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The projection is institute project three d of china to the two d space. So in terms of the 2 kinds of projection, it's a powered out projection, expensive projection. So if you just that that what it is and the perspective you have, so what is the perspective that so do you know the perspective in china culture? Or a it's a distant object looks bigger than the so this number is smaller. Those are near objective speaker. So how do you produce the perspective you have? And also, the production matrix is similar to the transformation. If you want to apply the projection, just multiply them. Projection is you have changed responding projection also.

The second part is it's about keeping and keeping answers. It's a to keep the work performance originally in class. We somehow it's beyond the lesson to these screen. So also the new volume from the trust we have to. So I think we talked of the attack which comes out of this the thrust and give the object. So how to deny that efficient algorithm.

So here are also a big question is I will introduce them the line taking areas about the polygon to be space. You have some thought of how to extend it, how to extend amazon to three states, three reasons that happens. I the big category is a line picking category. A a it's a very efficient design. Some are very efficient. So ok so the first part is the first part. This is actually a common. The relative is not. Yes, this is match for the project.

In the first lecture, introduction for three d graphics, time for three d graphics. That is given us three model, given the three d model, the purpose of objectivism is to synthesize the two d image and synthesize the two d image. So we have to project the three objects are not typical perspective, right? Aa big part to produce the two image. So we have to perform the projection. And so, so for the projection, it's defined by the project. Here is a line, this is the project first, and this is a projection that this is be the same kind of protection. So the same connection. So here is given the object if they are object. And so this is a projection on the projection that it might be part that this is a definition about the prediction definition on the prediction. We have a the cop the prediction plan, the project, also based on the particle appearance of protection we can classify in the two category.

The first time will be parallel objects. The parallel projection is, so that is the projectors in the projectors are parallel to each other, a project as a parallel to each other. When the perspective ok the project has a parallel to each other. In other words, a lot of the cop several projection is as a dignity market. Plus these two lines, these lines are parallel to each other. They do not converge of a perspective projection. And the project has been converted as cop and the project has been converge at the cop here, the ditch to 1 . 2 . 3 . that refers as a dish to refer to the number of vanishing part.

So do you know the vanishing part, the concept of vanishing part? Do you have the drawing experience? So vanishing part so that it seems a line will convert it a typical part when you draw the photo, so you will start the vanishing part. And the different lines you can write a as a vanishing part. So they can really show you a concept, a vanishing point. So here 1 . 253 . 37, the number of vanishing part on the parallel project, we have the of solomon and hopefully some of those. So that is a project of perpendicular to the projects of demand and perpendicular to the protection. This is a so for the only it means, the project is not the projection. Under the subject of projection, we have the multi view, also products projection.

For the multi view, also graphics. Ii think you if your background with we or I the engineering, so you have the during the undergraduate studies, the one class is who's going to do? I think you have that about. You also graphs. Projection. I give you a different projection. You are you are requested right? To to judge the three ship, right? On the, given a typical view, you are required to draw the other view, which line is that it is visible? This line is visible, right? So this is a lot of you also graphics. You want to give us about this project. And also the accent, excellent matrix, excellent matrix for multi viewers of reference and excellent matrix projection. The difference itself. The projection is for the most importance of projection plan is parallel to the carving, I think, is parallel to the party.

And for the excellent battery as a project depends not powered out. Project, sorry, the particle ok under the accident, actually, we can actually measure that measure 3 kinds of excellent metric. So they who what is the appearance for each projection?

After the question, what's our periods? The difference, so part is this kind of basic concept. You just know that for each projection, for each project, what's the effect? What's the impact of the projection appearance? Given objective, we use a different projection. It was different projection. The resulting projection is so here we can compare the before introducing the detail and before introducing the details. So we can compare the parallel provision, the perspective of it, ok so for parallel connection is and is this big issue that is that is the projectors.

