Electronics Equipment Integration and Prototype Building

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Lecture - 18
Example features of surfaces and solids

I interrupted last time up to what I thought was a logical shift from one of the what you call points regarding the very basics of what is solid modeling and what is surface modelling.

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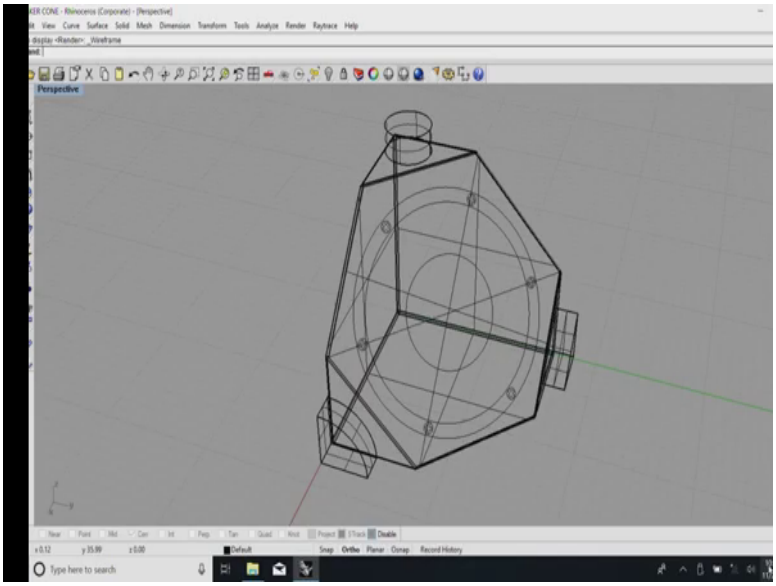

And then the feature which I wanted to outline is that a solid generally has weight volume. All properties related to volume will be there in the all properties related to a volume will be there in this.

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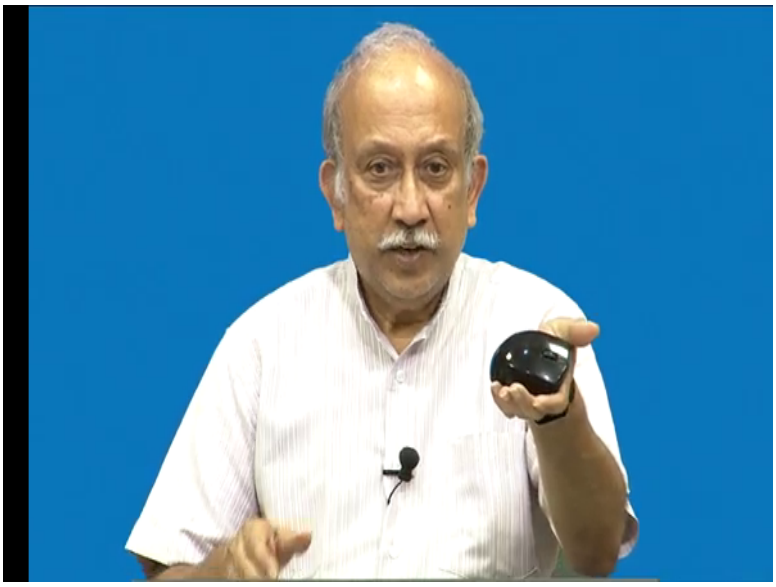

However, what is visible to you is the external surface. So, in generally whenever you see has especially if you see our for example, if you see all the games what is says obviously, what is outside and only when physical properties are attached to it, then things like motion of waves and physics of acceleration, deceleration and stabilization and how things move in those points the solid properties become visible.

However, games and those things are very very different has you have noticed even the wise city will not play as well and an ordinary computer. And then if you need to buy a proper game you have to buy their console otherwise your lost that a part let me start with a very very big basics. Have a look at the my working what you call computer, here I would like to prompt you also saying.

This things have been prepared with software which all of you must have heard about it, but any software is ok. I am not endorsing saying the software has to be here or anything is just fine.

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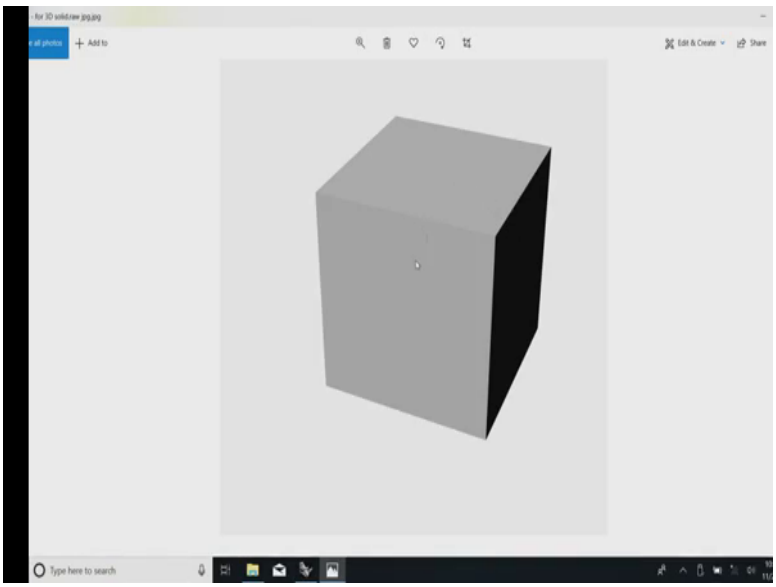

Now, the very basic solid which you can talk about as it is when you are looking at it you will notice that on the face that is facing the light strongest, the reflection is best and the face which is if you see this is a little bit in the darkness. So, here you will notice that there is no it is dark. So, one of the very very important properties is the way it reflects light and the type of reflection and all determine various things and further related to these things is that you have a face here, you have a face here when these two faces joined together you have an edge.

And since these are all real life your own experience thing your I do not want to use the word your brain and you separately at this point, you will be able to perceive that it is a closed solid though you are not able to see the other three faces, it looks I will say good enough.

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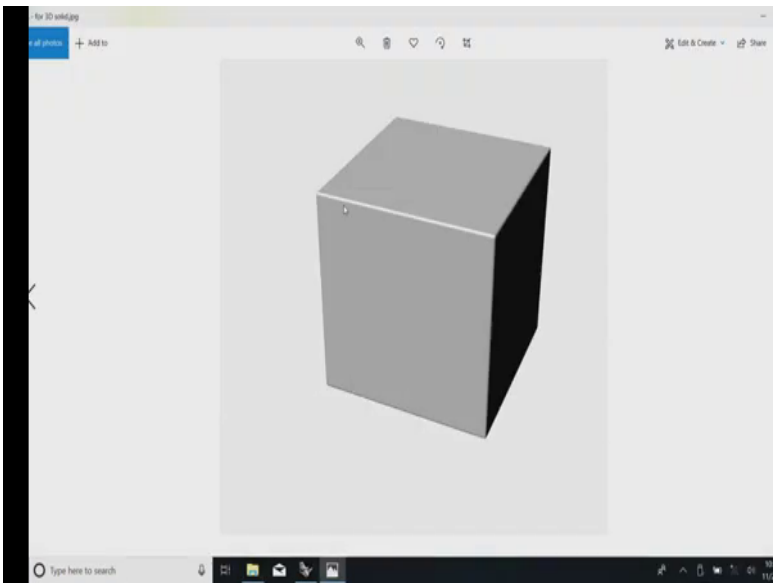

Now, see some small difference, there is a highlight which is catching it. So, this highlight is the one that makes things; you see here now highlight looks dull, the moment you add this is highlight suddenly things will become a little more clearer.

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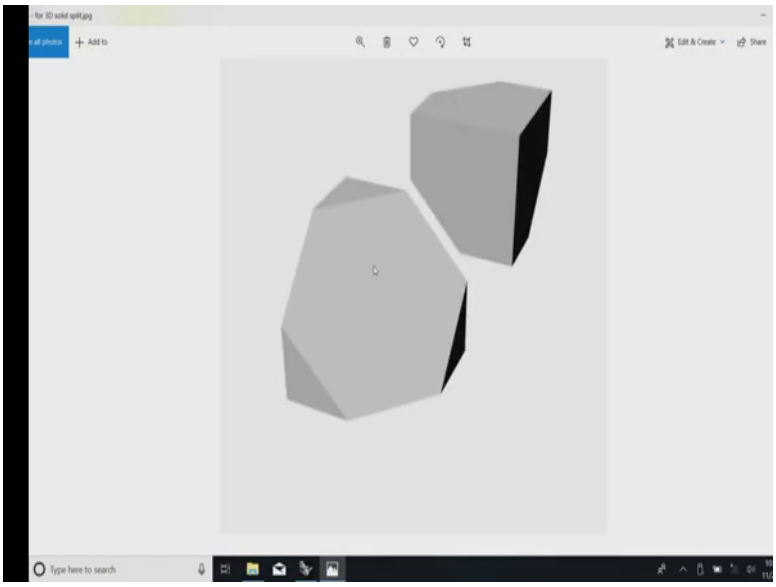

Now, this is the same cube, the centers of some of the edges have been joined together and we have ended up with this. Out of the 12 possible edges 4 on top, 4 on the bottom, 4 all around. If you just take the midpoints of 6 of them you will end up with this very interesting object. This is a hexagon and if you actually if you measure everything correctly, we can even make a perfect hexagon with it.

Now, we come into the important aspects of saying what is the surface, what is a solid. If you had to take a again once again you see here that highlight has been created here.

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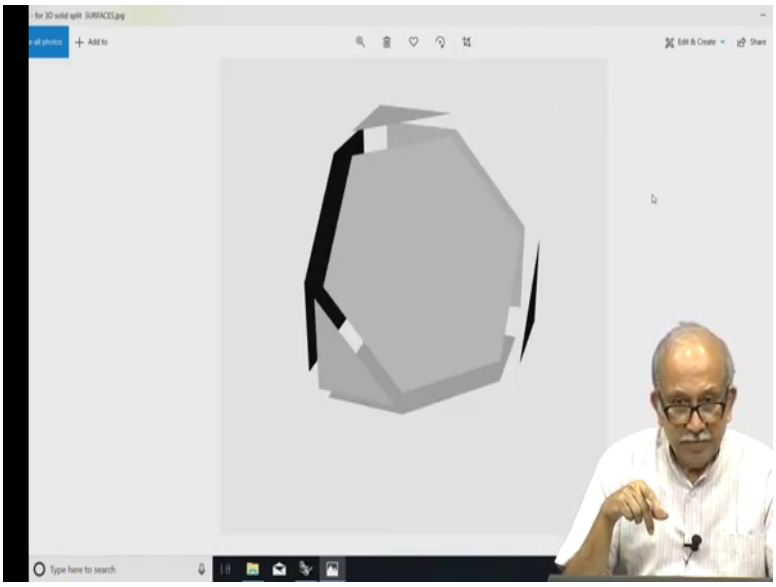

Hence this is where all your rendering software will make the object look real.

