle are equivalent very important event in mobile robot when you drive your cycle it is the rear wheel which is pushing again ground and propelling you forward right it is the rear wheels and the front wheels is use straining

so let me see have a look at cycle it is the rear wheels this is the front wheels no that position you can here is the sheet this is the cycle don't expect me entire cycle okay so when you are sitting and peddling in the direction is moving forward the traction vector pushing the vehicles again the ground okay the push by the ground an the vehicle is when you pedal which directions forward direction when the turn the wheels the wheel is no pointing like that the traction vector on the rear wheels is pushing forward you turn the wheels is the direction attraction vector

it will remind the same but this is direction of the role of front wheel right now you see there is the different this is there than two scaling the moment you turn you want go this way but that fellow is pushing this way the attraction vector pushing right so you see if the transmission if you turn i didn't do one things go back when you go back you ask the handlebar turn the ninety degrees than you see now for you can go you can but look at the child on a three wheelers he drive the which wheel the front wheel he drives the front wheel there traction vector as the direction

he want to roller always are same direction that is why the little fellow can sudden turn and kicker before know where happening fro quick turn you know wonder you know keep things i can taken the turn out how def follow able do to this fellow it are able do to let see what happens there so the sit is peddling this wheel the front wheel tricycle traction vector is the same direction wheel as turn because peddling as the front wheels no wonder maruthi eight hundred car so popular that is a front wheel track most of the compact cars
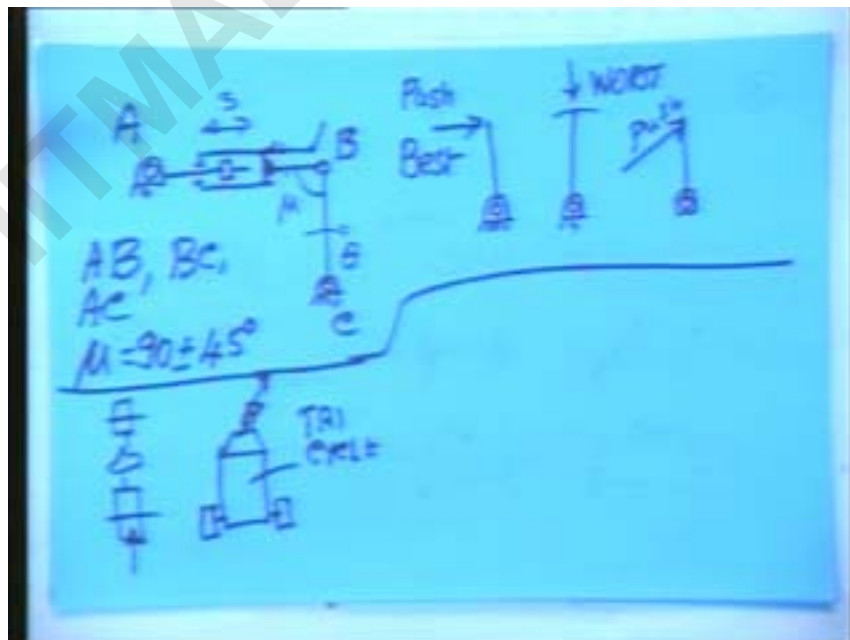
we have country today are all front wheel track so that is why you keep saying you know i can't turn in old feat so easily but maruthi (s noise) take a you turn in a small space very easily why the front wheel tracking in the direction in which want to go where as the older car the real wheels are drive the moment to staring turn heavily large i know the turn wheel large angle the front wheel than obviously

you push it round directly you put it straight but you want go if won't want get such that turn capability as you where compact car maruthi eight hundred maruthi are the maruthi smaller car all the have the front wheel drive you that make a big different when you design any mobile robot tomorrow keep it in mind its sure here It all the requirement so many are time

i find student you know indicia design in the small mobile robot with out taking care of the small point and than doesn't really work problem more over when you fill the small robot there wait is not much you have to things of this things when you choose the front wheels drive and back real wheels drive you have fill front wheels drive more complex to design real you need the differential as well as the gearing mechanism ever thing as going to one place (it noise) more complex are you (li noise) drive all the four wheels let also done okay