Here you are. So these lines operating a parallel features. Here is this is a also promises the present that perpendicular to the projection plan. But for the product, for the paradigm, sorry, the perspective projection. Here, this is a prediction that the project will converge on the cod we can regulate cpd exactly, because it's a line of product to each other. So that is the cop as he couldn't do that, the same piece at infinity for the parallel protection. The parallelism is the principle. Parallelism is the two lines are parallel to each other.

And after the parallel protection, the project reliance is still parallel to each other. So this is a parallel connection. Under the perspective question, the parallelism is not preserved in general, on which case the parallelism for percentage on the which case the parallelism is the same reason. That is a two parallel lines after the projection. The project is without asking parents. So here is the mission. In general. The paradox sentence is not under the special case. So there's still the parallelism. It is increased on the wishes, but you can have the sofa, for example, this line, this is my paragraph, right? After the objection, you are still paradigm. It is the lines of parallel protection path. This line is up. Parallel is the parallelism is stupid thing. Yeah. So you should wondering more results we come up.

So on the issue of parallels and secrets. So this page can show you the parallelism for the parallel potential, parallel protection paradise, isn't it? That's why some of you, 2 lines of dv and db and cui so this is a question that after the predictions of the, the results are not a prime difference, c prime different, are still parallel to each other.

This just to show you that what is the parallelism? So two parallelism, if you carry out as asking parallel to each other after the parallel language, ok here under the product protection. So there are two types, ok this is the also grounds attention and also province protection. So if the if the project has a property included in the projection, so that is this angle, is that? Yes. Is the right angle? Right? The landing group? This line is appropriate to this plan. So a it's a right hand. So under this case, be quite awesome. Why is it also rather otherwise? This one. So this line, so it's a project ask you have that to each other. But this line is not perpendicular to that projection. And it's not a good security projection. So here, by the only protection, i'm still under the orthographic protection, under the orthographic projection. Yeah, so we have the multi view of some products, multi view of companies projects.

So for the I think you are you should be familiar with this one, right? During the underwriters study, I see in the cost engineering job. You have another thing. I think you are here. I think you have a kind of job, other views. So that is a waste, which line of which I can be visible and wish. And you basically, if you would have to be a project, if you project the object, it was different projections that along different a few parts.

So which face which part of it is visible and which part of it is invisible?

Also in the next session we will do that. How do we attack? Is that the visible of aaa visible object, invisible object, and like giving the given the object right object, if you want to project the object to to the projects.

And right? So we have to determine which part is invisible. Right? This is the front, this is the back. So if you stand here, you can only observe the front part. You have to determine, you have to detect which part is possible to the if you can detect the correct, they have the visible regions. Correct? So the random result you are that is an individual part. The visual part, invisible region will be random in the image. And so the random image will be wrong. The next section in the high school kind of attacks is the algorithm that they are actually quite simple. It sounds of high school. If you have enjoying experience. So that means a if you draw a picture, right? So you really draw the discipline first and then draw the meal as a near part, will overlap, will cover the system.

Actually, we can design the album. You can use this interior experience to design. This is a multi view, also, right? To projection. The multi view also from this project as well. The object was different projection plan. So the projection plan is parallel to them. Hardly the projection and a a it's a parallel to the argument. People you are provided. The six, 10. The projection was the 6, 10.

You can imagine you can reconstruct the three d shape, right? You have different stuff, three d shape, in part about india. So you can only, but given the system and projection, if there is a complex structure, complex structure, is it impossible to become extreme? They said, but if it is a complex tree, yeah, because the complexion is fine. But if the opinion shape is not complex, pakistan is okay. So the gender part may not be, it can be a power, can be power. So this is actually because so this is the simple power solution project, the option towards the six things. Six. This is the first had a multi view of supplies for the excellent metric. Ok for the actual metric a it's a the previous stages for the north korea. Also markets is the projects plan. The projects and plans are parallel party, but for the absolute magic prediction to the prediction and is not paradigm quality. But this is still also markets projection. Ok this is still part of markets projection.