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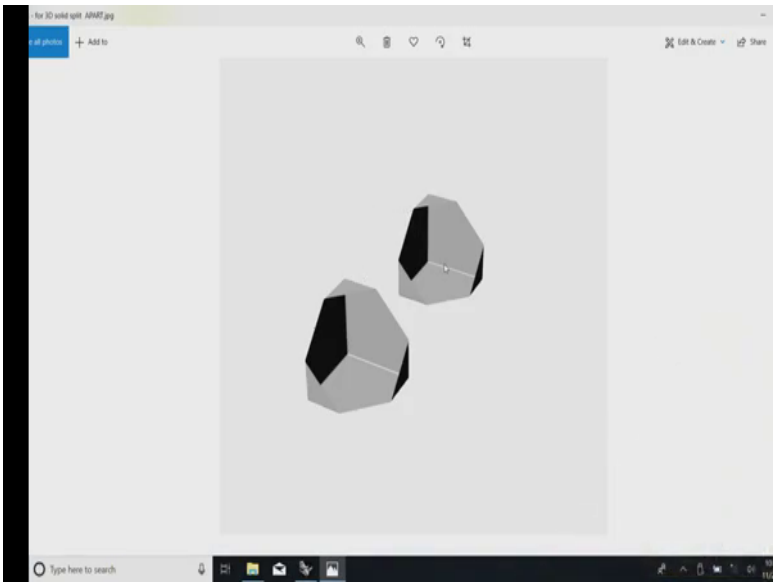

Noticed here first of all the hexagonal part is something that has been added. When you actually cut it first thing you will notice is that it is empty there is nothing inside. So, depending on the complexity of the what you call the software depending on the utility of the software, you will be able to make out how well it is represented there on top.

And why is that part of this? Finally, again coming back to the original what you call sir may saying all this is available to you, you can get it what you call free or if you can pay for it, you can maintained thing and if you are part of a organization I am sure you generally have some sort of 3D object suits and so, many of them are popular yourself you can check in your region what it is.

One of the things you will notice is have you seen that this has been intentionally this highlight has been created intentionally, that is the one that makes it look a little more natural and real.

Now, when we want to actually make this cube, its possible just that we take all the six faces glue them together I will accurately use the word glue with our without tabs and you have this object with the least amount of trouble.

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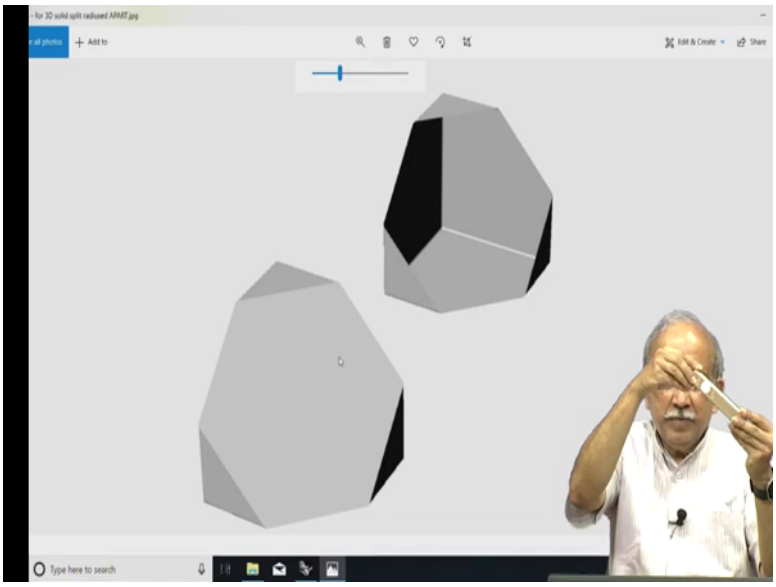

But then you were expecting when we actually cut the solid our normal thing will be to expect that something like this will result in this which is well its good to think about it. A genuine full solid modular has the provision that if you slice a solid, you get this and full-fledged sculpting is possible followed know full-fledged sculpting.

Meaning we can create objects which are real life objects including that mouse which I showed you or these are a very ordinary thing with can probably at best providers some simple thing like this. These are all there are certain geometric primitives that are there. In the case of pure

geometry we all know about the line circle arc and ellipse and so on. Equivalent to that while the similar lines everything are there in most of the packages you have them at three levels.

One of the first level is the basic lines and curves, second level is surfaces and the moment you come into a surface, you come into other issues about it saying how can a surface be curved.

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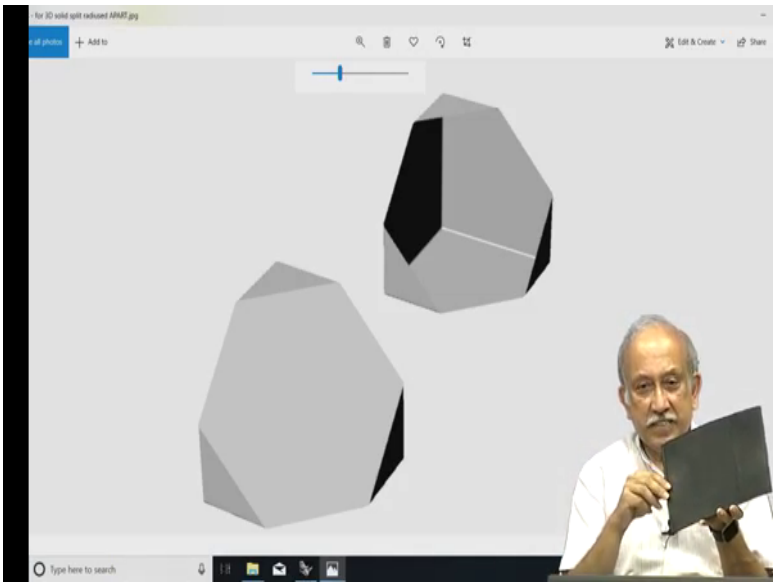

So, if I take I am just taking things which are around, I have this mouse pad. For practical things its a surface for us you and me, but for a computer representation it is not enough for us because the moment it becomes a curved surface life has become very very complicated. You have seen this and this is where concept of geometry and measures will start. You have flat plane all the points in this are called planar and by definition any number of points can exist, but let us say in space you have three points; a plane can easily exists to the three points a unique flat plane can exist there.

But the moment a fourth point comes if you take the four corners of this, movement of fourth thing comes we may end up with a two elemental triangles joining together and forming a something else. This is how all mesh generators everything start and a lot of the things which we assume including shadows, all depend on that. Say from here this has been cut something has been done added and we have come so far. Now, this I have explained to you already we have this edge, this was the starting point.

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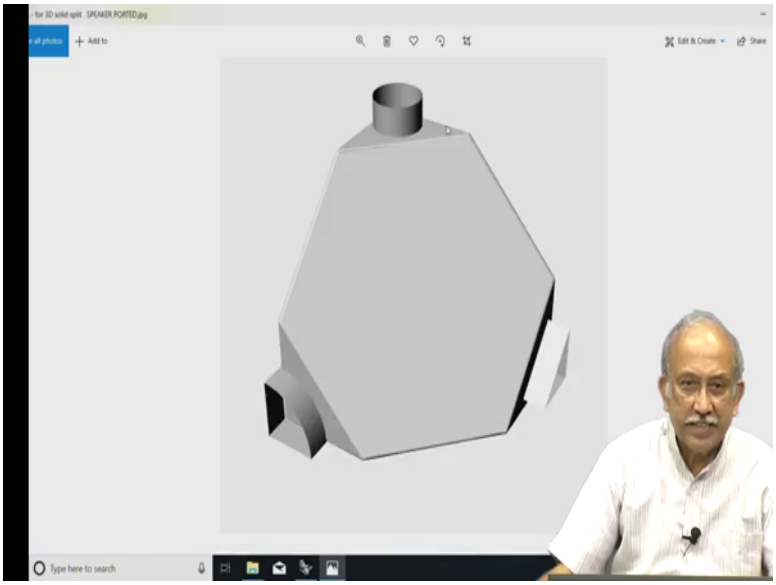

Now, I go back a little and then get back to the package and saying, imagine I want to make this object do not ask me what it is. To make it interesting, I wanted to show you that if you have a corner of a room, we can probably have a speaker device like this, why cannot we have a speaker?

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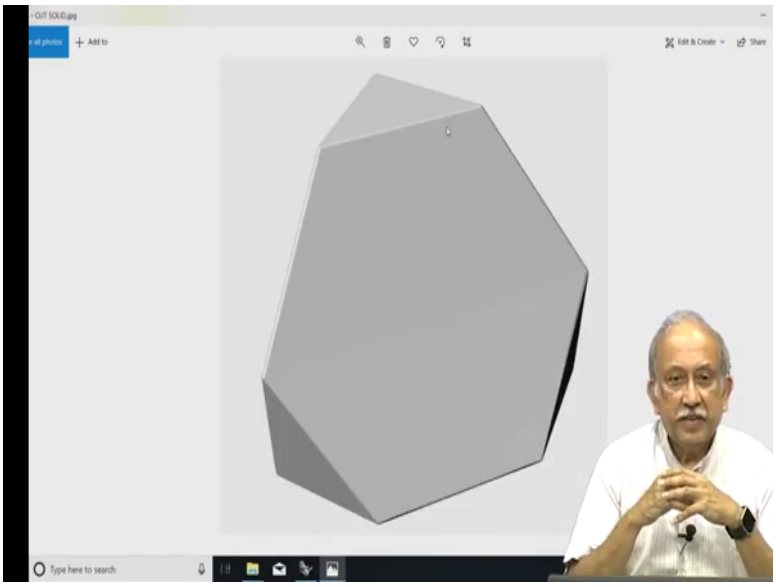

I will now go around looking around for a two way speaker system and to make it convenient, I will see whether it can have a baffle ported enclosure. So, what you saw there was my earliest attempt at a baffled ported enclosure. We have a on top we have a circular port, advantages circular ports a little bit of the rules are known and then here I have a triangular port, because its easy for me to follow this corners and that is something halfway between that and the saying, I can say the little on the surfaces by using one of the corners of the wall.

All I need to do is put only one arc of a surface, open it and then I have a beautiful portrait enclosure.

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So, let me go out and then I have this beautiful speakers, at the moment let me not talk too much about it except saying that I need to have mounting and their coaxial and probably quite powerful.

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You see them occasionally in cars.

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And then home also you can that know. Just to keep your what you call to hold your attention. So, this is probably the speaker and this is the grill on it saying, can I know make something and let me go here and start with; looks good?

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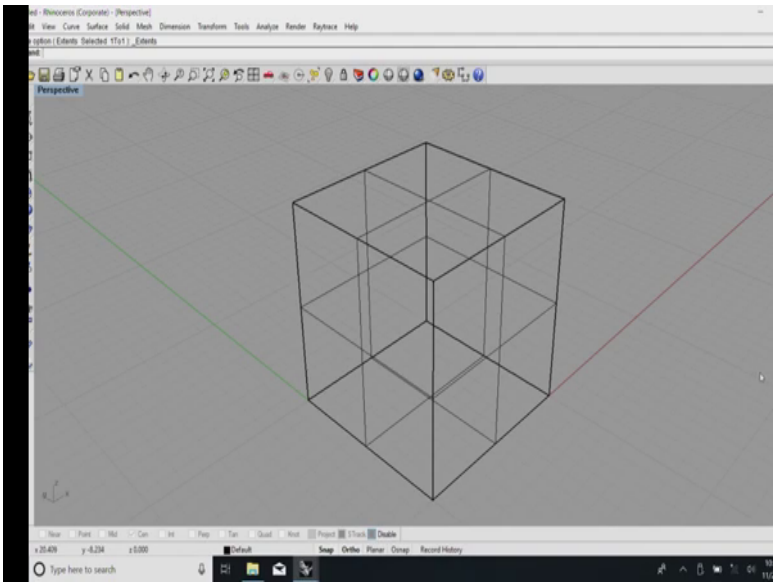

So, I will see how best to create it I will start with a absolutely new object. We start with a corner; my basic boxes ready. This is where I wanted to tell you this it probably it helps if you are familiar a little bit with the normal geometric drawing or specifically if you are a machine drawing expert. That is the reason why I brought those other two what you call that pipe and so on.

