Electronics Equipment Integration and Prototype Building

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Lecture - 34
Rendered on screen

I will continue with what I had started yesterday saying the importance of making a solid model and unlike the mechanical or from the drafting angle which have become historically associated with manufacturing. And not as much for laying out and making design. The advantage of like a laying out and making design is you have full control about it those things were earlier done by using a graph sheet and making models and people trying to get back to the so called drawing board.

Now, the drawing board itself has become a what you call you have a touchscreen and each component also you get the 3D devices which are available, but because of the historical reasons, we still continue to have two distinct ways of making things; one is what the electronic design automation people do they do have the printed circuit boards do they do have everything.

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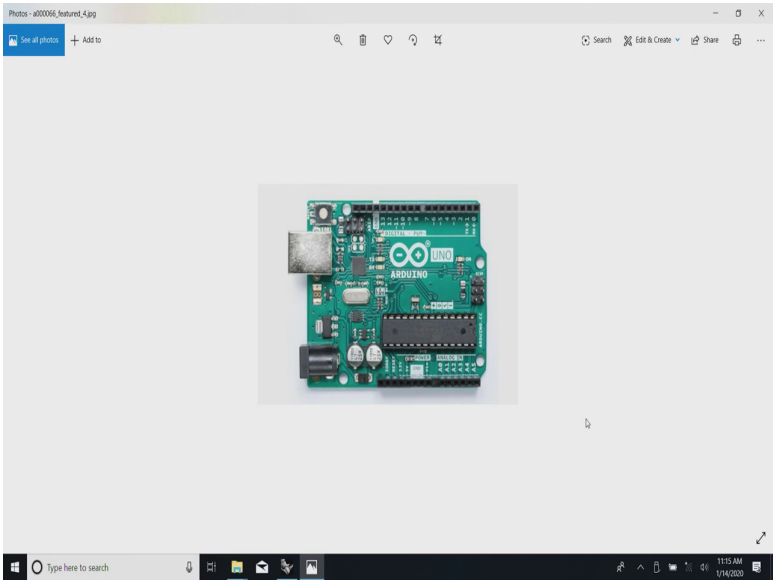

I will just take you here and see and this is where I wanted to make a I keep repeating and try to make an impact.

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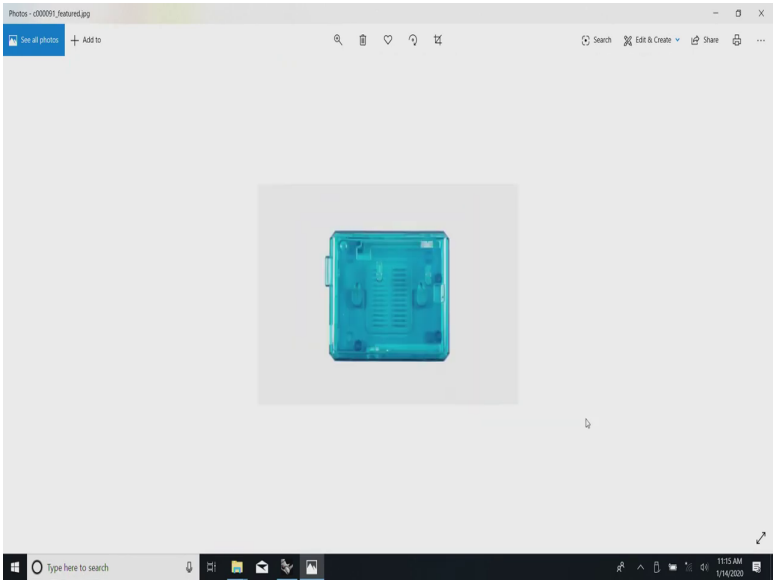

You see here, we have a very large number of these. So, called subsystems the idea being a picture is available and if you ask for the 3D solid model, they will give you something which is little more mechanical oriented. When I mean mechanical oriented its meant for the fabrication and machine shop. Not so much as for our purpose and if you are talking about electronics invariably it will talk about design automation by which circuitry and parasitics and all are involved.

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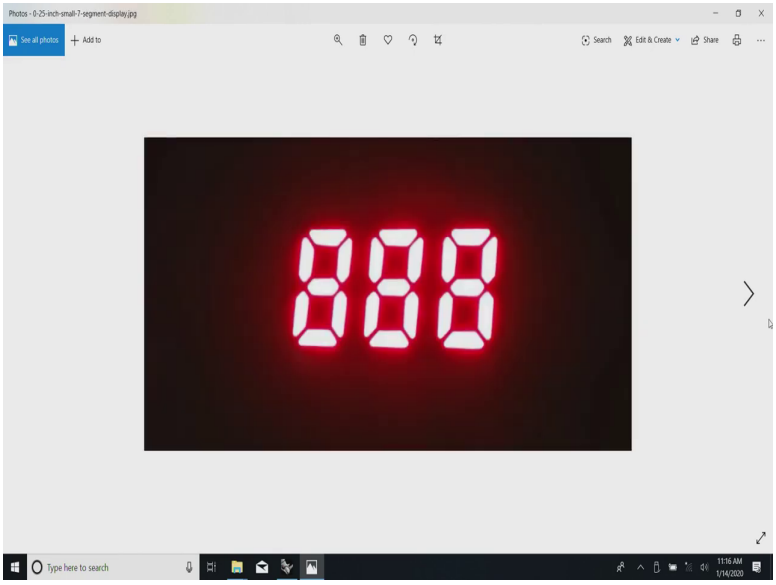

Now, for several of these things, we even have these various types of enclosures everything ready. You have seen this large number of these things are available there we have enclosures we have you name it, we have it.

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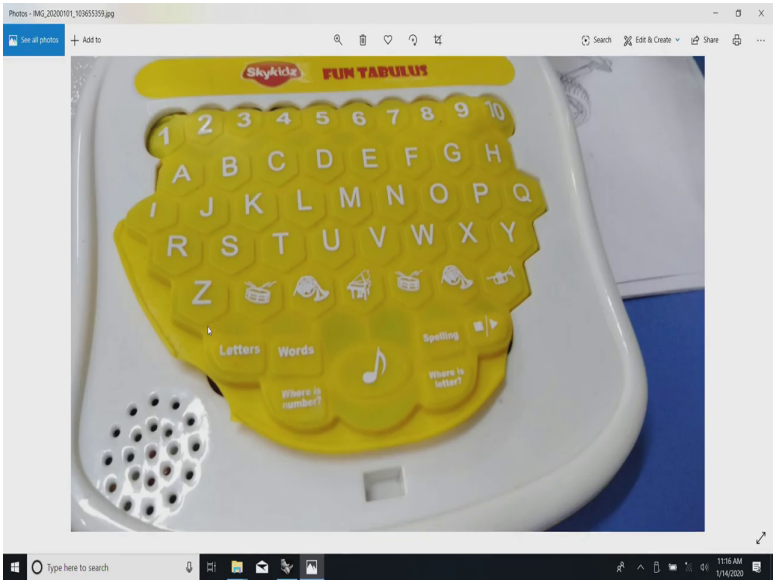

But, when you want to make a product like this, what you are looking for is a interaction between the mechanical fabrication items and also the electronic automation. This is a I mean just a childs this thing and then you will notice it is not a QWERTY keyboard and it is not made in the way conventional way in which the things are laid out in and all thing in fact, it is made like a honeycomb and they have put everything neatly a to z and you have all these various things.