So that is the These lines are still perfectly creative projection, but this projection then is not parallel to the party. It's not a parallel to the party for this. One is this project parallel to them by xz pen, xz pen. The projectors are complicated to the to the protection. Because if you find out there are also 11, the definition of awesome practice, the project as a community project. But for this one, the excellent metric production, the project has so are still probably good for projection, but this time it's not a parallel argument. I think that an argument, this is a excellent measure under the excellent measuring protection.

So we can classify the did you know that she naturally imagine that?

So how many classify it? These 3 kinds of excellent matching? The figure, how many handles kills on I for example, physical. This is the magic. The angle between the three principal axis are different. He actually, for example, this one, this is aa three quiz. For example, you can take this reaction that a principal axis plan, this is three ends, are different. So it was a different. We call it not true to imagine what's the dimension, is the angle between two of the principal axis are equal. This is the magic. We have this kind of diamond, this kind of one. And for the isometric, this is three angle. This one is if you if you use different projections, actually the appearance of the result of appearance of it. This is a a different kind of projection when you produce the revenue without the regular image.

According to the requirement, you can select a different project. You can send a difference in practice. You practice this, is it amazon a 90, right? So the areas so you use that a bit of violation. And the result, the the resulting project. So this is the definition. The definitions are different partners is a paradigm foundation. And the perspective of teaching paradigm foundation maybe have a lots of properties. And only i'm not surprised in the . of view, as a practice. Excellent magic. Also on the excellent, it is how many angles of cuba. So you can cast a transaction, right? I see. Yeah, so here the concepts is a sufficient. So the next part is a but if you want to apply the projection plan, if you want to apply the addition to the object, right, giving the rhythm, we will perform the project if you want a typical projection.

So here are similar to the transformation. We during the last lecture, right? If you want to apply a transformation, you just multiply the transformation, which is to the object, right? To the object, the marketing of the object. So still, the project is, it also can be shot at the a kind of transformation. So still, we can use the matrix multiplication, just multiply the projection matrix to the object. So you can we are not treating the projects. So here we consider the auto markets protection. Here are still review a as located at the origin. And if you are, the building is located in origin. So that is the cop and the projects that I see located at 00 d this 1. This factor here, I just drove the two d aspirations. And so this is the projection for if I located at the 00 d and this time is parallel to the exercise, it's very popular.

And so the parallel in parallel to the excellent given clients in the video, xyz to the project requirement, x prime, y prime, z prime.

What's the relationship? This is also market. What's the probability of also market? Yeah, so a a this is a bike and this is a production. The projection kind of 00 b and it's a paradox, exercise them I and this is also lots of rockies projection. So give up time in the pap what's the relationship between x prime and bi prime and the prime, which is this coordinate and this coordinate?

Also about this project. And so this part will be projected to this plan. Also prophecy. So a that is a project us are probably clear to the projection plan, right? This line is probably clear to the projection plan, is a plan. So this time it will be projected to this plan. So that is the dimension. The same dimension will be able to dy and for the x and y division, xy division, we do not treat, right? The xy division will not. Yeah, so this is for also, parties are usually, so this is a relationship, right? X and y we should keep on change. And the because of high moving, I just like it projects, then, how do you convert it to the how many commitments which is about nations? It is the the given part and the new part.

So we can build their relationship in the vicious competition, how the converted in the vicious implication, in the form of nature's modification, the lack of transformation.

Do you still remember the, how do you convert it to the form of missions? We have to use it for virginia's. We have to use the whole virgin is a private one. Here, x primary and x primary equal to x and it can be shut up with 1 times y prime equal to y each other y prime, y prime is the 1 × 1.

The same part is equal to b in last lecture, I introduce it for the translation. For the translation, you just have the transmission. This is in the original contest, original context.