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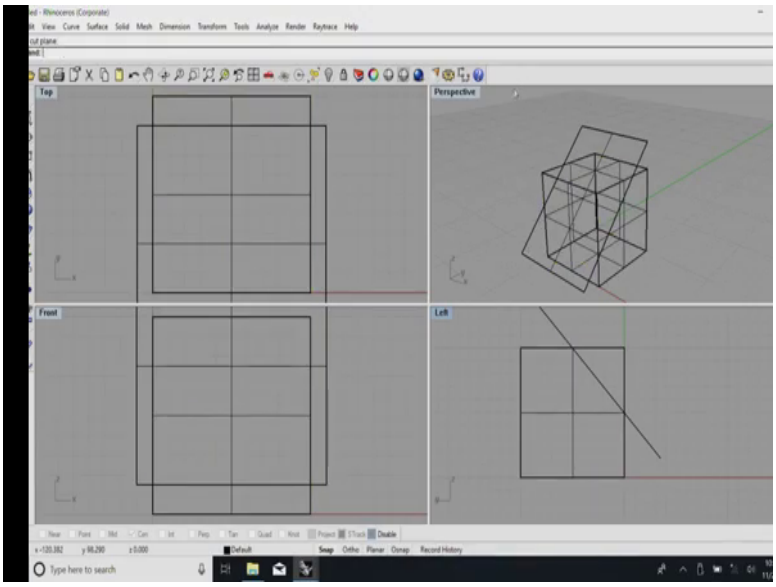

So, when we start here, let me attempt to cut this and say what will happen.

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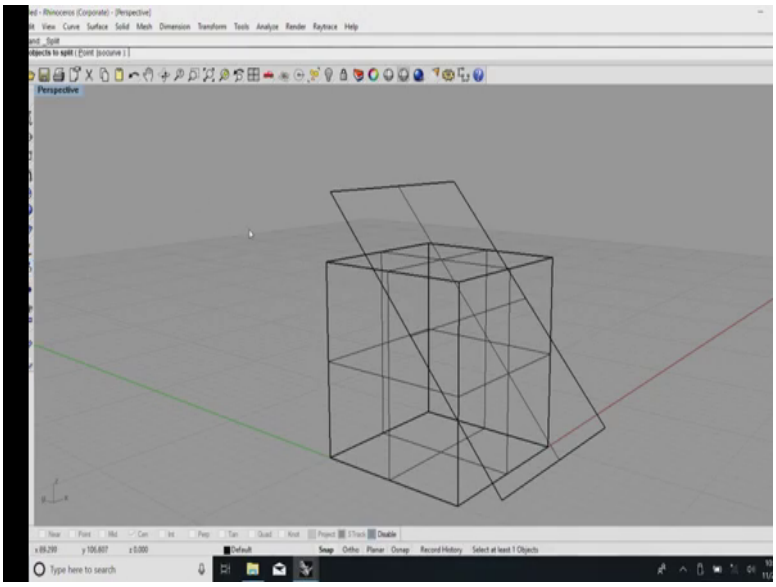

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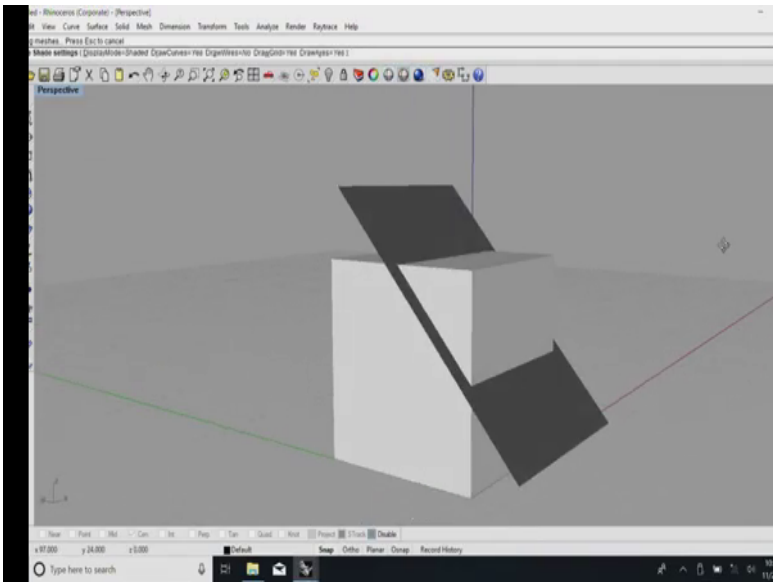

Good enough. I have a cube in which parts of it I am removing this is where I thought I will show you just how the.

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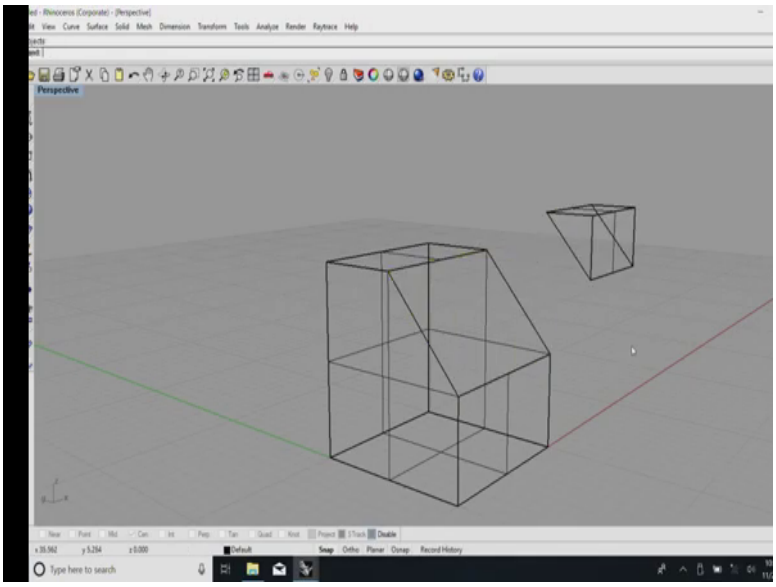

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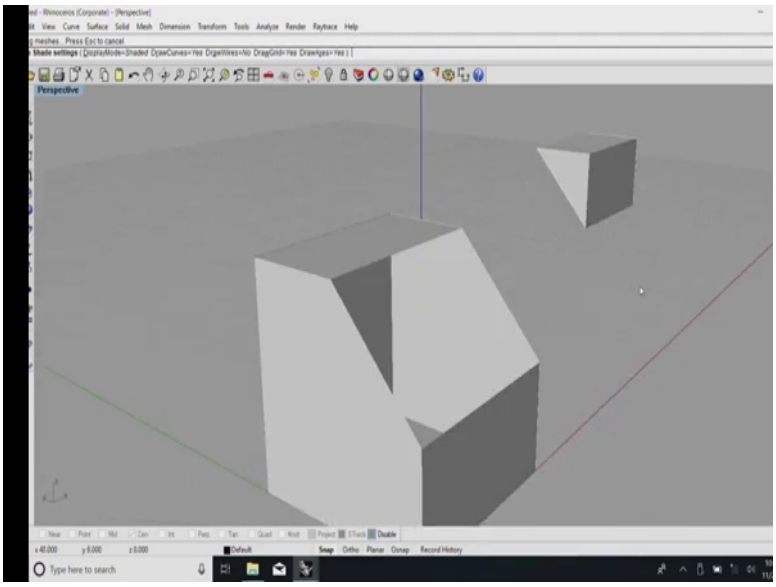

This is what I have been mentioning all along. We end up with a very very peculiar hallow devices and I will try to undergo back and say.

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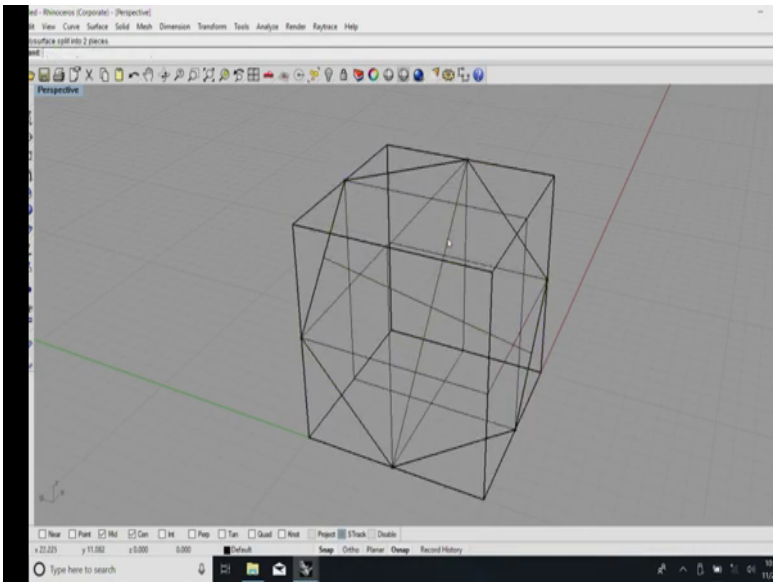

The hexagonal cone thing has been done by a very edge 1, edge 3, edge 4, edge 5, edge 6 and I pass a curve through this. I have practices I have rehearsed and practiced it. Seen this I have a beautiful hexagonal appearance, at this is a little bit of the as I say drama built into it do not be the call to upset by the drama. So, you see here that now as I explained before, I try to make it into a surface because that seems to be the easiest way of I select an object, I use this for splitting seen the see.

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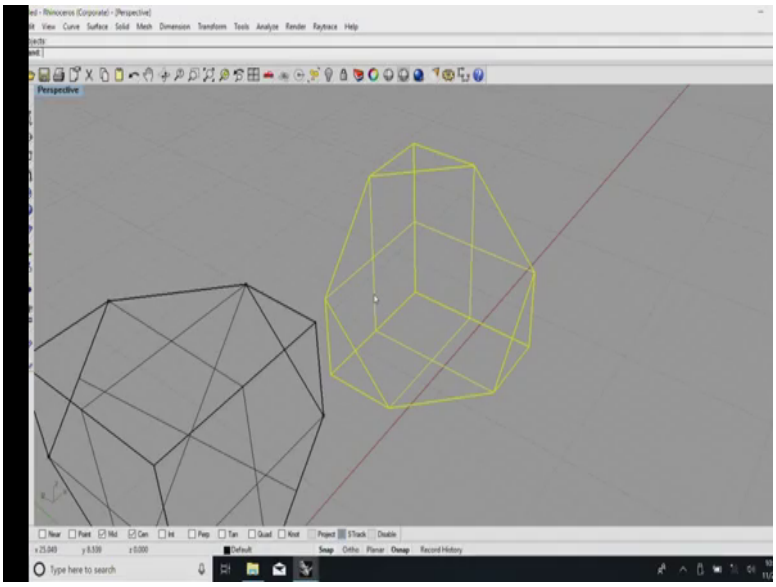

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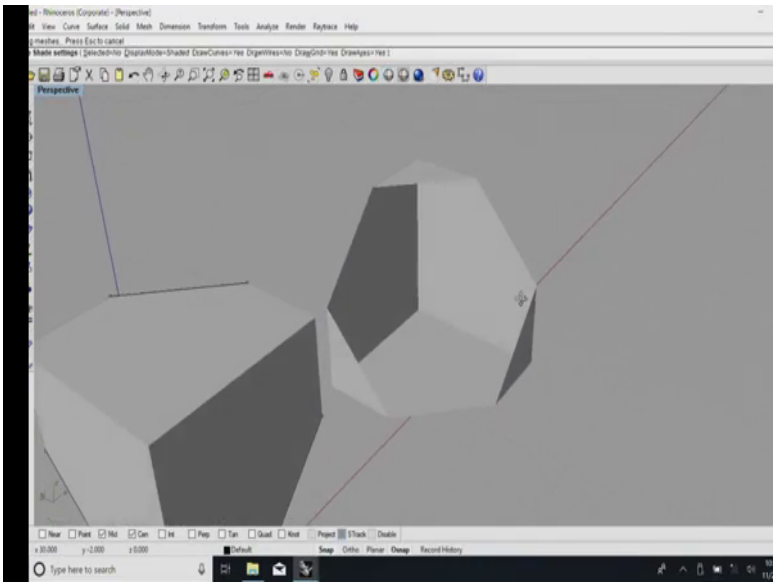

What has happened is, as I have shown you before I have ended up with this empty what you call box like thing.