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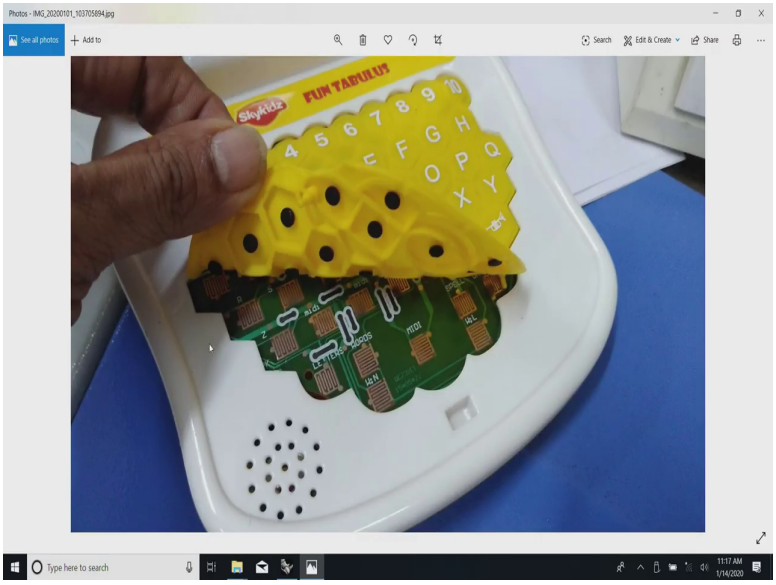

But, when you open it and see underneath you have the same thing which you saw in the remote control. Now this is where I thought I will make a contribution saying when you make your models you need to make them such that.

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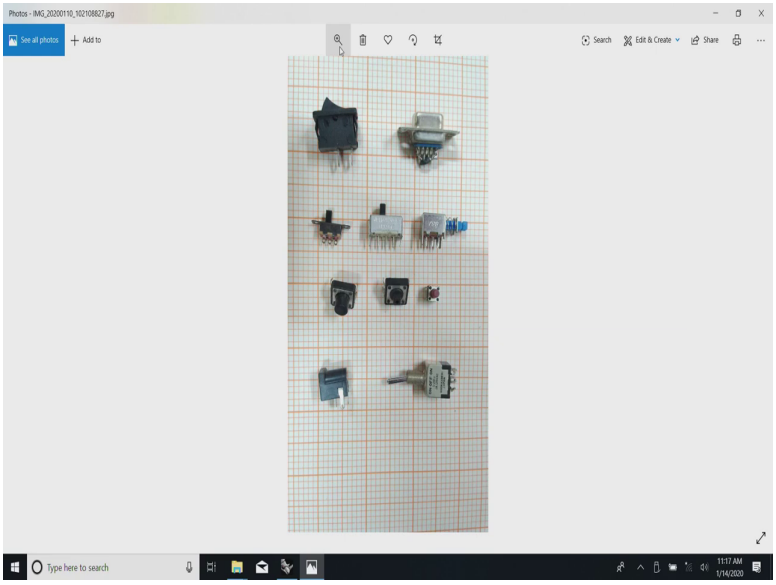

Each of these you include the mechanical part. So, that you can fabricate items include the electrical footprint and the pads where the connections can be taken and this is where I also wanted to stress saying, we have the nice way of exchanging information. So, we have the drawing interchange format or even higher level you have the IGS format.

So, you can save these various details and then import them directly to a PCB. It Is much much better than trying to play around with making it 2 or 3 times and in the end you will notice that the front panel which is made in millimeters or inches does not go with the other item saying there is still a problem with it. So, we have a large number of these what do you call inconsistencies.

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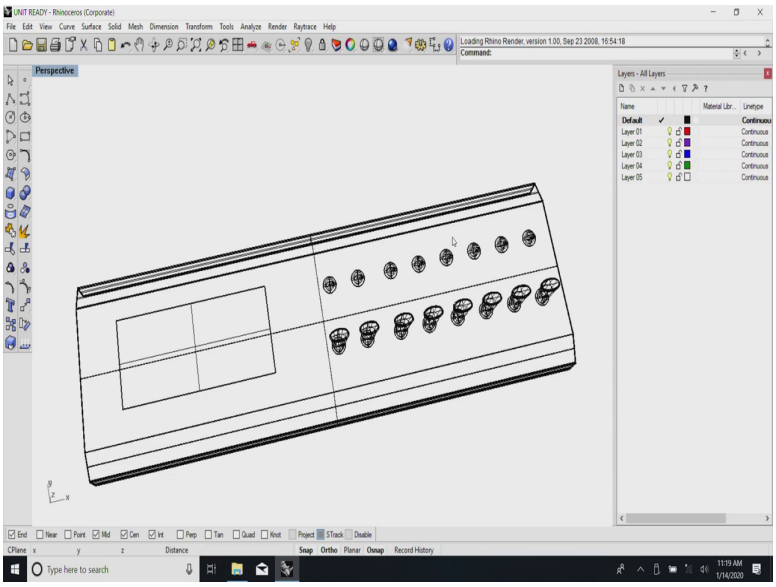

Now, let me get back to the drawing which I had started. In this case if you remember I started here, do you remember? Something has crashed, do not worry about it.

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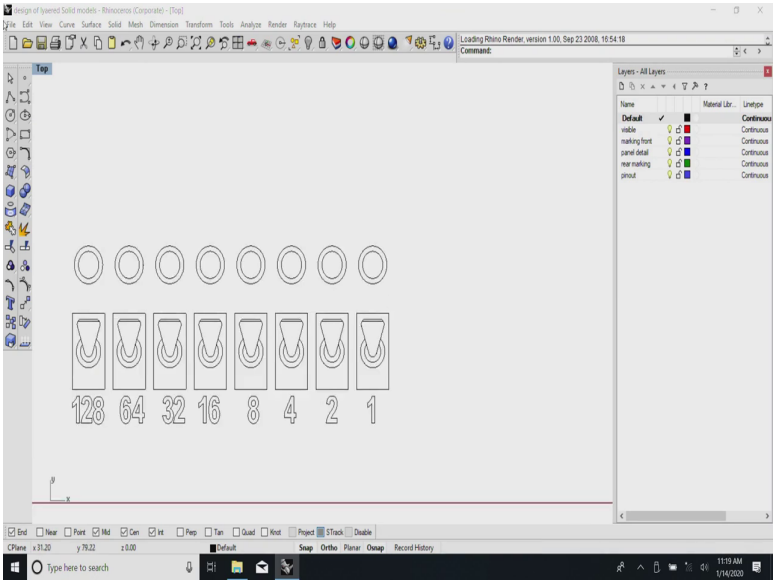

It will come up there was a problem in accessing the pendrive, I had started it here saying I need to make these items.