Why is the to calculate the sum of them to scale? But for the matrix of modification, you have the product that you stay at the time if you handle them to handle the translation, which will be, we learn the genius part of that. Just increase one more dimension, right? We can increase one more dimension right here. It is, you impose the this is the trace. It's a projection issue on the lots of. So you come out what's the difference between the translation business? And the translation matrix and this matrix, the projection matrix? Do you still remember the translation machine? What was the instruction? The case of transport? So the translation machines? The dialogue is all one. All that will start in the elements. All that time is on one and the translation business. The translation patient are encoded in the last hour.

So for this one, at this time alignment, that because this final identity attack, it is equal to the past zero past d plus zero past dok here. This element is not one. It's not translations, it's not a translation. And so this is the paradigm protection.

Okay, so this is the first comedy using projects turned out attention. Yeah, the second product is so for perspective projection is the purpose of introducing prosthetic projects in the past. We want to purchase makes them the projects are more realistic.

So how do you but how to achieve a more realistic appearance? So that is if you use a camera, take a photo, right? If you use a digital camera, take a photo, so the but this is the object looks smaller, right? The linear object looks bigger. In this way, under this ways, you can sense the best information from the the pitching part. So that is all in the market that is all that kind of. I can imagine all this is a discount, this is a discount ok so it's more realistic, but for parallel projection, for paradigm protection, it can't give us index, it can't give us. That's information. So this is the last units release it. It's a natural units. So here it comes to the the prosthetic effect is the the object that joins smaller. And this is from the observer. It increases. Give us the tax of the sense of the tax.

It's once and for studying you have research. This object looks smaller and near objects speaker here. I show you that if the if the lines of parallel to the projection, and so this one, if the real president, he kind of hispanic projects is stealing, it is seen.

And otherwise, so that's this one. This is a lot of paradigm projections there. So the effect a it's photoshop. So here I this you should perspective that this is a photography right in photography, the prosthetic and give the impression of three dimensional taps. So that here is that in single to the movie. Yeah, so the actually back to the paradox in china, but in this image, in this image, it seems the real convergence and taking part the real converge. That is the one, also, this one. So this is an object, this is a part. Look smaller with this line. In this way, it's more realistic. So we know all this is that but this one, that is my close to the view, a a a it's a close to the view here under the perspective production. The paradigm not is a challenge that is a not reserve in german, but under the originally on the specialty on the specialty is still they are still in the car that is a suitable, the skillful.

And for example, that's you practice the part of it is up still part of it, so equals the parallel and partition plan. You can see on the parallel to the transition.

It's a view the parallelism, isn't it? The parallelism is that, yeah, for the perspective projection, we can classify the perspective projection into three categories. It's three categories based on the variation part. So the variation prime is the number of the parallel lines. The parallelize will converge. So that is this here, the connection on the infinity. This is a parallel lines to convert if you have a job, if you want to join this paper. If you want to draw this picture, the first thing we do set is the notation section five. This ad is adr and so on. This ten eighty five, you will send them. That is like this one. That is fine.

So based on the number of vanishing part, phase out the number of bench part, we can classify this. The 1 . 2 . 3 .. Yeah, so firstly, introduce the concept of vanishing part. What is the vanishing part? So here, the venture finally has the volume parties. And so that's a huge in this example. So we have a we have a lot of q we have a lot of q and this is a larger square, is a part of japan. It's a project here. We have a multiple model, two ok for any medicine time, any study of parallel line that are not parallel to the projects point will converge of. That is one.

Okay? For example, therefore, this cube, this line, if you consider the top, if you can see the topic, if you consider the topic. So these two lines, these two actions are parallel to each other, right? These lines are not product and partition thing. This is a larger sphere, is the partition there. So these results, these connections are not parallel to the material you can emerge. This is the best one. And also the bottom of this. The bottom is, this is the one rule, 1, 224. This is four lines are parallel to each other. They are not parallel to that projection, and we will be ready for the last next part. It's similar. This group. This line is fun. This is for edges. It will be ready to the right edge part. So I just said the parallel lines that are not parallel to the projection. We are converted to a vanishing part. So each step of parallel lines miss a different part. So is that this group just show you this is for actions.