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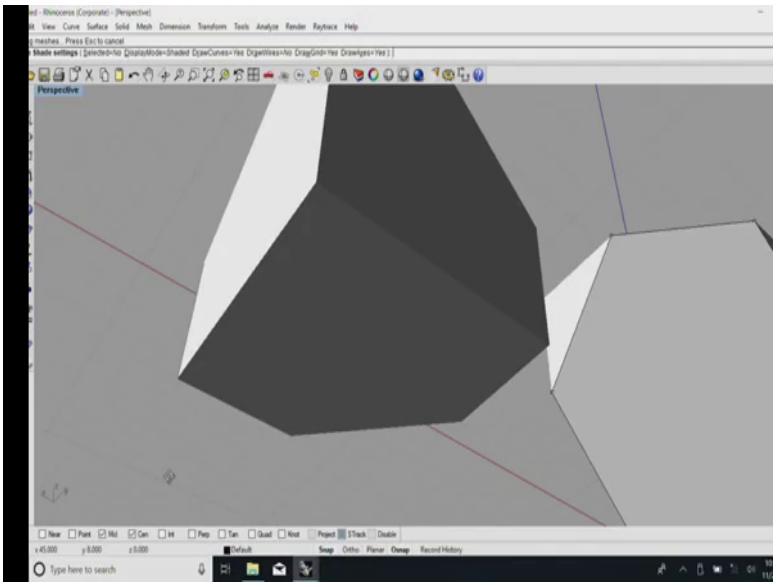

So, I still have that elemental that hexagonal you know the plane, this is available.

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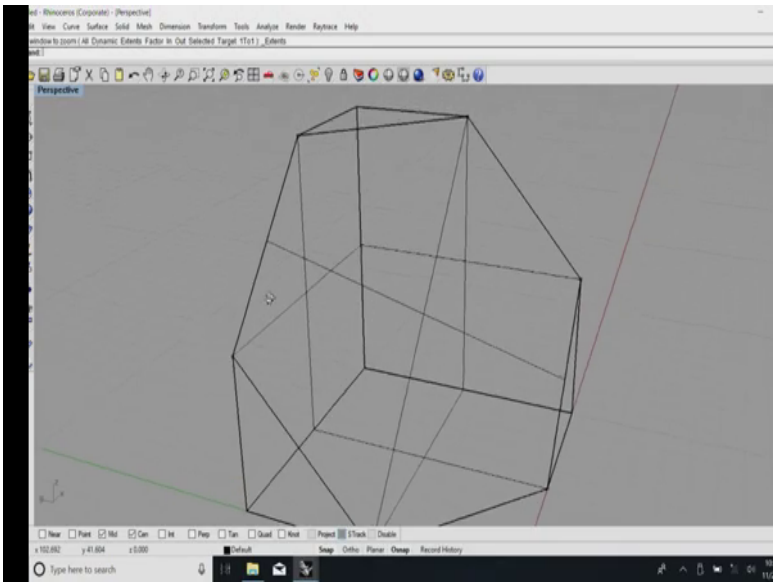

So, I will instead hide this. Now, this is the object which I was looking to create in the first place.

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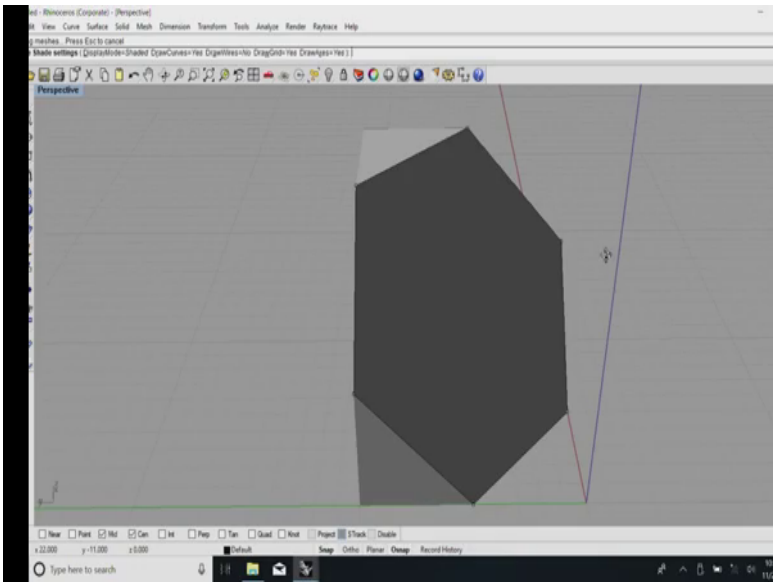

Can you see this? Just to keep your attention and interest holding, I thought I will make something useful. As I said earlier it is possible for me for example, to make a tube here so, that the tube can be used for porting and if you are one of those audio enthusiasts.

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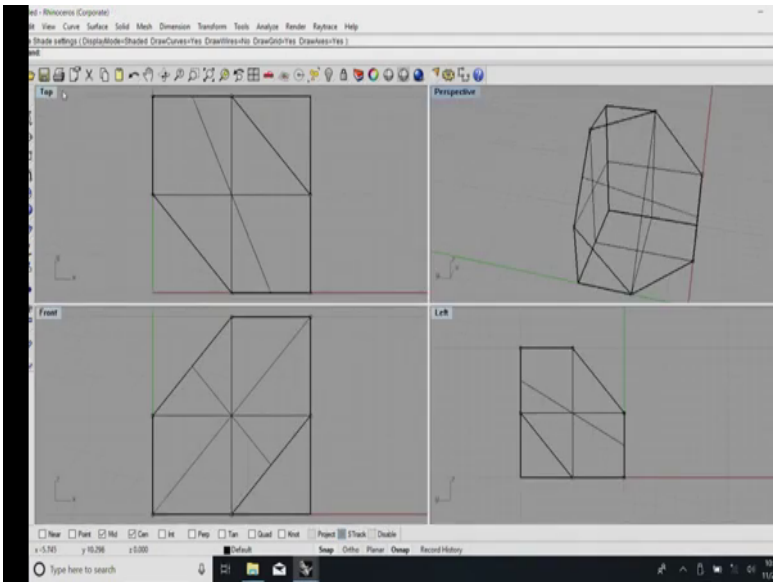

You will probably it is very much possible for you to.

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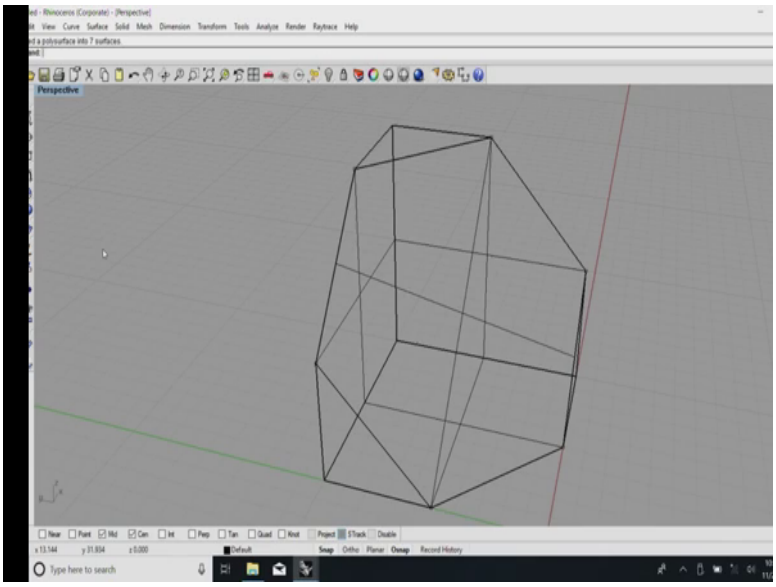

If I join all these to all these together and make it into a this thing, this has become a full-fledged solid. Now understood it has become a full-fledged solid now. Now, at this point I can do various operations including I can cut it, I can you know make openings in it.

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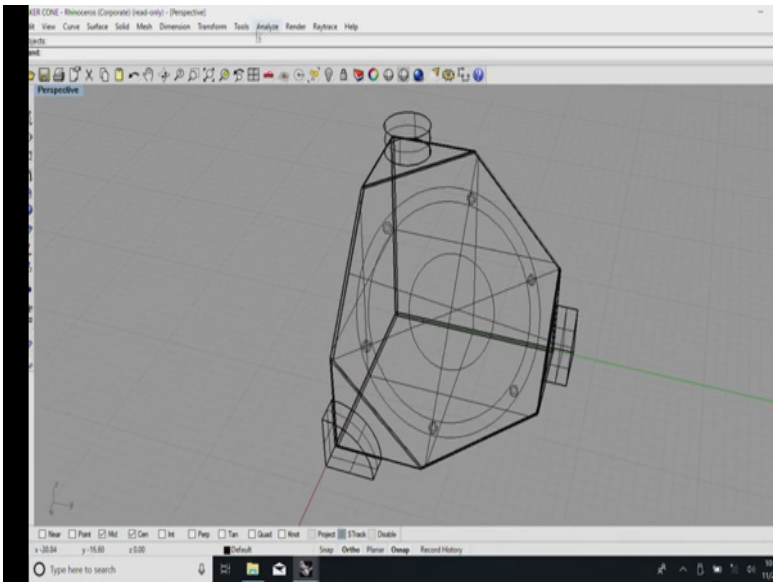

Just for a start let me see this is the basic Boolean that is possible.

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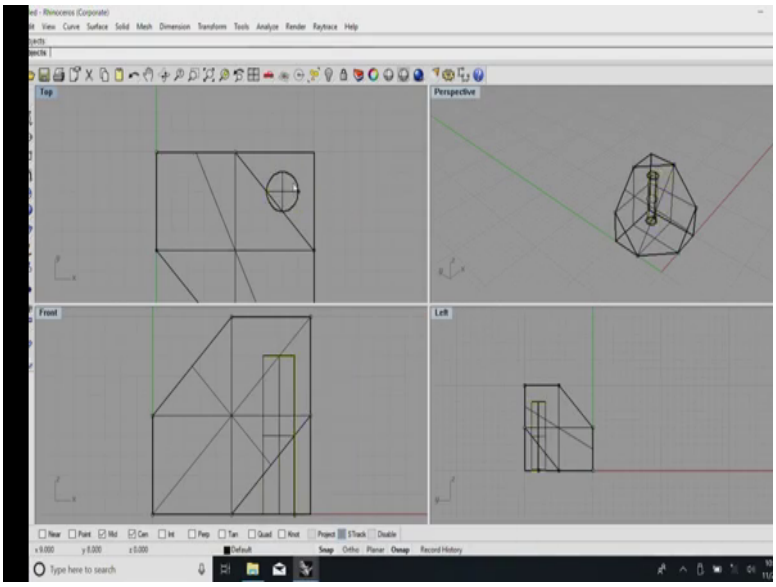

Now, I will make a proper Boolean that can be done. So, looking here, I will know that I can make a small cylinder. So, that I can use it for now this cylinder goes in here, I had finally, made you have seen this.