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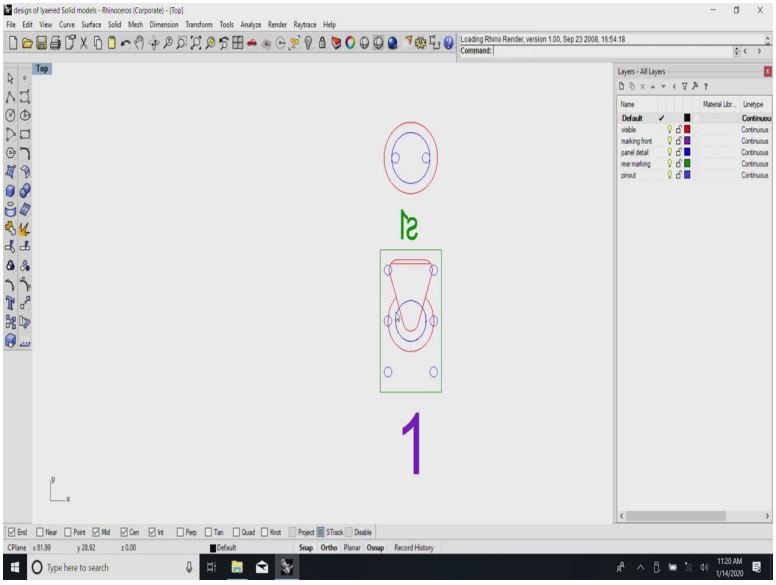

And further I had taken it to the next level saying you try to include the other elements and then you make these layers in this. So, by this I need to just copy these things at various instances and in the end it works very very well.

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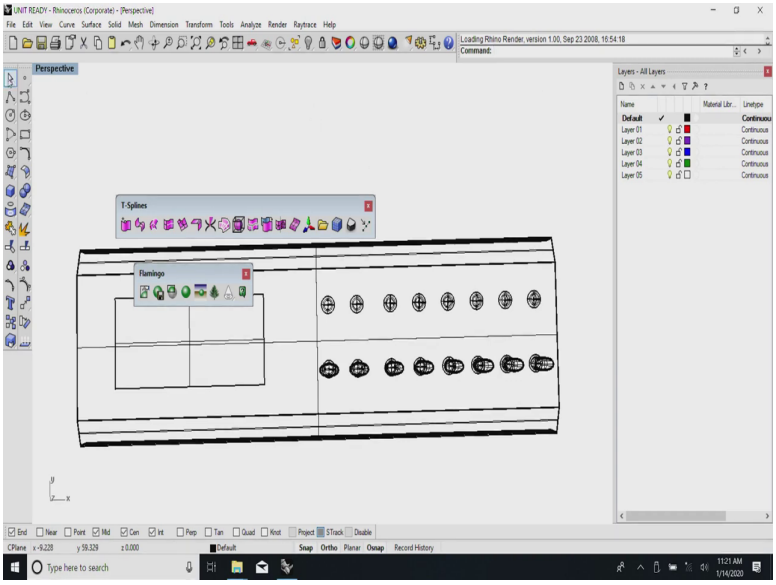

Now I will see if I can open, we will edit it out. See at this place what I had finally, come out is saying. I have finally, made a switch which I will try to show you at a slightly perspective point you see here I have this switch.

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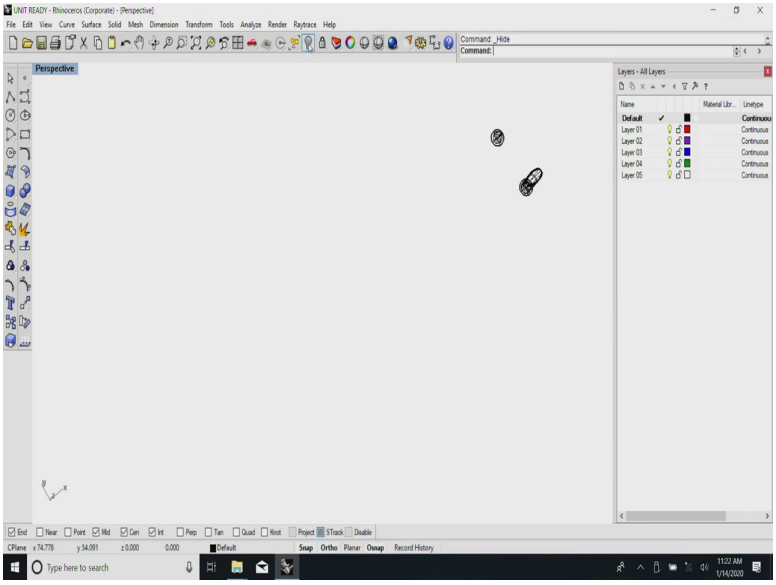

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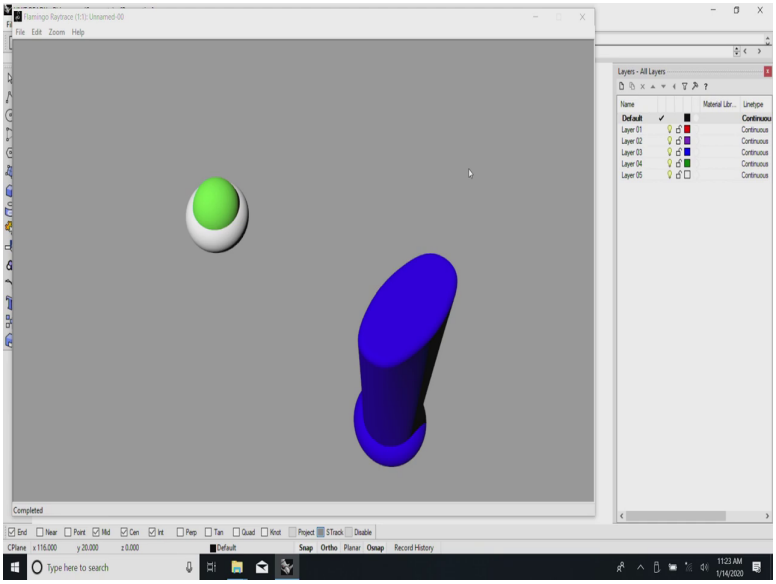

So, if I give this rendered image, I have the toggle switch and by the shape of it to understand whether its flat, it probably goes up and down and lay two positions and corresponding to this on the other side we have the small LED with its bezel. This is just a crude representation saying how it helps and now when I attempt to render it you see here I have a nice way of showing this.

Intentionally, this particular thing is only about the how to organize these things on the front panel, how to move them around and how to make a very simple interesting thing by which it shows if you remember the what I showed you last time. It shows us the how to make a simple device which has 8 switches and if you operate this switches some LEDs will go and eventually on a display you have something this is not a real equipment.