We will convert it to that Left edge. And for so this is for ash. So this is for edge will, in blue view, with the right hands, right? Reaction mark, the set of the parallel lines on the same thing to make you a korean vengeance part. This one, if you consider the top case, if you consider the top case for better, sorry, the rap, ash, and the blue edge. It's on the same plane. So all of these four edge are on the top face, ok the same kept lead to a korean event on the left and the right. That's all right. So if you connect with that, that and the right benchmark didn't build from the horizon. And so like, what is the if you now this is to and at any point on the horizon and respond to the moving direction, this is the concept of managing part.

Here, how many value, how many vanishing part can be produced in three d space? How many value vanishing parts in this figure I should to vanishing parts? And then right, how we produce more. So this project is a single projection. How about the workload? The other two, this is for, thanks. So if you have another projection, yeah, so this green water mean converge. For example, if we have one more projection, you can project to the other position when you convert. So the problem is how to produce the renaissance on the which case you can produce the adventure. At most, we can produce the three at the edge one. We can produce three edge, one, 1 . and 2 . 3 points in the question of how to produce these out of which case we can produce one file under which case we can put 2 . 9 for one for this weekend.

So it's a single version, one version. So this they catch will converse ok if you project the object. So this is a projection point. If we project is up to the projection plan, and this patch will converge for these lines are parallel to each other. Also parallel projects. So after the project, they are still parallel to to the partition. And for this figure, so there are two variations on. So this has will convert it to the so that is the right x part. And these figures, this is right in that dimension. And for the, but it will not have produced a venture for this one. If you are part of the three venture, this is a why am I should find one more and the worker? What do you do? This? Is not a good version. How do you put it based on the rotation relative to the partition plan? Right? How to produce, if you want to produce a different number of management, we can sell a different post relative to the projection plan. If we set a different problems and we will produce a different amount of invention.

Here we have. And actually, so under which is we can produce different number, very small. This is the one point that is the projects. And it carried out to principle axis. The project plans in parallel two principles actually not what is equivalent to that. The project plan is parallel and difficult, hardly, but it's equal to the projects and parallel to the typical projection.

For example, for this one. So this is a cure, right? So this is a cure. So if we can draw the a lot unless it isn't a magician, this is a project that I this is the three principal axis. The three the green block is a projection plan.

This projection plan is a parallel. It's a parallel to is that's what this is, and this is. So the x principal axis and the five principal axis are paradigm. This projection can, this project can. So here we have part of this. That is part. This is actually, so here this is the reaction part. The projection plan is that is a paradox in a vertical x probably axis and 500. And also you can observe, so this these lines are still parallel to each other, right? They are parallel to the projection then. But for these lines, i'm not a parallel to the projection, and it's a good conversion. And so this is not will converge at the convention. For this line, our product projects that they are still contact each other out of the projection. This is the to show them still the one part.

So how do we find a two part based on this definition? Have to just imagine that is the two parts. If the projection plans, paradigm to a single only one principal axis. The projection pattern, probably is that one principle axis? So true, that is not ok that's this. You consider. In this example, there are three d cube. This is a large scale, is a potential ok this is the three first class is right, so that it is nice. Right? I can see, right? The principal axis z is a parallel to them. In the principle, x x is excellent, but i'm not a product. And we were used to valuation funds.

This line, this axis. This has to be a branch here. And this axis is very much in two dimensions. It is actually in this only the vertical in the vertical prescribes. It is parallel to protection. This is a two part. How about the three part? How to produce a three management service. Even the projection is not apparent at any of the principles, right? So that means, in this example, still, a few the three principal assets about this is not a product anymore. The projection challenge is not part of any of the principle axis ok so there will be three left and right. We are not sure is the three dimension part. Is that the right and the work? Yeah. So this is the 3 kinds of percentage rejection.