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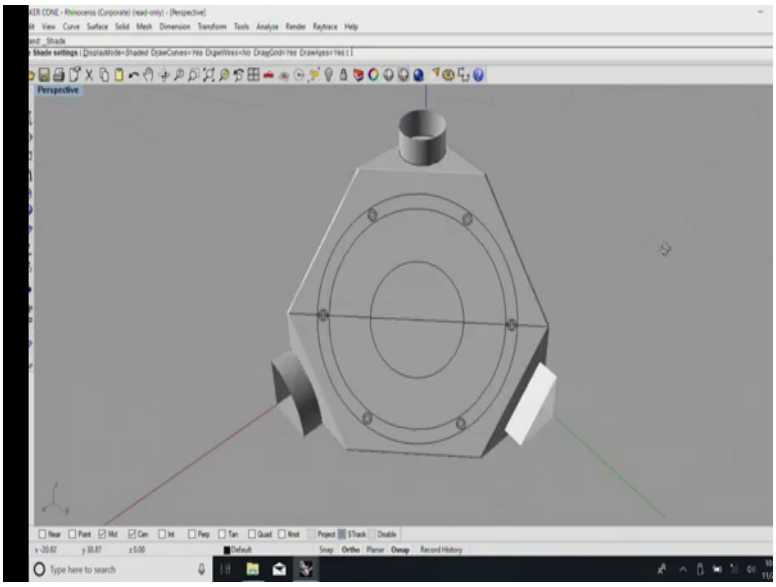

So, I have a what you call something is solid which is intersecting, I can have this speaker just sitting there and by various manipulations and all that it is possible for me now to go ahead building things out of it.

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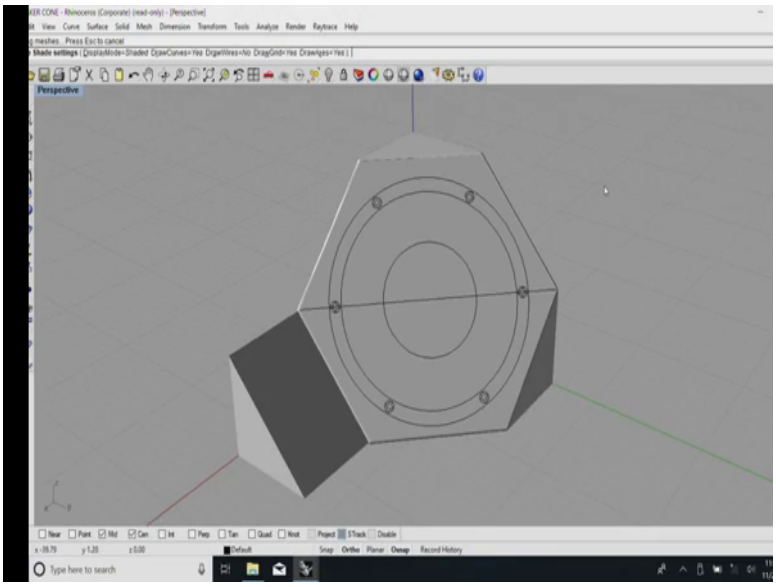

Just to see if I can do something else. So, we have one face here, it is possible for me to make a solid out of this. For the first time I now have what I consider it as a slightly improved version, in case I want I can have it sticking around like this or if you remember the first time when I showed you that I had made that very peculiar ported enclosure. This particular one can sit in the corner of a room or directly in front of your down or in the corners or they called four corners of the room.

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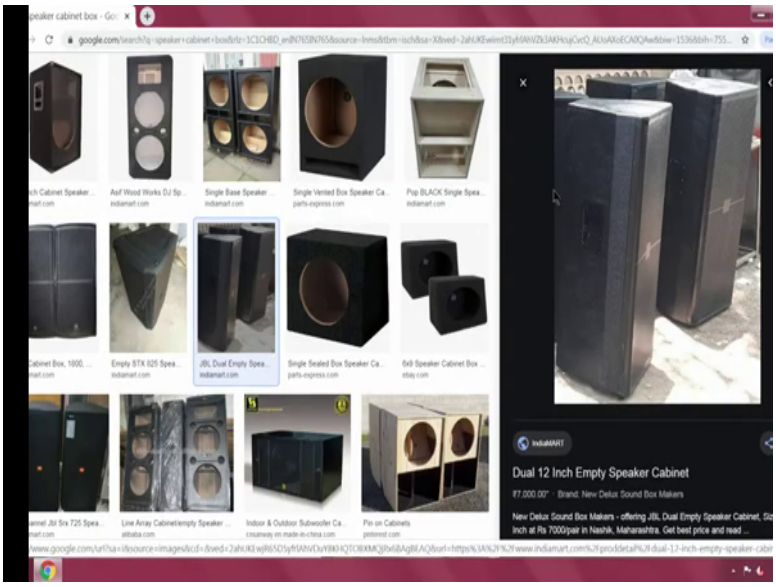

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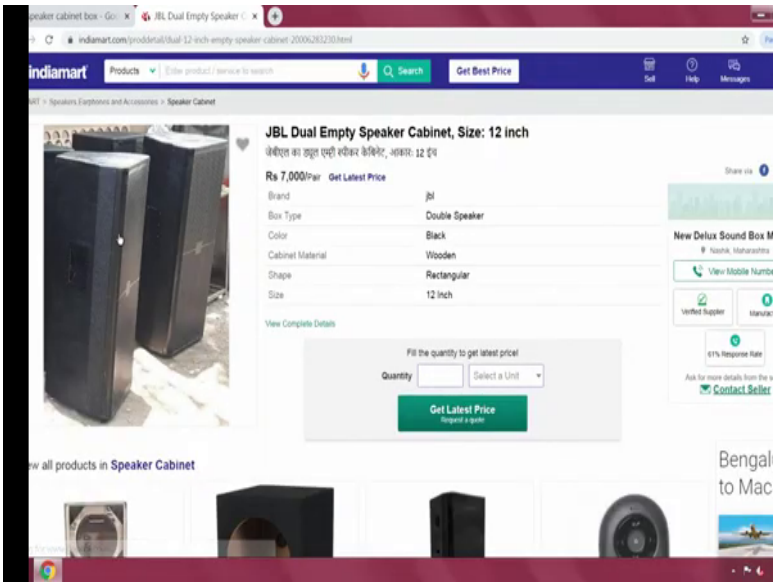

The issue being now if you look at a regular practical speakers and you see this corner speaker element, seen that there is a beautiful cut there at a reasonable this thing and this is how exactly this things are produced.

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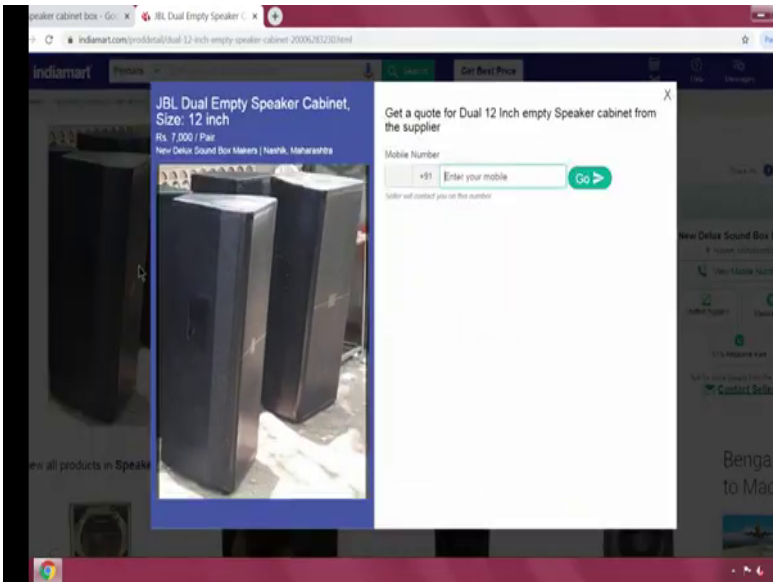

So, there is a corner something goes into a corner and if you see carefully.

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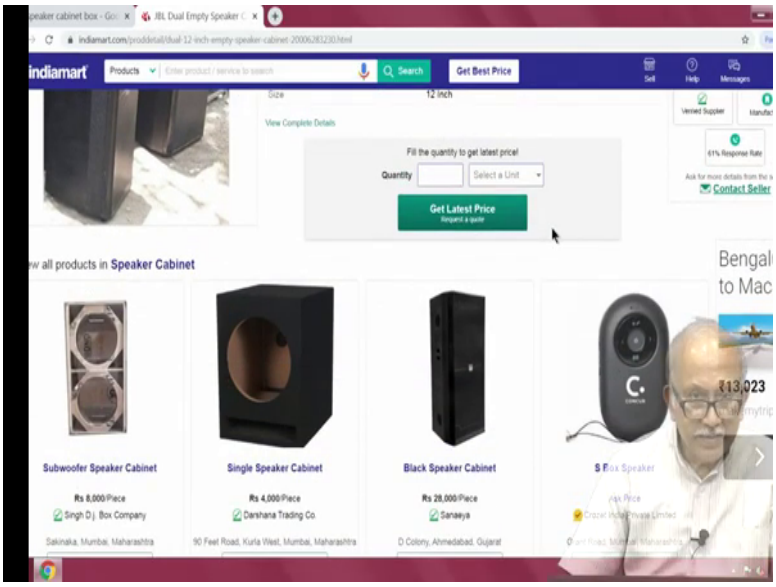

In real life this is the standard geometry of most of the objects that we see there.

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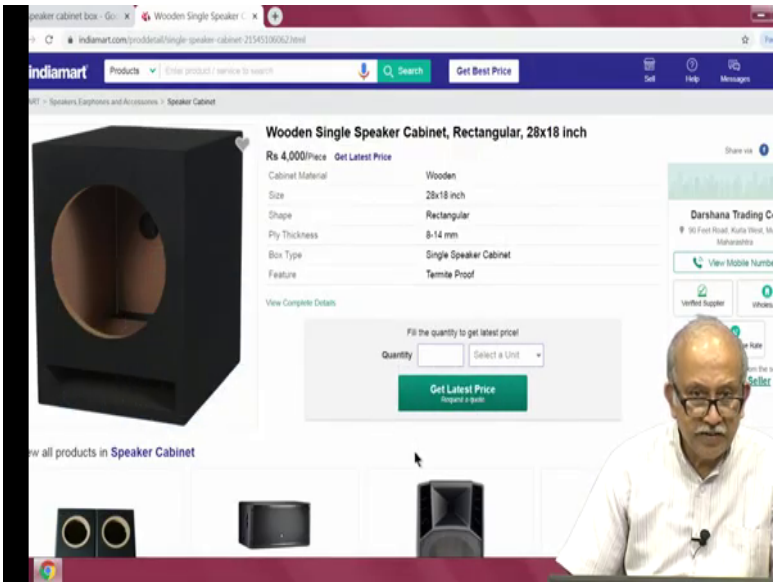

And miraculously for us seen that and you will see the small opening at the bottom.