Because, this topic is not about how to get the functionality out of it the topic is how to use available very simple design tools with us and you can now without having to go back to

various other places or go around searching the marketplace, once you make these things we will make a picture of this thing you can organize this.

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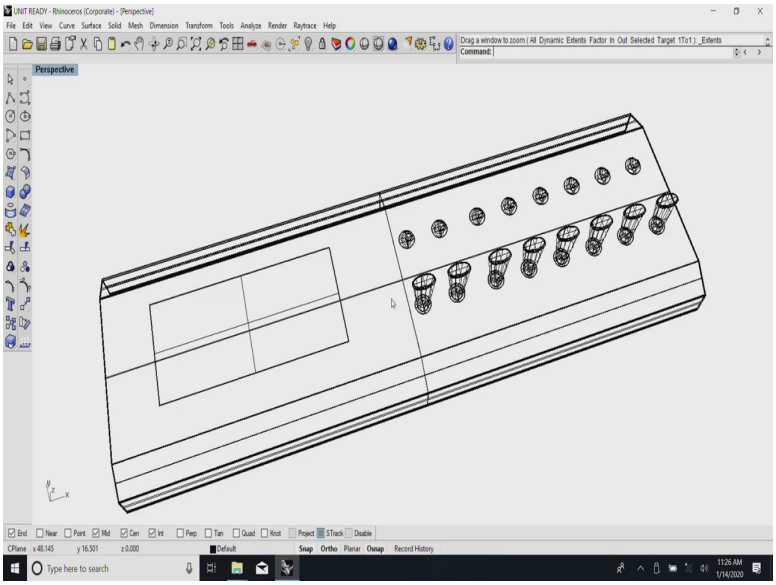

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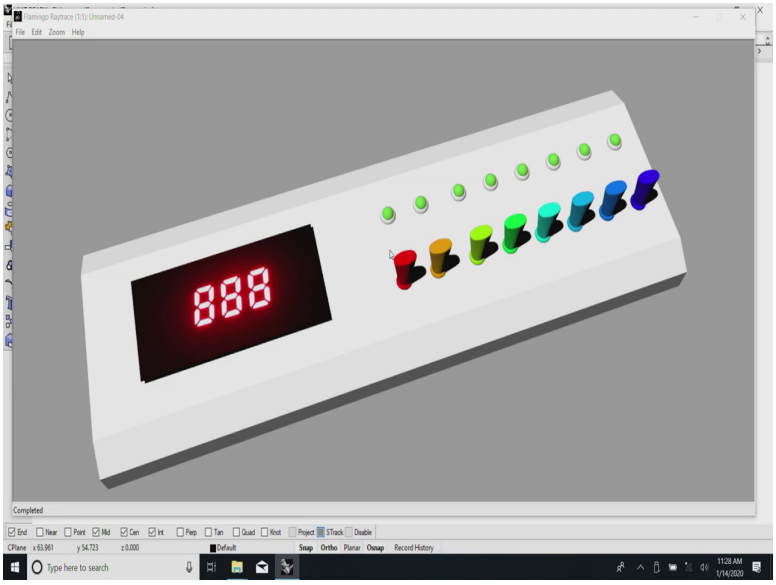

Now, let me go out here, see I have a beautiful equipment already have you have seen this. What started not so what you call interesting, suddenly I have this nice beautiful device here you have seen this. In this, if you see in reality everything is just what do you call I want to say lifted of the internet everything is taken from the internet by which you know. I am able to make things and make a reasonable presentation which is quite useful looks very authentic and real is it not I have a display there I have these keys here.

In this case because the printed circuit board is probably directly behind the front panel this all the equipment it is just as sort of a simple flat box to make this thing a little more interesting. I have given a beveled edge and important things like the circuits and all are hidden here.

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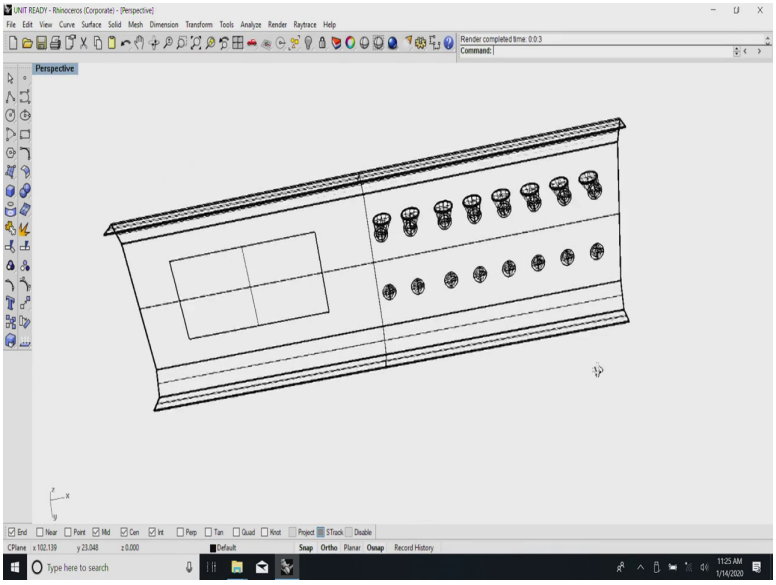

But; however, there is a provision, if I now right now I have not actually populated it is very much possible for me to have these things directly populated here.

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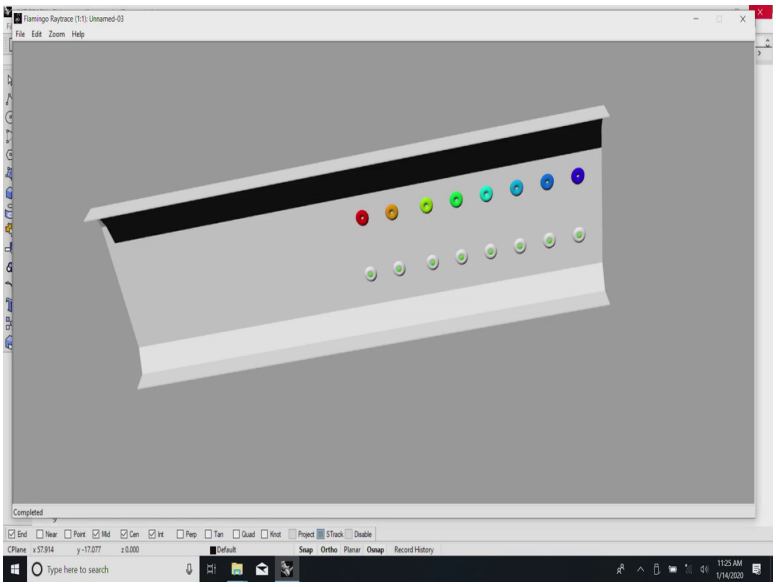

So, in here this is the thing behind at this point, I only left the basic mounting whole and a small grommet which will allow it to sit inside. I have not added the terminations, I have not added the rather enabled all the thing. When you enable all those things we will have neatly all these things from behind the panel and you can have the drilling detail taken from here by selectively switching on the various items and without having to.