this is one import things one have keep in mind so called transmission angle as given a just simple ore you are that there are let as go back we are real provider cylinder the way of seen the linearity problem there rather (itch noise) we are seen that we should attempt me make turn linearity that one things you have to be find between input and out put that useful entity and we also seen the we have to worry about the transmission that transmission angle worry all over the play not rest in pivoted cylinder

let me look at what are those you know one what previously we had independent right an each access way the manipulation some body comes and know you are carrying actually unnecessary in have independent drive you know this activity has the carry this access right apart from pushing this link which also pushing the wight of this a access pulling are pushing what ever may be call it okay carry this access so some body tell me why not them both of them give from the ground i come out this new design where i have both of them design on the ground i have a manipulator like this

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the vertical access which am not going to show it is there okay on this platform see this which a y base base rotation is very wide i have intensely made because i have put may activator outside there are away of doing it keep the t base compact also unless very heavy lode to lift you can keep the base the smaller than there infect you know one of the key things for design for robot is waist together we got waist here you have the large diameter right rotating platform so what are know as waist bars

other wise put a shop and put two paring space the part obscures here also more than one but still waist baring if we have develop this baring once they we an applications there using a other machine roll

i have got one you know my first access here give by a usually invited by the grank the real cylinder mechanism commercially it is called the real cylinder real provided cylinder mechanism but as a kinematics as a called invited driver you see play both your rolls in shop floor tell the worker invited tided grack we won't understand you go to kinematical telling rear provided cylinder mechanism we also won't understand

you have to make sure you know both and give explicit and right way the use the right terminology at right play hear the cylinder one which drive this link than i have provided other link here and let come out to be like this am get showing it okay am like this notices how am driving it (d noise) this is one access this is other access this third access also that is incidental right now where not very much interest this much

this cylinder one drive this access drive this link to the this cylinder right access now let as do one things i give the name i call this A i call this B is proved i call this C i call this proved D ground proved D rather than proved an this okay now whole the cylinder two let mean don't pump oil into the classical to the position and drive cylinder one what happened hold cylinder two and drive cylinder one pump oil in to the cylinder

one are rotate this where the rotation going to other which angle is going to rotate i call this angle theta A which angle is going to change theta A is going to change are you sure why once this is lock distance D C is constant that is L there is shot of not constant i will correct word won't be that doesn't change doesn't varying the distance DC doesn't vary

when no no the cylinder two is lock correct when cylinder two is lock distance DC doesn't vary so ABCD become a four bar linkage ABCD a four bar linkage BC as the coupler so when you move the input of the AB is BC also keep more ABCD this is he four bar linkage when this is lock okay

now you one two start oil in to cylinder two relies the what will happens let see was happen obviously when you start pumping oil into cylinder two tintack moving and if you lock cylinder one if you simply tell lock ant conventional there are provided cylinder so what has happened the motions of these of these two joints theta A and theta B is two joints are couple

so who has the short this as who the encoded the computer as read and it as to shot as you live it those some advantage by having the cylinder mounded on the ground you have to worry about this things the coupling of the activator and doesn't mater (ike noise) look at this carefully if this length is constant kept L and this is lock cd is not going to vary during motion than you move this AB is become a coupler is become the follower link of the four bar linkage as ever body got is not okay now than you will say okay

okay here it is may be it happens rear provided cylinder mechanism are if i replace the cylinder with two also is empty my happens because apteral the ball screw mechanism this will share more are less equivalent throw goes up and down inside the pistil here but when this happens (id noise) if if use gear for example

i could have my design like this i have the second link here if he simple manipulator and i have one link to the ground here and if the some body drive this joint throw direct with the motor and gear box joint A if the motor gear box drive joints here so this link will rotate fine when is it quterial with this access put a gear and qureral with this access gear B the another gear let those things mess and drive this joints throw this two gear i got it i will drive this directly motor couple here and drive this link