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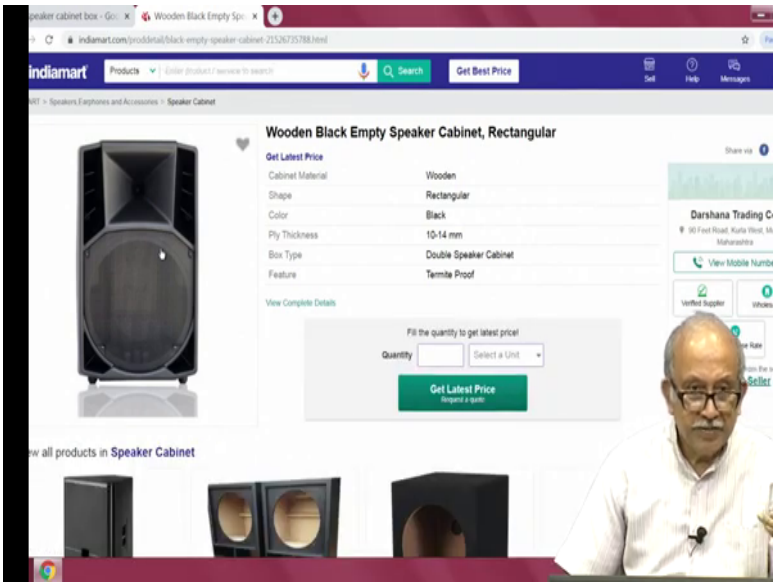

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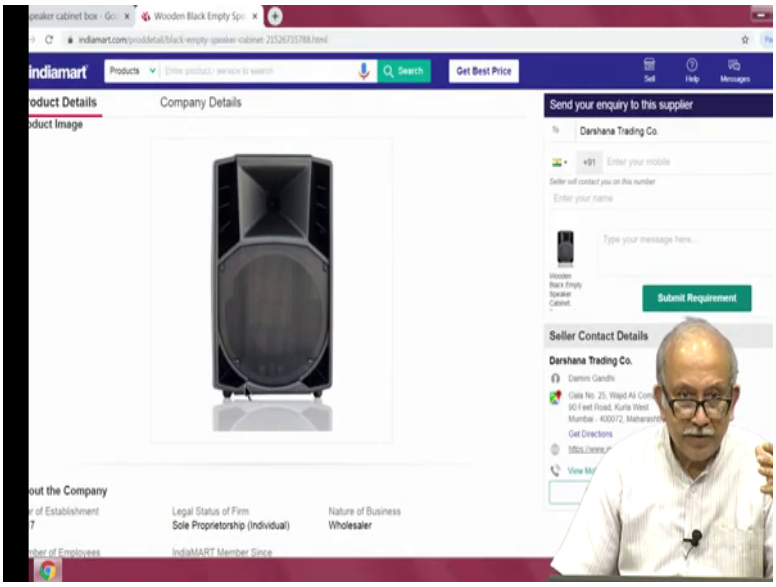

And if you go here in fact, if you go to this type of an object you see there all the complicated things are all still built around basic geometry. So, the corner here they have left a small gap here. So, the top is used as a horn and the bottom is used as probably the boats for the reflects what you call bus reflects ports. And inside if you go back and check the inside probably there enough designs anything you can think of probably somebody has thought of it.

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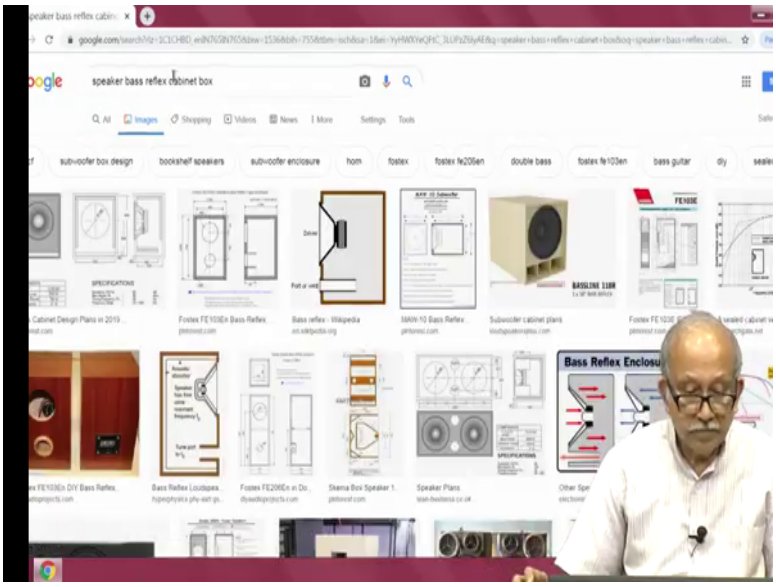

And you can have huge amount of these items at least this time I got it a little easier.

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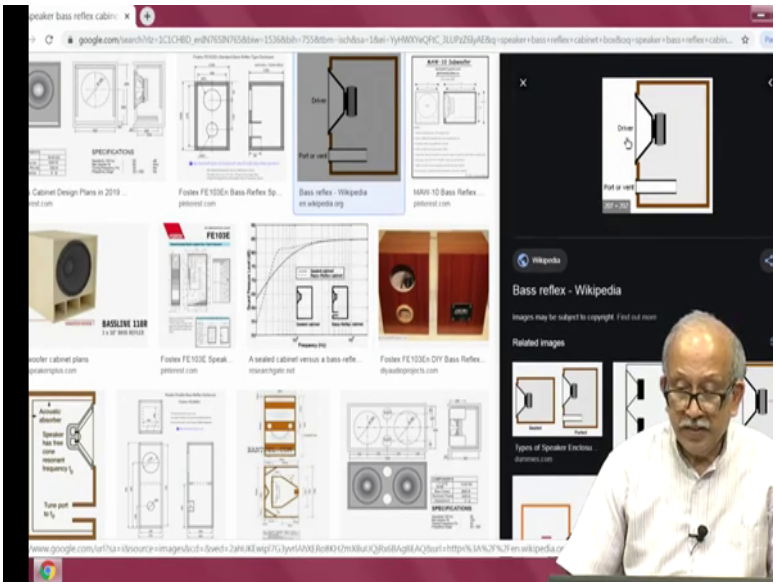

You see here typically this what I thought now, I will try to show you in the first instance.

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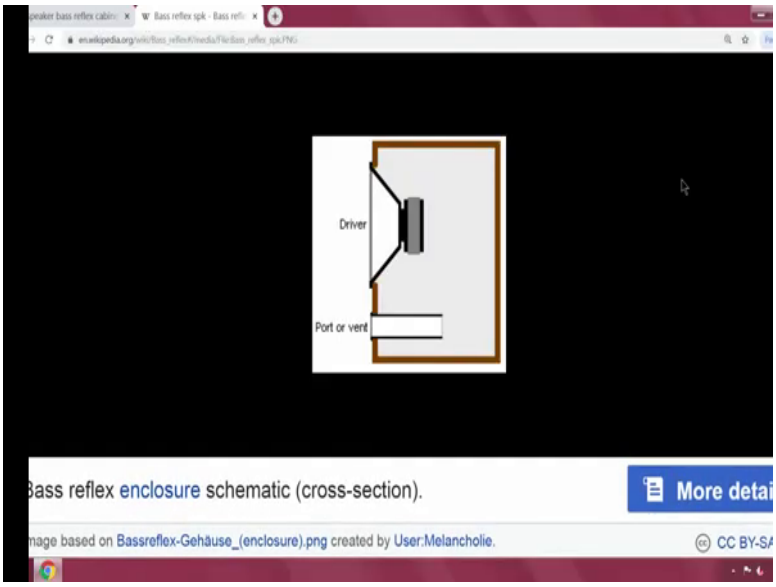

And you will notice that, this is with a port or vent which is there. So, it is possible for us that you can carry out two types of design; one is the geometrical design, one which the volume and those things are calculated another is the mechanical things especially the baffling and all that using, your simple basic layout of a equipment. In the case of an equipment as I said generally most of them end up with a rectangular parallel equipment, but in the case of the speakers and all that, the same thing still involves huge amount of calculations huge amount of you see here.

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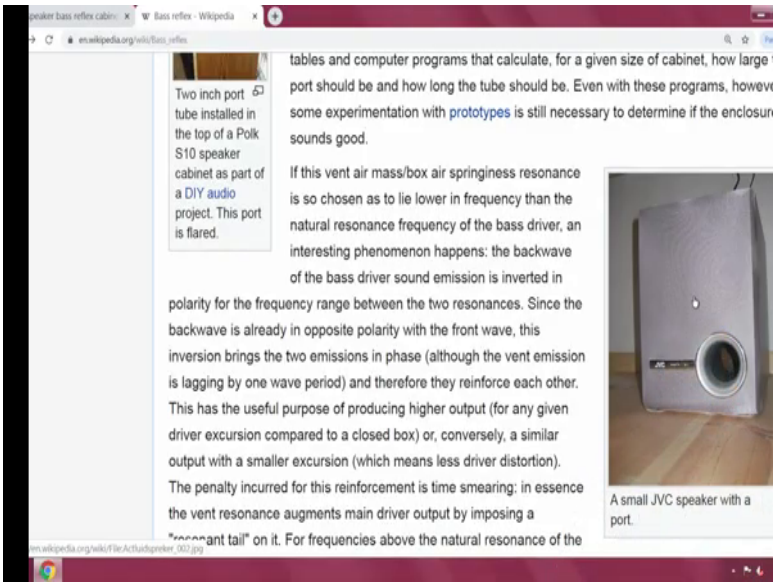

And these days while once upon a time they were very very complicated.

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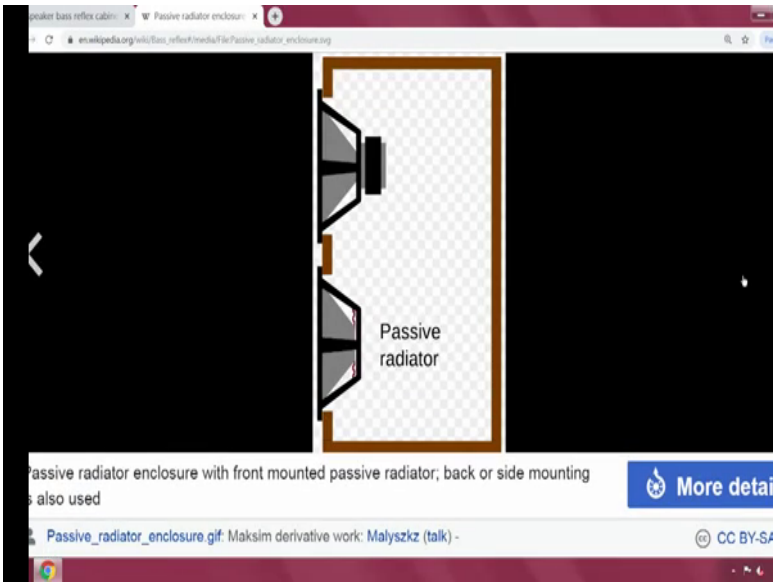

Now, instead of just leaving something just like that they have, something here which is a little tune to both the volume here both the characteristics of the volume and now the standing waves may get affected and a very similar thing which is there on top comes here and you have a beautiful this thing.

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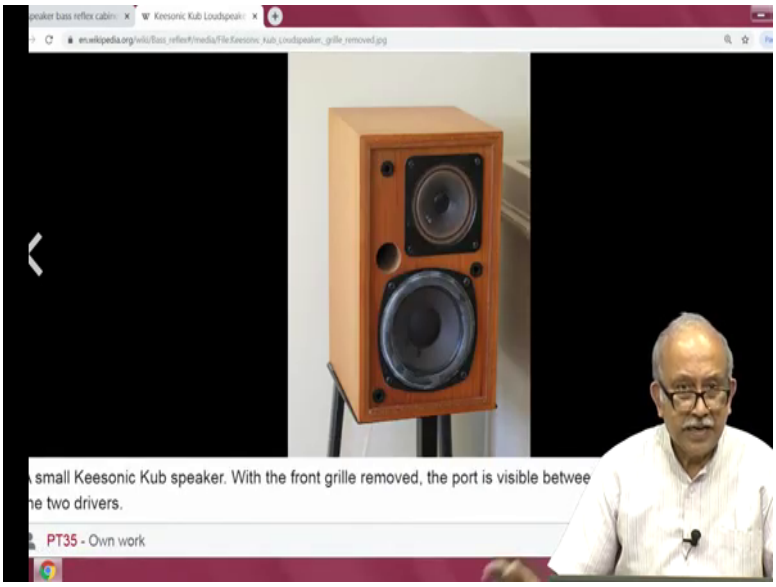

The second part of it is invariably any of the this things involve calculations and in calculations most important probably first thing is the volume. And if you have access to any solid modular calculating the volume is very very easy similarly all the geometric path of each wave is easily calculate table using those things it has nothing.