Actually, go to the first level of the prototyping you have an equipment which is ready, you understand it may or may not be functional, but the prototype is sufficient for us to convince our other I mean teammates saying this is what I am thinking about. So, if you see very very small items which look insignificant like I have this for (Refer Time: 10:54) I mean honestly I do not know what it is? It is just a pointer we use on this I am sure it has gone through several stages or several rounds of redesign and optimization.

So, if you go to the very old design books, several of them are again related to mechanical engineering where at the highest level you have a need analysis and so on it comes down to embodiment design. In embodiment design you have this sometimes this solid modeling and something related to this is the analytics including related to stress. Same way when you have the electronics, you once again as part of the detailed design or embodiment design you have the other design, the electronics design and in electronics design what do you call mixed mode simulation is real without that a small thing like my mobile.

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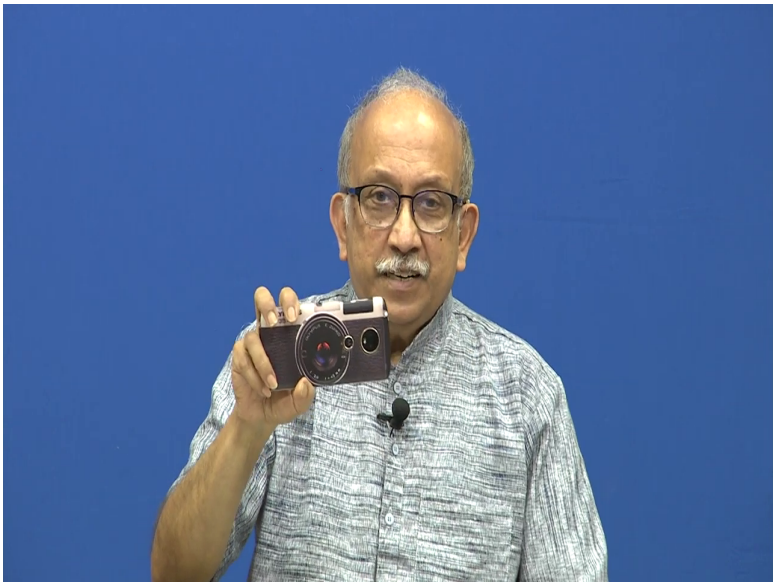

It is surprising that this mobile has 4 to 5 radios built into that. In this case radio means wireless things all of us are familiar with the basic GPRS system, we are also familiar little with the Bluetooth and then several other wireless. But now, these days, so many of those things have been added I still do not know we have the chromecast device and then we have I

just do not know what all is there if you open one of this thing, this many items are sitting inside.

This is where I would like to stress saying, each of these items probably there is a mechanical component in it and then equivalent electronic component. And in the case of a device like this its very very critical that everything is packaged extremely well added to that we also have a battery it is waiting to explode, not all batteries explode its just probably a thing.

Now, if you look at my this rendering here, I have try to add an element of I do not know interest or whatever you can call it. The element of interest here is generally, I do not know whether I have mentioned to about the concept of most significant bit and least significant bit and all that. When you have this 8 what you call 8 bit word or anything extreme left conventionally, we have got used to it if you have a large number something which shows 10s of 1000s extreme left shows the most significant thing.

So, the error should be minimum in this case. So, it is just a gag I do not think there is any reality about it I have made a red color to it least significant I have given it a blue color, but then they as I said I keep repeating this is not about the coloring or anything. The fact is that when we make the first solid model, we need to include all these things inside. After you finish it is very easy for us to make things while at one level it is probably very much correct.

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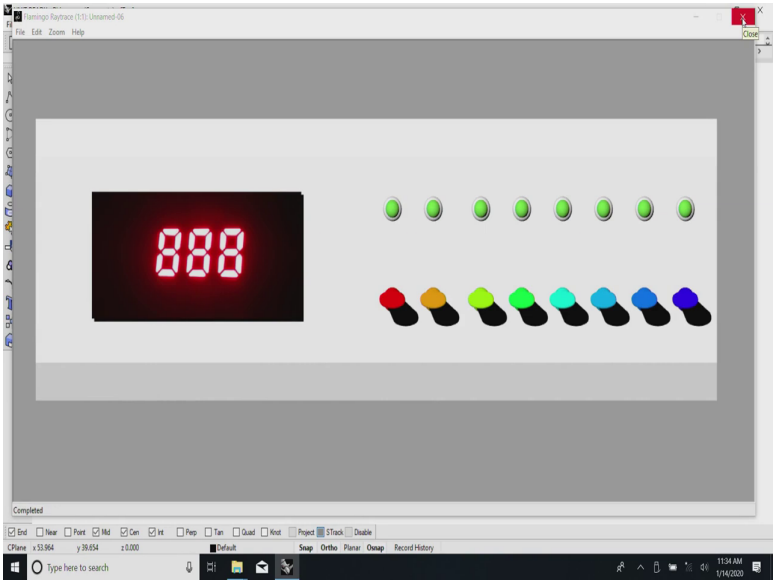

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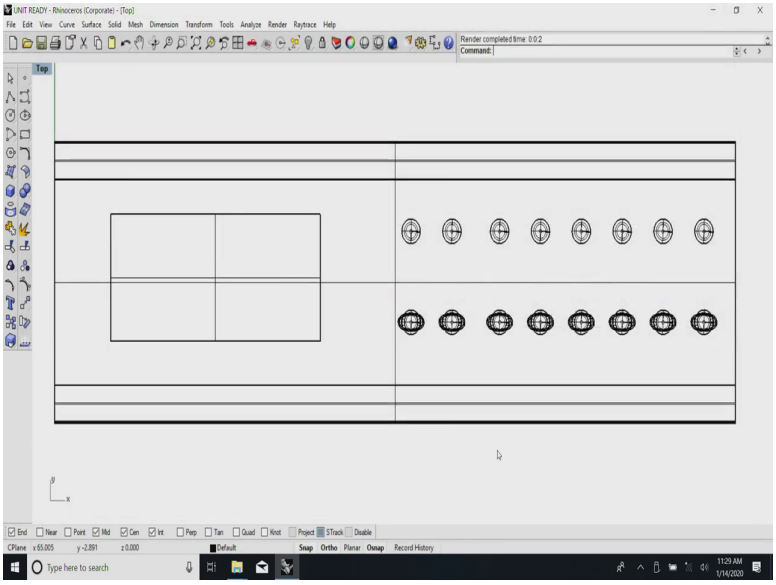

This is not how in reality, this thing do not have never made like this. In fact, if you see the I will just search for a 16 key hex keyboard. So, if you can look at my monitors, the other monitor here just like that in front of you. I thought I wanted to give you a sneak preview about it.