i have put one here here this wheel turn this does coupling accrue this moves now let let let go about slowly i want t rotate this link so obviously motor for driving this link is half i am holding it i rotate this link the motor it will see this.. other links also moves

sun and planate (id noise) even if have the bell drive bell drive the what does do you have the essentially see in a gear drive when this gear rotate in one direction that rotate opposite direction that is what govern with motion this inverse conversation in a bell drive both rotation in the bell direction so even if a put it chins here drive chins drive bell drive you get this so this know as coupling of actuation know as coupled actuation now who has the short this out it is the get it here even if i draw one gear here and another gear here chain belt what ever may be it okay now
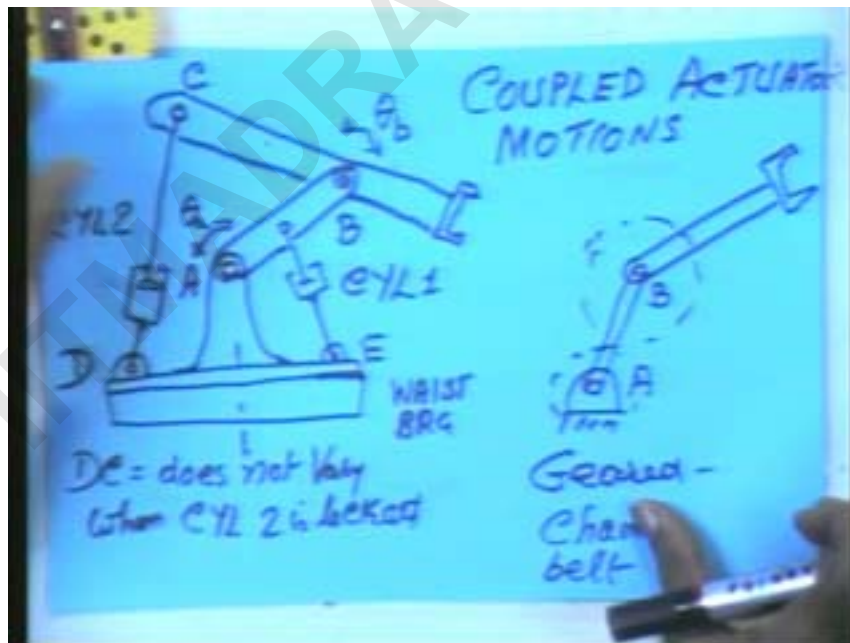

well you have seen the rainbow robot in the robot slide i have movie effect one of the introduction lecture weather lot of change all over the place there exacted charted out of that is done by the computer the processor take care of this you obscures you have return the program very easy to check the process take care but a lot of hard work goes from

the human being who right the program you make the mistake the rotate other wise we same rest are in particularly you know the rest drive come at end of the hole change right the end last

so if you want a carry a large parole it makes send put all those motor for away from the ender possible so don't keep the base also are in the same link in the one of this links this end this end balance that weight by having the motor that is can be done you balance the weight essentially supposing this is a links

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 and there rest motions are here and show it here is access with the it as make strength and this length is noted around this point it make strength put all the motor so the center gravity whole link is brought do to   now you have to transfer all the motion from this motors who have transmission and i have show you have the three roll rest where the
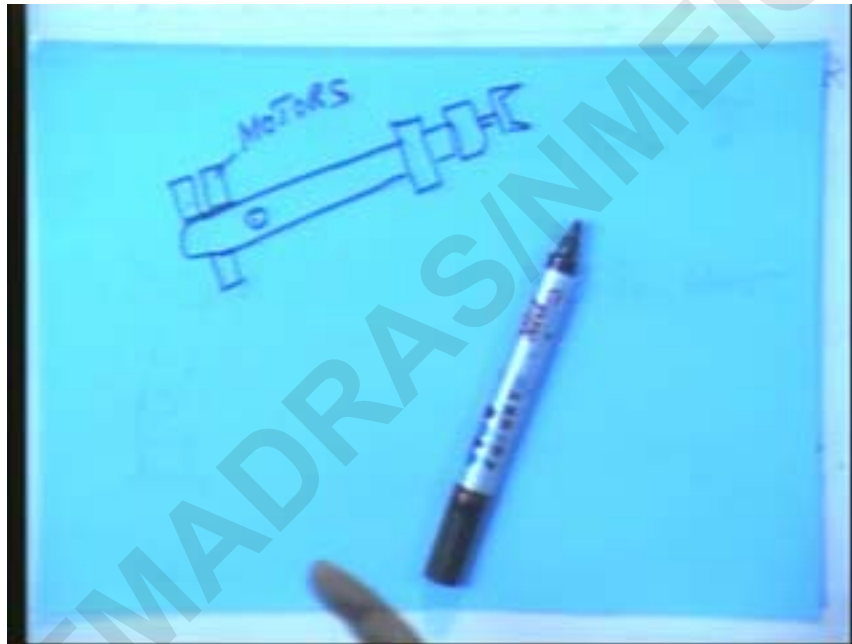
several gear rotating again in a star of the sun planate compensation epicycle on may not directly spot on under sit it here differential motion   it will occur and all the coupling occur pipe value there and that has to be …… .