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This is that one of those what you call ports this probably tuned and in the first prototype somebody has done it, afterwards you just have to fix it in each of them and these are all the smaller things.

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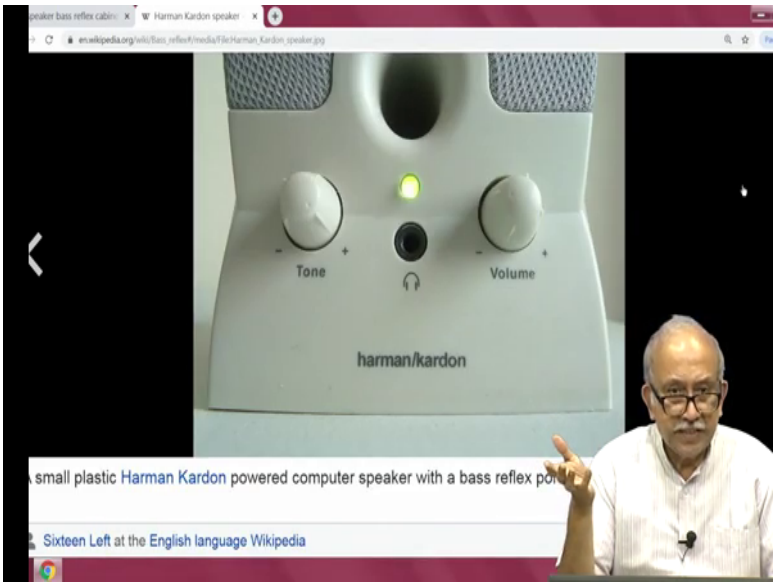

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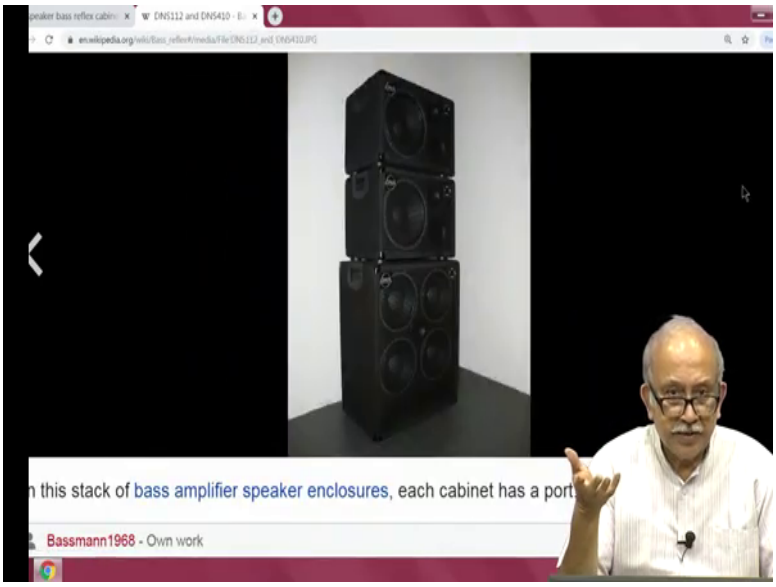

So, likely that you may have it there is a little more bigger professional device. While these calculations what I talked to you about has about a small standalone thing in one corner. Now, if you have a big auditorium and if you have or even if a big hall, the way the sound propagates the way the what you call signature of the whole auditorium is generated can easily be done by geometric modeling.

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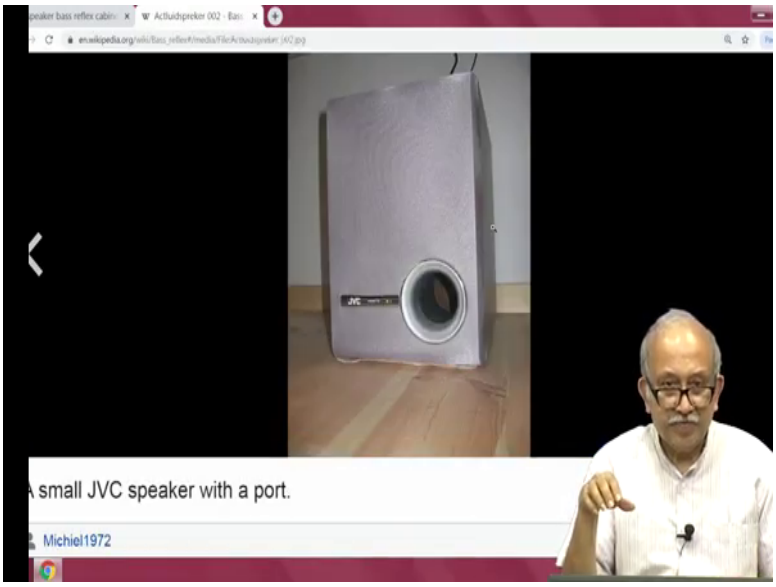

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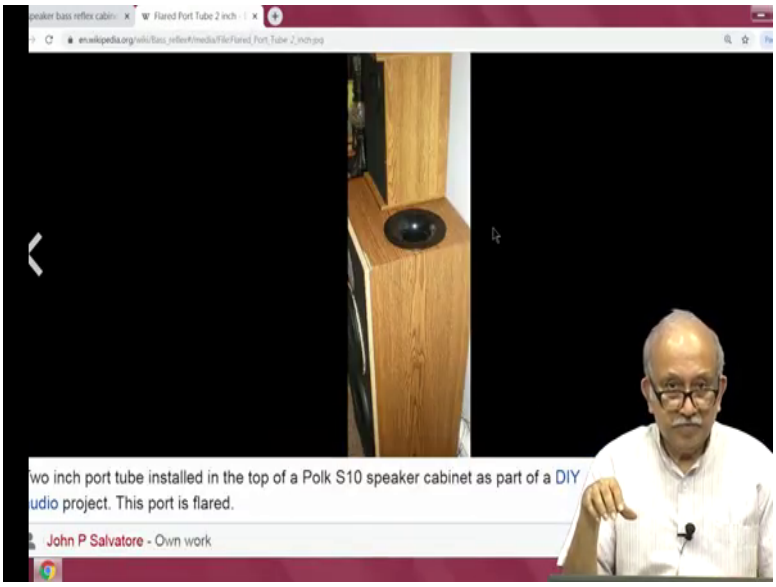

And if you have a proper what you call equivalent. You have seen this here the port is on top this is what I had attempted to do there may be a little unsuccessfully. So, with this stuff it is easier with the with us to go on making very very complicated this things here.

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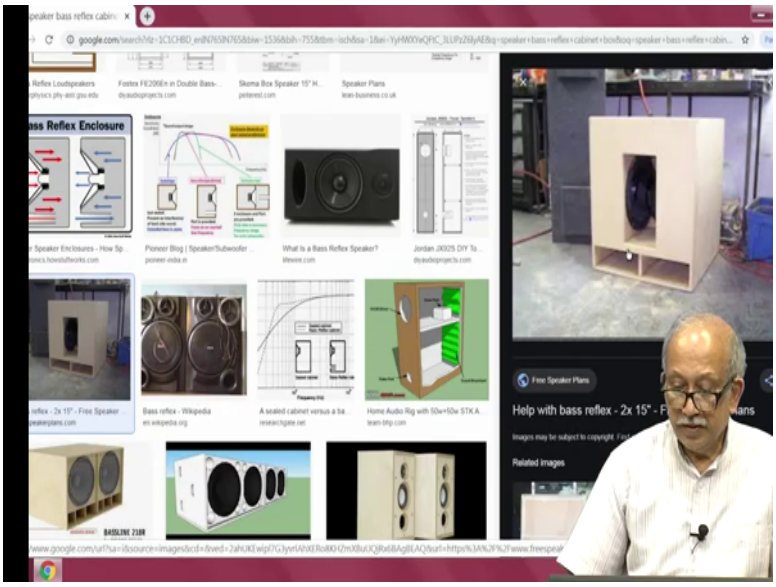

So, if you take any of these what you call these designs, we have beautiful speaker plants.

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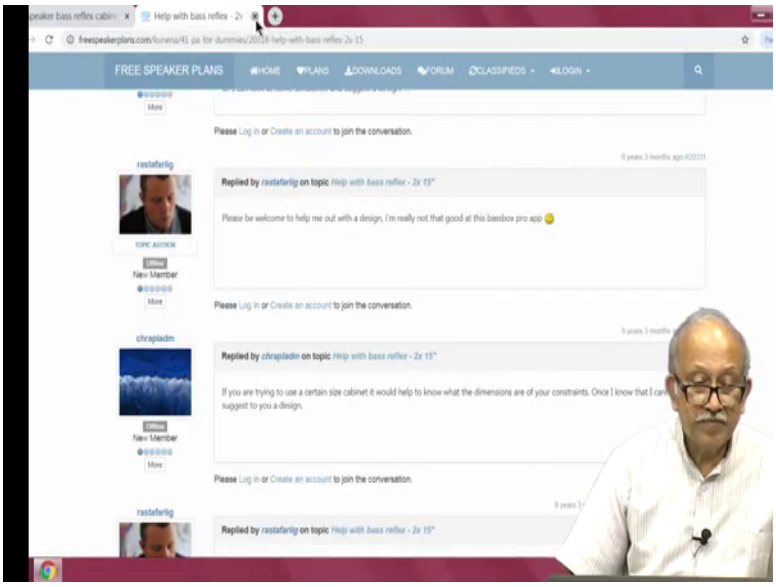

And its up to you to see how well one can build these things, I am very much even today I am fascinated by this.

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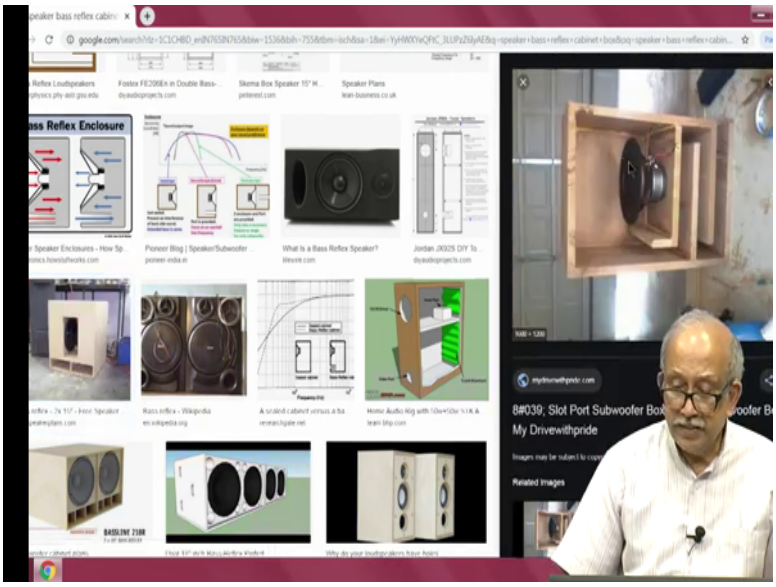

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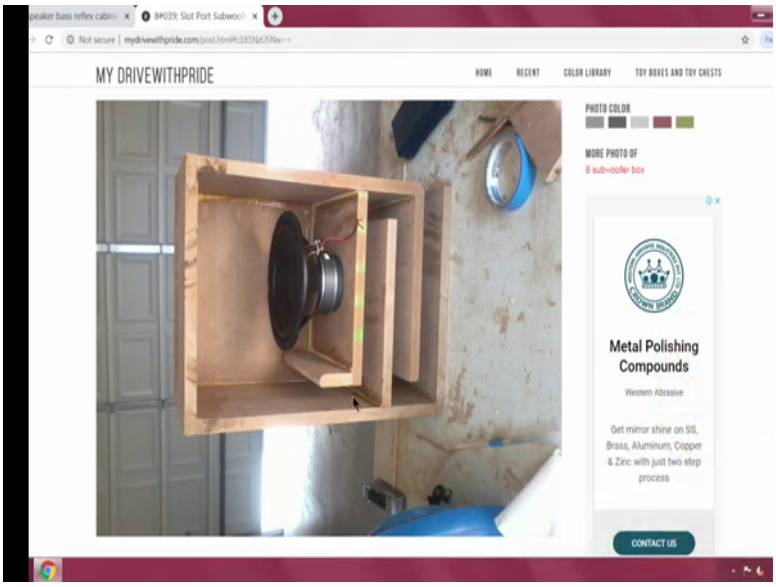

This is what is the portrait with baffled enclosure. So, you see here see this we have something here and then this thing not comes out and there is something which comes back and all these, which can easily be made by a software and like all software and all physical phenomena the ultimate thing is your experience or the users experience.