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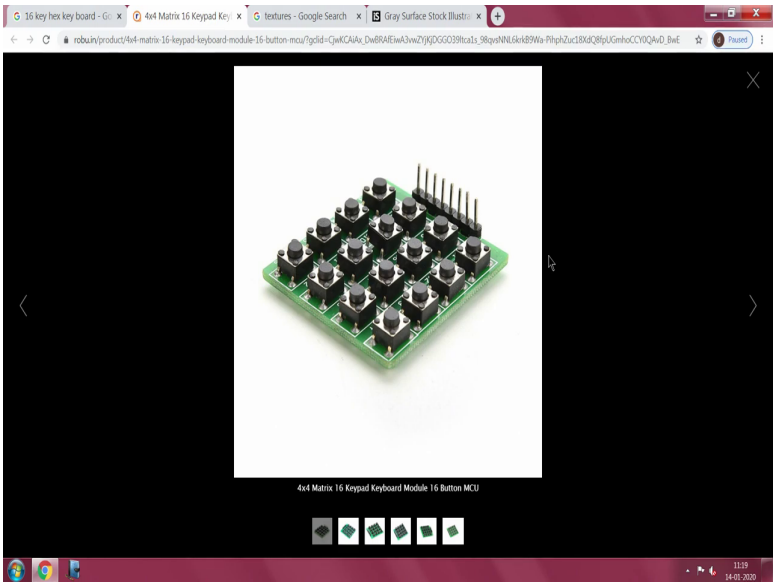

This is what you are likely to find on your most of the kits, you have noticed here there are 16 keys and all of them are made in a simple matrix, because from a learning point of view its very very convenient for us that we need to learn these things.

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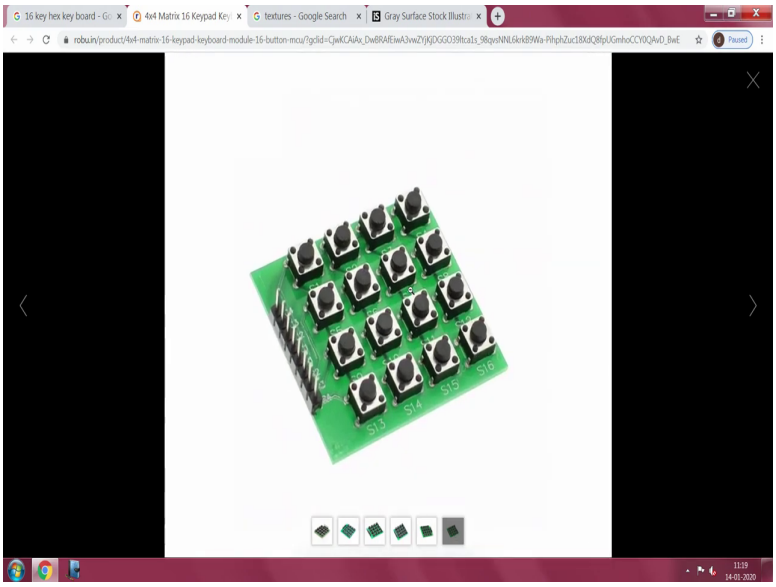

And sometimes the designations are given here starting from S 1 to S 16. So, in this case randomly they have given here, this just is and this being a raw keyboard there are no other things are attached to this except the numbers.

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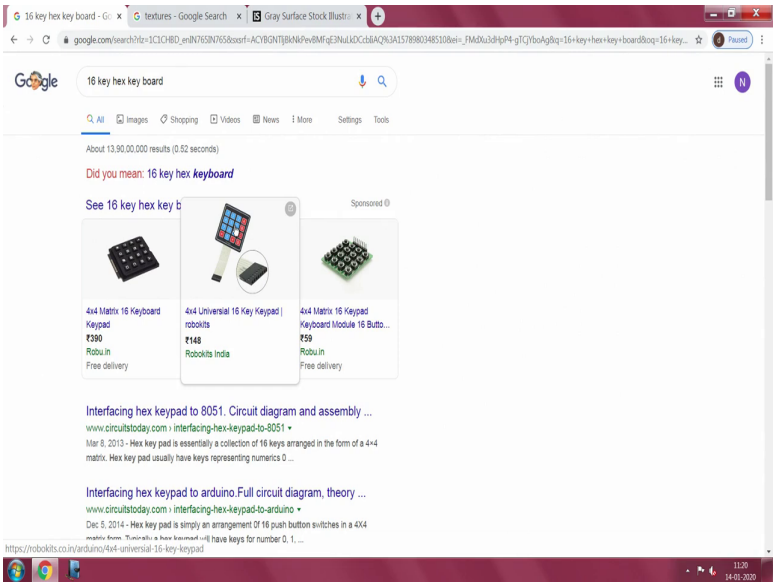

Now when I go back, if I see the keyboard layout, you see this beautiful keypad.

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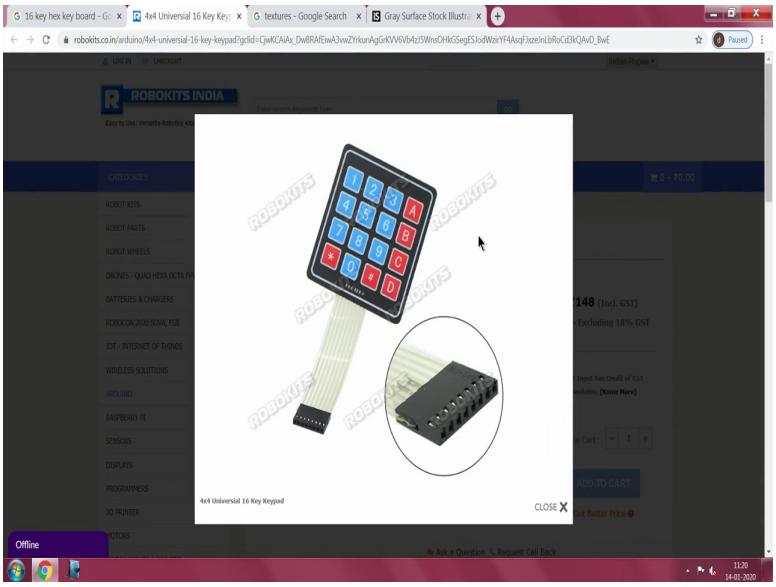

You have noticed that this is what you are likely to find in a any other place, but here there is a small I would not call it a gimmick or anything I mean sorry it is called gimmick or gimmick, whatever I would like to point out is this is not much to do with the layout except that I would like to say you see the way they have been organized here. In fact, this left to portion of it has been made to look like a part of old DTMF keyboard and then you have this A B C D s, this is a very unusual combination very rarely we have such combinations.