so the three roll rest which i have ton   and which will find any standard test you will have to part coupling how coupled activated motion hen get couple those have to give we have seen the main body and it transmitting system particularly the coupling that accurse as you check be activated toward the base links remotely and connected to the   motion joints

you have seen that similar thing know existing this this predominately   there are three motions mutually perpendicular axis in mutually in allow of three access to intersect in to

the virtual what you called the clerical rest if you take the universal joints yesterday i have toad you the universal joints i think up i don't have the picture know i shown you universal joints are hooke's joints you know shot of key know the two access intersection in the third access could be are though also may be pass throw and you have the virtually a clerically rest you know ball and jacket equal ant you have built out revaluate pair ball and because ball and jacket is difficult (s noise)

i have told you one there is big advantage in heaving risk of the ball and jacket i still like you short it put may be one of the lecturers you will have a why is it i kept saying you know rest is the ball and jacket joints are equal an let me that one things in terms of the trigonometry you encounter

when you try to calculate the various given position and orientation some of the problem a chelercal risk which is usual it is the equal ant ball and jacket it is the very useful just thing over that i live it you that denote so we have seen charted from the manipulators base and we have look at this various main body we have look at drive and all now i go to the gripper sudden point which has to know keep the aim my first set of lecturer with give a sleeping view because nobody will be visiting these again the won't be telling all the engineering point some where spinner point design and all that again and again so you way say that why do you leave (le noise) mostly particular is not do understand how the system function you should know all the things let me go to the next the topic on grippers you know essentiality your manipulators are carry parole doesn't make front carry other in to motor and so

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we will see that how technology procuress when we started the early eighty and all some of the better robot you use carry about one are two kilos payroll two two three kilos of payroll and themselves way about ninety kilos or hundred kilos that is the payroll toward the weight of the robot today obscures you have better weight much better because very good motor come often so many

let i see what is gripper they essentially gripper on object lift it are move it release it and some cases they have some senses build in to…..okay than you can have the single gripper are you can have multiple gripper first i can have the single gripper two finger grippering on to the job doing help

i can also have multiple gripper on a single robot get the see the gripper design by self a very big are what ever may be call it may be because lot of renovations and all in involve i show you get see this is the gripper mounded on the end end effectors of the robot there are two touch up finger is a finger this is this is another side now this is the machine and to which the job is being loaded this is job

what you do is bring the robot here when you unloading the job just unload this job gripper than you rotate whole gripper whole things this is broad in line you should back if

you good multiple gripper you can inter change gripper very interesting to see one robot what is does just queue   and i pick up of the pair of flayer if you want do to this spanner

if you want do to this these robot also manipulator gripper   have been design like that there is the ball click here and this goes into the main this of the robot end of the robot is a flinch   follow flinch like this you push whole gripper into the this gripper of kept various gripper the hand will come and push inside this is the hand   this will come push inside you kept one gripper is here of another gripper of gripper type is here okay lets different gripper let us like that this fellow as the ball click you know the ball click ball loaded wit the spring