So based on the number of management part, based on the number of vanished finally classified, one final two, final three final process can be a question. How do you practice it based on the pose of the object? Relatively different projection? Secret paradigm, perspective, attention. We asked, if you want to apply for hispanic project, but just one more kind of projection matrix. Still, we consider this example, as soon as the view is opinion, is origin, the view is the opinion is operation. This is a different. This is a situation. The projection kinds of people here, 00, b and parallel to my dxy as xy plan. Given by xyz the project defined as time one that time. So on the low perspective projection. So how about the next time? In fact, how do I think that I can see that? But the relationship between the projected part and the origin part, this is a perspective protection, right? For perspective projection. So the project has built converged as acop right? So that is if you you connect as a so this is acad one, the similar projection ok this is a construction part in construction part between the project and the project that as a location of project part, right?

So how about in this location? It's really good. You just drop a similar triangle line. I suppose it just draw a signature, and that says one. But this is in two d space and in two d and with a two d elections. If you makes it between that. So you can show the, you get a similar, right? The vision you can, this is b and so this is the same problem. So this is a zero. And partial, you just got too similar. This is just a similar. We should involved in that.

That's in the projection that when they give upon, that's why? So this is acop which is to, this is an international part. You can draw, first, you can do a lot of opportunities in the binding. And then this is right. So you can also similar channel and optimism. Another symmetry. You can optimize the relationship. This is ab right? This is, what's? This is ax five. This is x five. Right? X prime. The ratio is equal to the e to that similar for the y prime. Just try to say that to similar to others, you have opinion relationship, right? Because of client z will be projected to this kind of life. The particle, the project is this projection and the same probability, and is using the signature angle in our relation to the x x prime time one.

The question is how to convert it to that, which is about the issue. How many convert the matrix part? Also, actually, based on this is three founders. So you can observe they appear in the denominator. Right? Actually, is this family explain, well, expand the perspective effect, the prosperity effect. This is an object. This is an object that is z is a large part. This is an object, z is a larger zapa is ab time, zi z is a larger, and the x times are very hard smaller. Based on this fundament, based on this to formulate it is expandable. The perspective event. You see, if it is an objective, exactly the z is a larger z is a line x happened by having a smaller ask. The protection, if z is smaller, expand on the background with the logic. So it produce the prosthetic effect. How do you congratulate the vicious modification? So this equation are not meaning, but for issues about education is a linear transformation.

This is we the next the first period of modeling, because they appear in the denominator. How do you convert emissions? Excuse the homogeneous argument, but even you use a homogeneous argument, you still kind of dinner, which is because they appear in a nature. Without additional design, we still kind of right out of the vicious multiplication from even using the how much it is, part.

This is what it is, part. It is called increase the one more dimension. Begin introduce 11 dimension. 71, the value is usually 70 10 k so here we can extract one common part. Yeah, this is the street popular, right? So here first we can write out the genius requirement. Ok the home homogeneous economy. And so also we might make sure the comment. Ok we have each other common problem. We are in this world and puts the carbon top out of the beaches. So we are in this world, you can run out and you be with. This is the projection which is under the projection. Without extra extract, this company probably is impossible to write out to convert the the perspective projects in the fund issues by the issue. Because this is three formula. Maybe the matrix multiplication is a linear transformation. Ok it's linear. There is a gap. One is a linear one. We can put exchange one common term out of the matrix.

This part is a it's a prosthetic, the prosperity projection power that projection here we can compare for the prosperity projections more realistic because it can probably ask the tax information. Yeah. Due to the perspective, the different object looks smaller and near object looks big as a but for the parallel projects, 11 less investment and that's what it is due to the lack of photo shopping. And the first many projects is the size of the object, very university problems, cnp and above all perspective, parallel projection, parallel lines, I remains how about so that's the third one. The third problem is the two kinds of projects. Animals only remain entire for basically parallel projects, ok so even that's the given time, given two lines that figure.

And if the face is a paragraph partition, so the animal will not change the animal between the two lines in large ok so this is the first part about the Projection of prosthetic protection. Paragraph protection, let's have a break. Then we have a second thought. You can have for this part is impossible. So you just know the different kinds of projection dissertation as a project.