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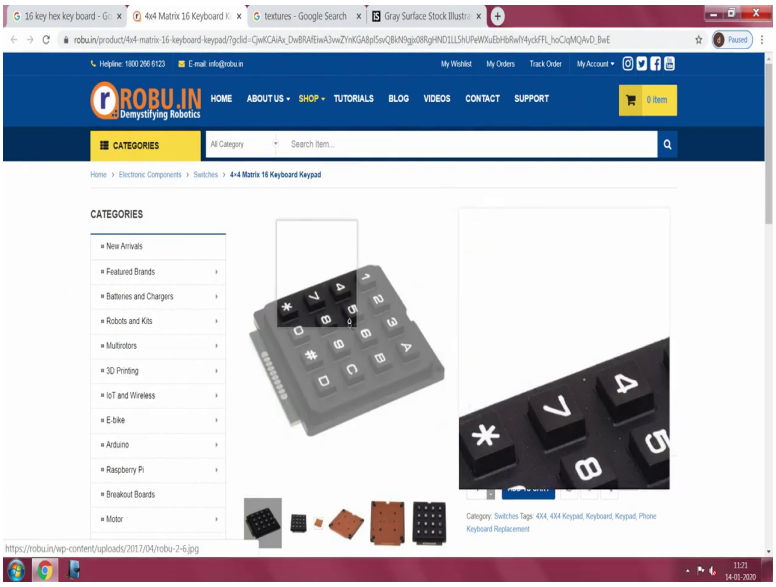

But, if you go out you get large number of these things where you have seen this something like this is there. And all we need is probably a drawing to take care of all these things.

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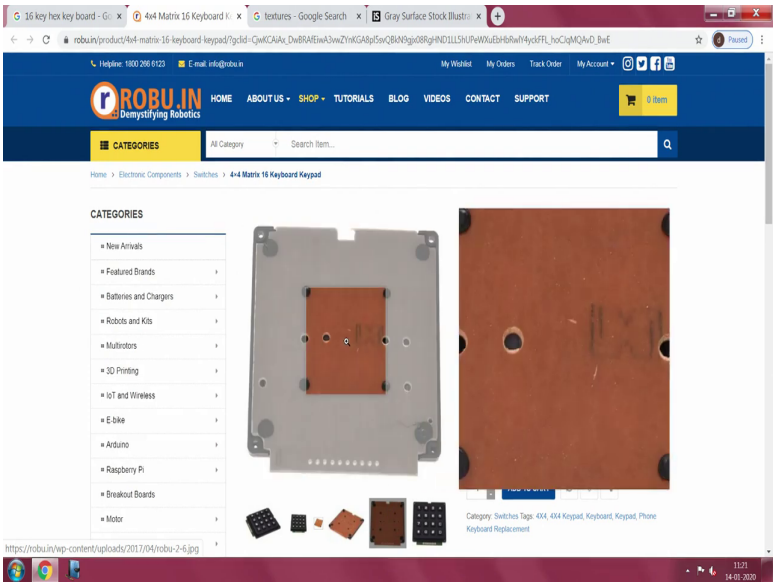

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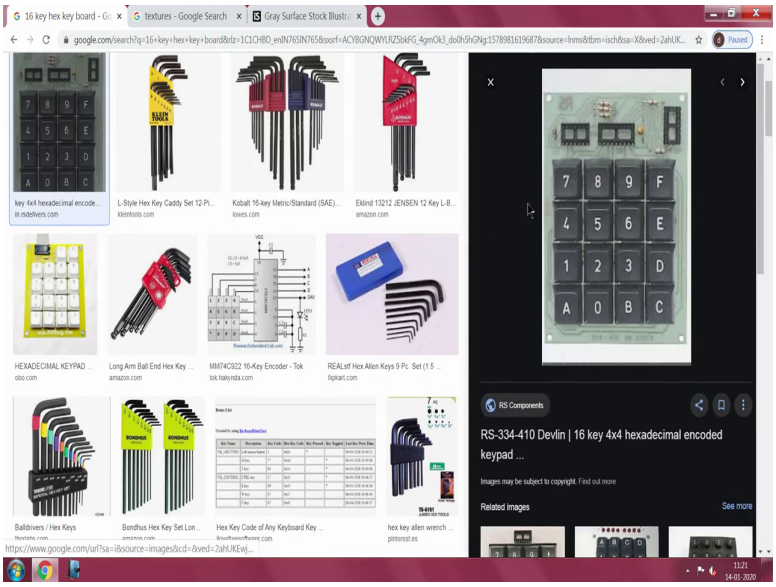

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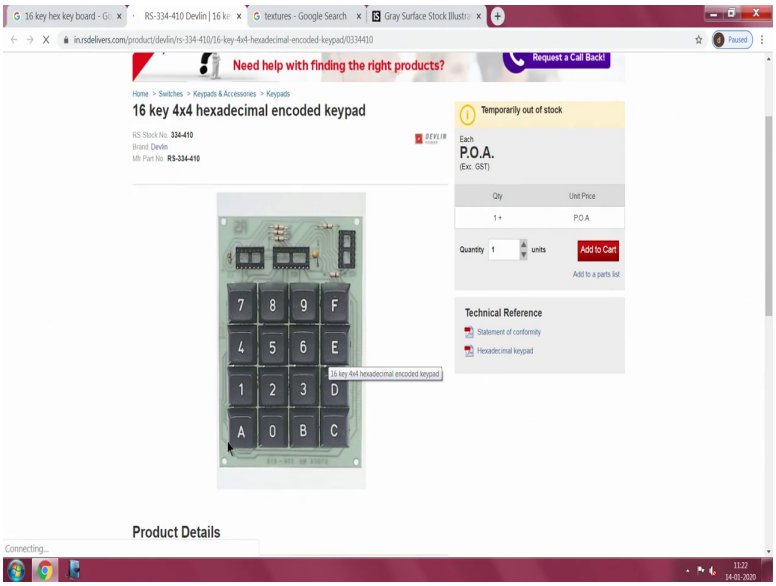

And then this is traditionally what you would have found in a kit, the old 80 50 or 80, even older board you see here slightly. What has been done here is nearly everything has been made here, sometimes this 0 instead of being here it will be here and ABCDEF are here.

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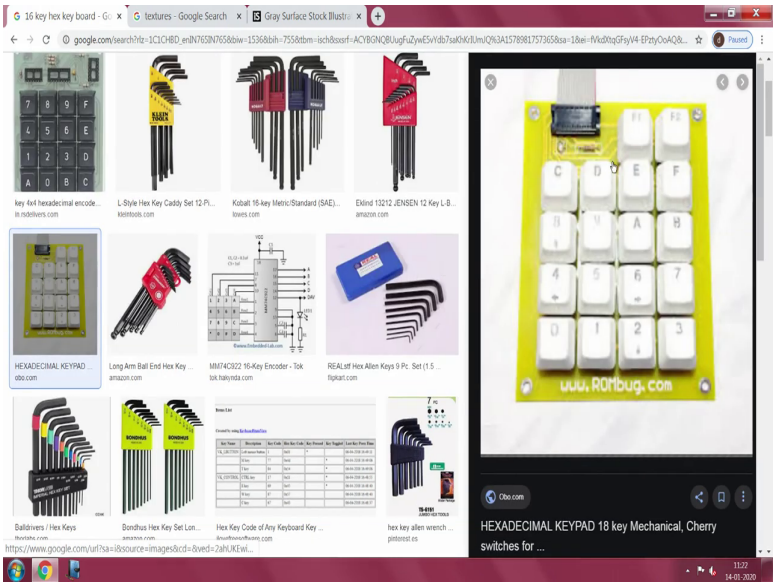

Now, why I wanted to present to you this is saying this coming back to my. See here, so many other options have been added they have been added a small other than the 0 to 9 slightly different operations have been given, why I cannot say why these things are important, but they are important.