so the gripper will come here and as the goes there the robot i say you say the gripper end portion of the robot the flinch will come here the ball click check inside the tube and when it goes back carry with gripper to come back release to gripper okay quite interesting to the watch this
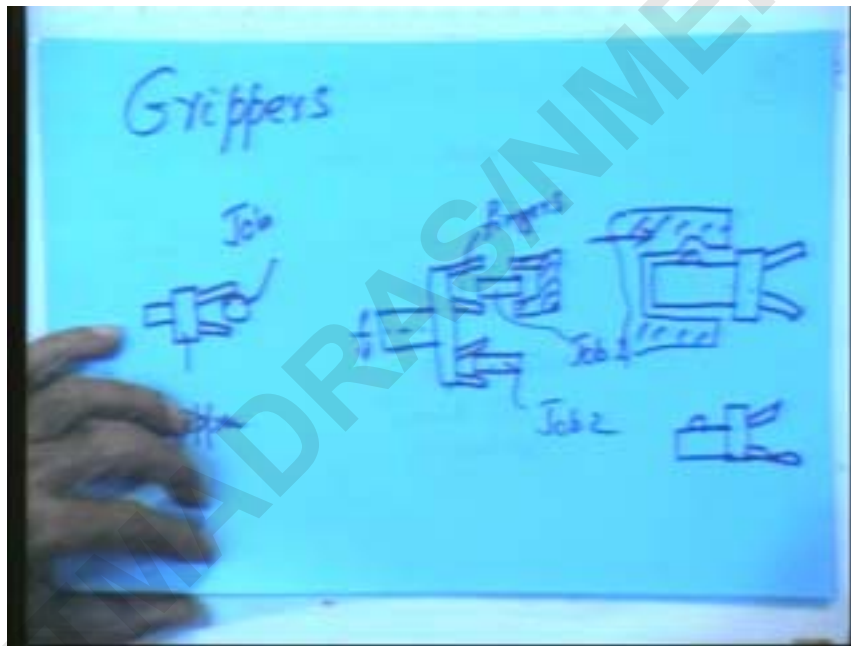
you have seen this automobile i don't know how many of the seem this spanner where you just insert screw driver where you can insert different this same techniques that all now the finger can close on the object angler motion can you used close the finger on to object

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you can use either angler motion are you can you the angler motion these two finger close on the object to angler motion job two finger the close on pair are (itch noise) you should have parallel motion we will see that late difficulty all by the nimieties given here it there device here is one gripper system it is given by a nimieties so i have got the so i have got the one more link here both you are Provided body of the gripper and given by a nimieties piston here

i have got i link here another link here so this move forward and backward   these lives as provided around this and gripe the job   okay now how do we you should have a nimieties cylinder to usually nimieties which use activate all this gripper

some time is spring is (noise) one direction it is nimieties   other direction of pistil for reason of safety when you are moving you like it nimieties space   the object may be so on so you like to close on to the object to the spring sport there is reason of safety apply the spring force close on to the object whole the object and the nimieties force to release the object is the safety if the some of the things we have designers as the consider all these things (w noise)

when we   makes the when we because you know gripper you have to design in all probable you have tell the manufacturer what are the gripper you required safety is the very important issues that time safety infect very important issue country likes other (a noise) manipulators   is lifting a on a object and it has the weight here the motor are energized keep it there there are no breaks now power fails you know in our country we have frequent problem the whole things will problem at the time

we are inspecting something below so now that is one and than you know when you are wonder what has gone wrong go near   the robot with in ten seconds of power resume you do not what will happend so safely required and main the moment the power fails so the mains also Tribe so that robot does it awake up by itself which would be as danger as the robot using power remember

it soon awake up by itself and bank you on the head you should careful about this this is what is some of the safety requirement i am touching an them go along than we have this for parallel motions know many are time   when you want a whole the tube this short od scissors like a motions   is not what you decided you like to have parallel motion here i show you device parallel motion A B C D is a parallel ball linkage AB equal to CD and AC equal to BD AB equal to CD and AC equal to BD as a consequent the jag these are the jag these are move to parallel to themselves as you move them they will all as the you can always draw the picture of them little four pair as you them visualize jag move like this from here this will come here this is simaltanology come here obscure