So, somebody makes all these things and then should they how rigid should this be should they walls be rigid and should there be some damping that is provided, how much of damping should be there all these things its relatively easy for us to predict. But for the basis of all the prediction is you need a solid model.

So, what I have shown you is a very simple solid model, but not surfaces which you see in your car or which you see in your clothing and two of the best examples are I am sure as a child, you would have tried to make a globe a terrestrial globe. So, terrestrial globe easiest

way is to probably take another ball like thing and then add something and make it like this. Alternatively next to best is your soccer ball which is made of hexagons and pentagons. So, if you go and check how many hexagons, how many pentagons, how to make it that is easy way

Now, why you have mentioned this concept of a curved surface and why this ball with hexagons and pentagons; a hexagon and a regular pentagon are again made with equilateral triangles, which is the basis for all surface modeling a small triangle is the basis for all surface modellers and that is the mesh which unwaged things are very much built up.

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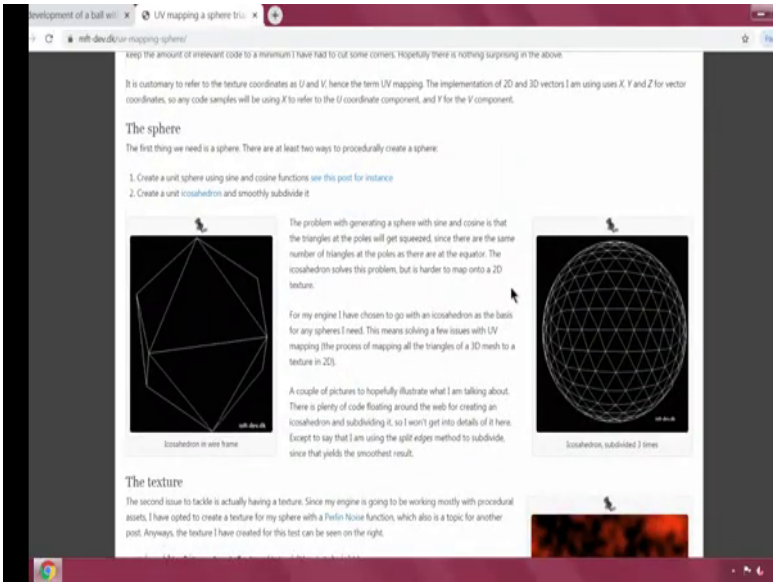

So, I will say I will of course, I will make it lot more in detail later, you see here in several of these mathematical programs and all that the starting point is a icohedron.

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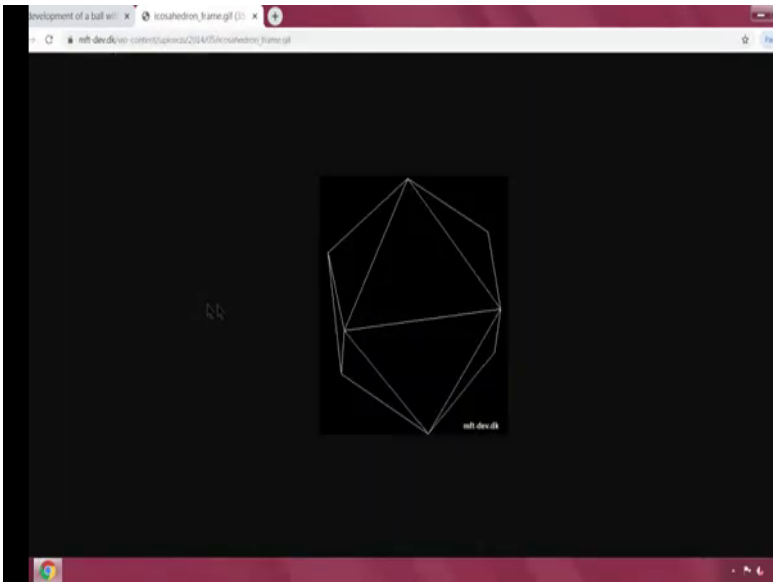

That is I mean sorry icosahedron that is where this triangles are all assembled together.

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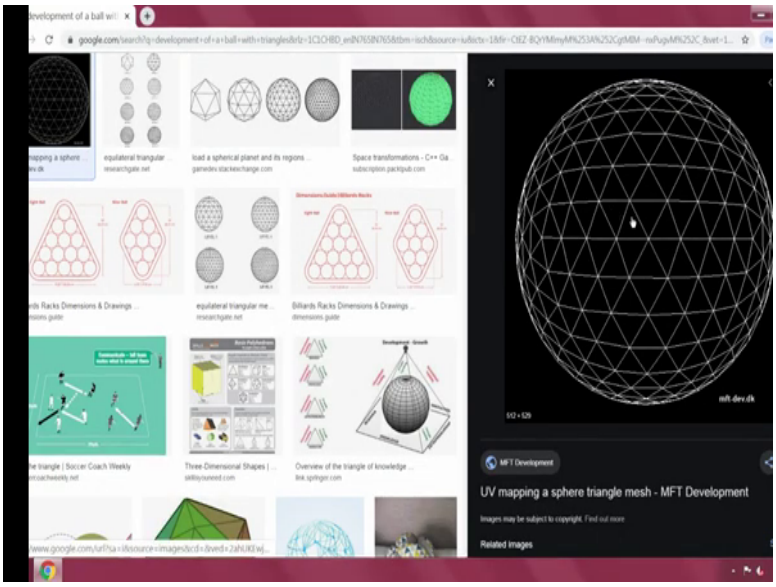

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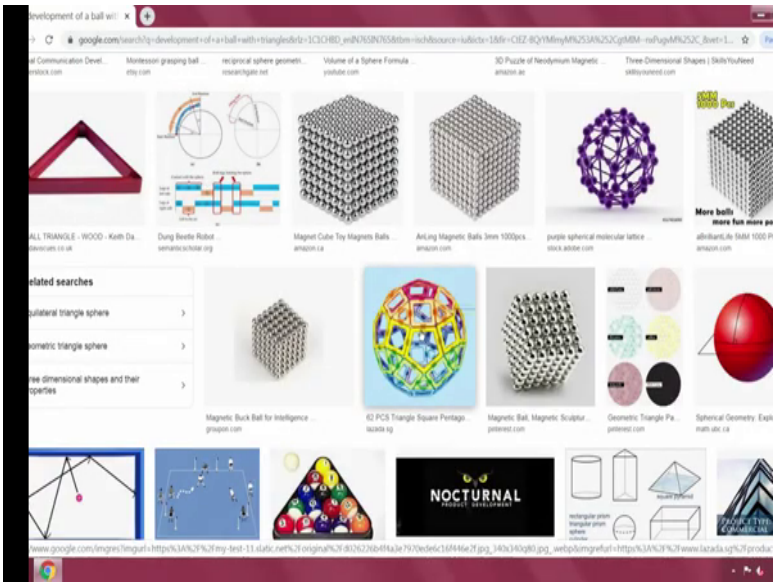

And something which becomes a beautiful thing like this occurs and then this is where including things like our famous Bucky ball.

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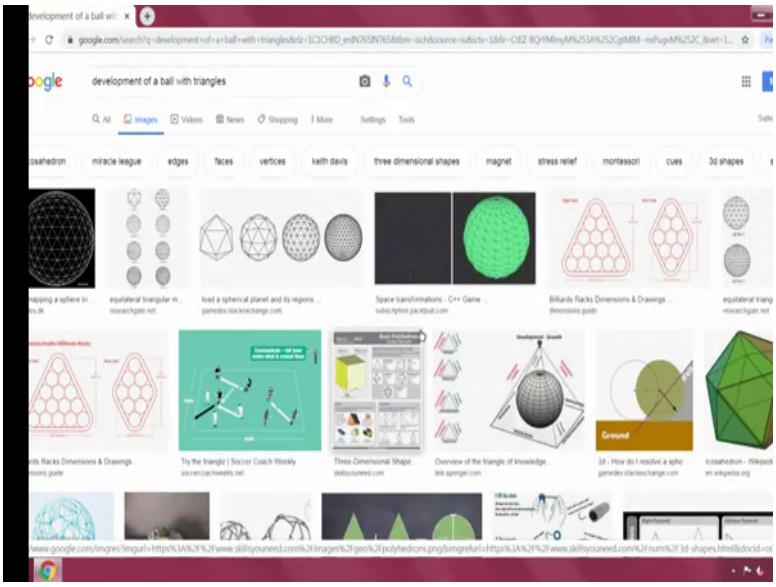

And everything on any structure see in this.

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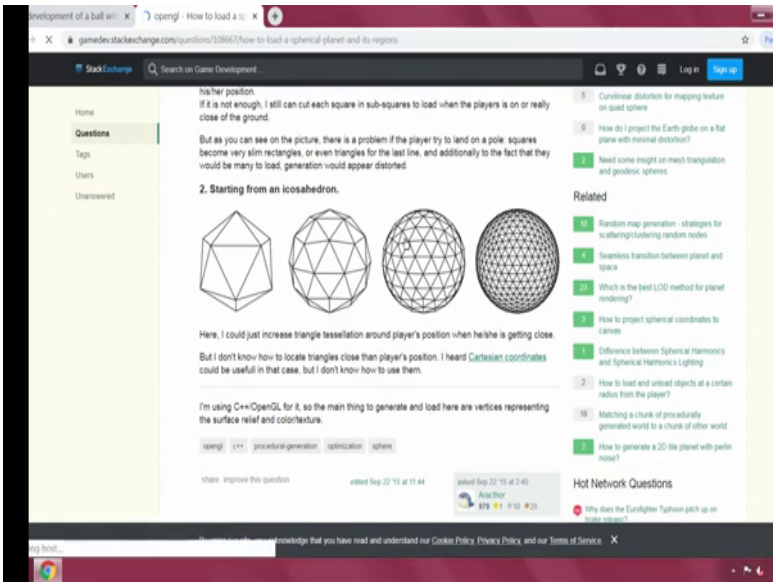

Its a question of granularity or the resolution and then you have this triangles and then in one face if you see 5 of them will be making a pentagon, 6 of them will be making a hexagon. So, I go and search on the net which I will try to show you it is even possible for you to make a ball by taking a printout from an a four sheet the hexagons these things are all attached to this.

So, I will continue with this in the next session. So, until then my suggestion is go to the internet or if you already have something try to download some 3D modeling package and see if you can print out simple four triangles, four equilateral triangles and then by attaching to the you have a prism and you can also make sure that they those things are all attached together without being a discontinuity there.

So, thank you I will continue next time.