i am assume both linkage given from a single this this is come here t here is parallel to themselves this is parallel to the jag are parallel right this is what you useful when you are closing and to the rectangular job the figures these are some of the mechanical gripper with are used parallel motions and the additionally

we have the vacuum grippers particularly to lift object   like glass sheet use glass sheet have to menu position car and all   you have the such in cup obscures there using such in cup the vacuum gripper   are magnate gripper for lifting heavy steal all and industrial the magnate are very   who electro magnate you may grab object of out side are if it is tubular object you may grab in inside many have time you done that small object you put both your fingers and than open them grabbed from outside okay

you can have three jag self centering like a clutch pencil you know the clutch pencil
the pencil with where the light comes out when you press that has three jag the clutch
pencil to similar to the clikepencil

you can use use the i can keep on talking about gripper for has a months describe   a so
many gripper either supplied by the manipulator are design some important things
which one is concerted is supposing the gripper is having an object in it finger then the
object weight W and the gripper is holding on to the object is four cs mu time f must be
grater than W other wise object will false

so imagine if u small what would be value of f and you may end of finishing object and
breathing you these concentration must come when you design a gripper how do like a
carry a spiral part in mu of this are you increase of X of coefficient now this is weight
along but when you are moving can we acceleration and deceleration which much more
then that are gravity and while moving also you have worry about this things and gripper
should not end of vibrating

you know you brought object here than it is vibrating you can put it down   particularly
in assembly in assembly this happens see you have brought object very fast here and
than whole things is vibrating whole robot is vibrating here vibrating some can not tall
because your are loosing time lot of time coming very fast your are loss of lat of time
here waiting for the vibration frequency of natural frequency by the system behead look
in to the when we are developing this robot there is very interesting application know as
(as v noise) for assembly just study you now in assembly i told you difficulty bet in a
whole task you have got bet to be insert all assembly here there know nastily   my bring
the bet in line would be perfectly still try to assemble are you stilts of
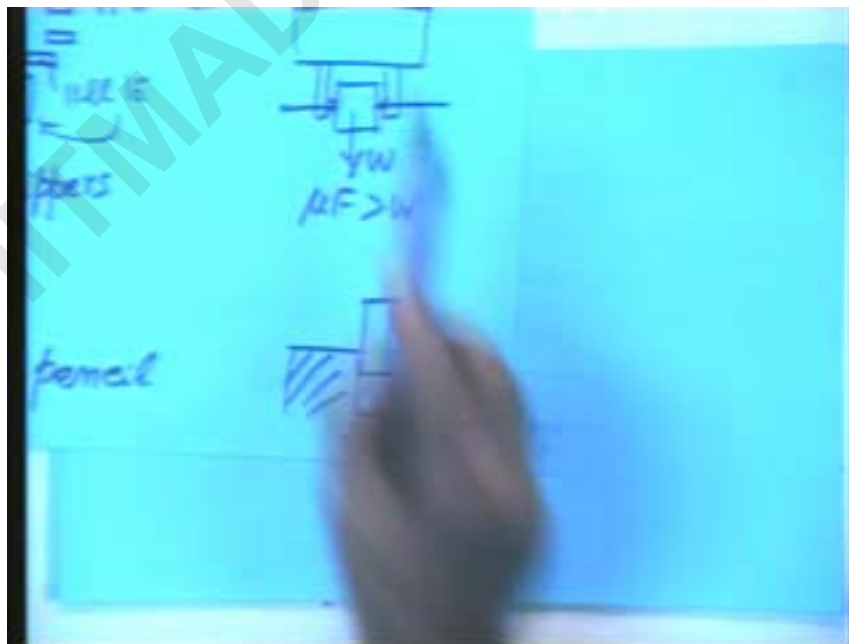
one side try to assumption just one side fraction   some body came of these what is this know as remote center compliance are this is very popular one   i the gripper mounted on this essential

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 i tell you what how it is work this body mounded of the end of the robot and there is the rubber rod here it is sharp just like a shape and pencil there are   four such rod mounted on this plant material is not exactly rubber but some thing flexible material is connected here no no revolute pair and all that t lot of cut are is a small hole whole material those things (pop noise)

so this is one this is two this is metal plate this is rubber i call it rubber today so many eastern and all and than again from here there is another similar rubber got four of them there are circular so one two three four the center position there is another set from this plate to another plate okay

 the net result is when you move he play it take appears rotating around this point there is why name remote the point for as is virtual point space is it okay as those the rotating around point now looks   peaceful so you i tell you how is just degrease not exactly of very good example okay

when i have the parallel bar link is essential we take of from the parallel from regesbody linkage mechanism we can figure out what is going on and i rotate what is the past of every point any point on the couple of other if this length is a this is equal to a because the parallel bar linkage this part of point b on the interview gate link a circle who various is so this point is moving an a r center is here so imaginary virtual connection okay what is now tick is play (m noise)

what we do is   we take inversion proved point in the ground and move that all the take an inversion point ion the ground and move there are two mechanism we take two some time spend if give you clue because tomorrow usual as… here there are four rubbers rods and one circle and as   code fill this know you work it out regesbody

 i know work it out obscure know this   these are very stripe in the actual directory this rod very strict in the actual directory but   can flex (noise) the shout this particular property now let as see what happens you want assemble this   the assembly is the job is a hole and i want to insert this still actually would i gone like this but there is till circle because the sum… in the table a have put this access here what should happen is this happen i show you   another picture we as it moving downward but this rod   your cylinder which want to assemble now instead as cylinder which you want assemble space around this one only the cylinder shell have exacted whole things as it approaches you know
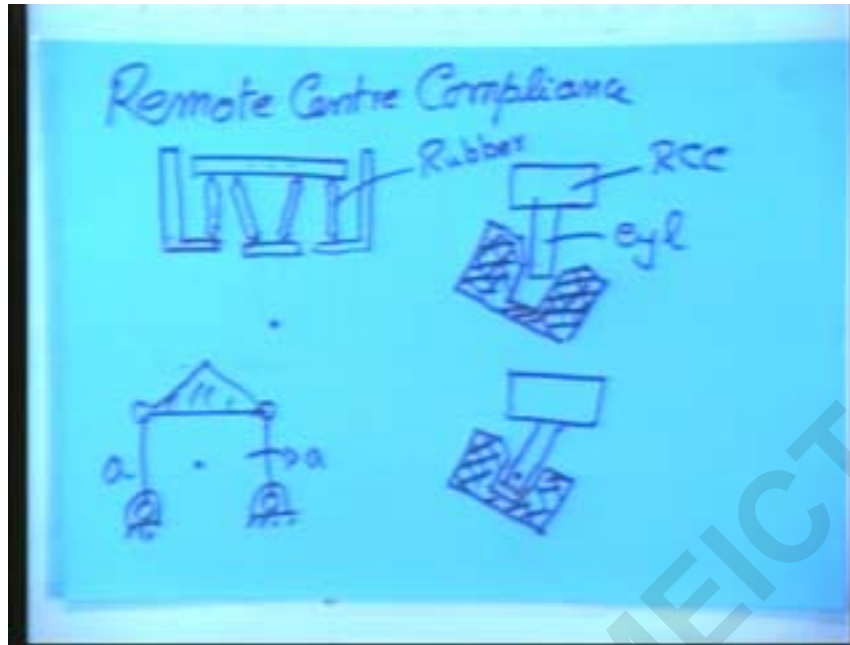
as it approaches whole touch as than it rotate   around this point this fellow adjust this fellow straight it rotate around that point doesn't rotate around this point rotate around this point … this is well known remote sense apply well known devices

i will go to the last of today i briefly touch upon   various i have told about gripper and all that i things i will close i things i will close for today because you know class for class next class i will close for the day next class we start look at actually you know we look at how to select from activator like elective motor what we will do

thank you