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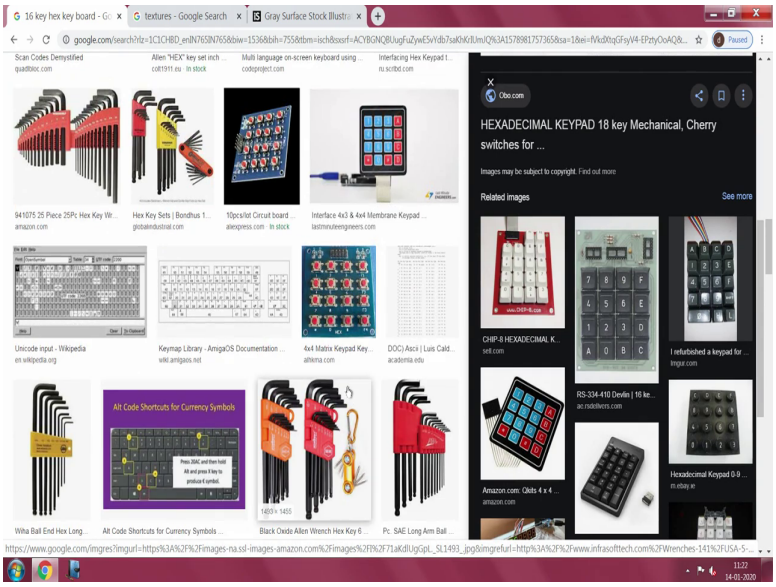

There and slightly different from the conventional QWERTY keyboards we are all used to.

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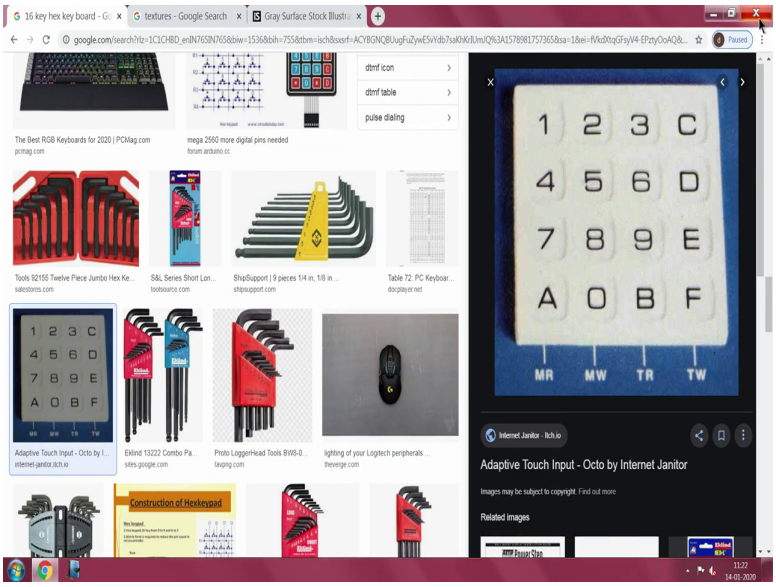

This seems to be a very very normal adaptive touch I leave it here. Now kindly get back to my other what you call this design keyboard sir can you please show the other one, in the case while at one level it does look it is not really that as we would want it.

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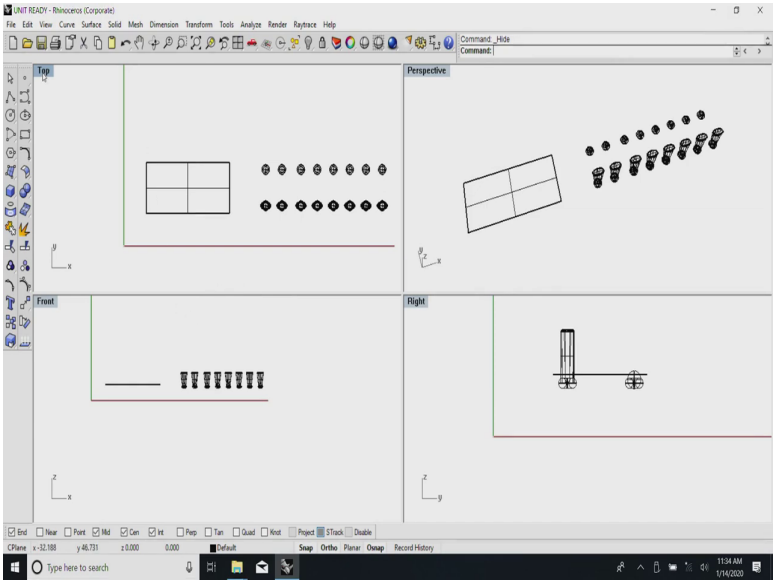

So, I will probably now, see whether I can the same elements I can rearrange them to make it slightly different.

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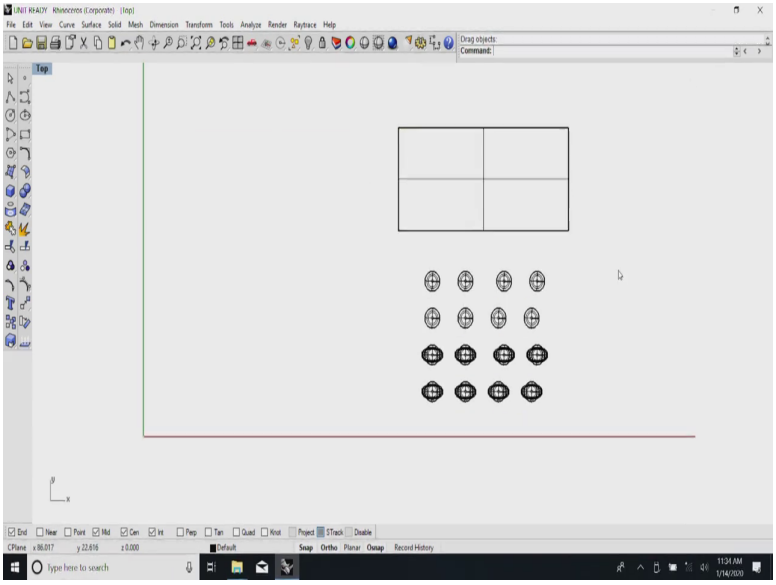

In this case, all these keys I will make these keys in two rows.

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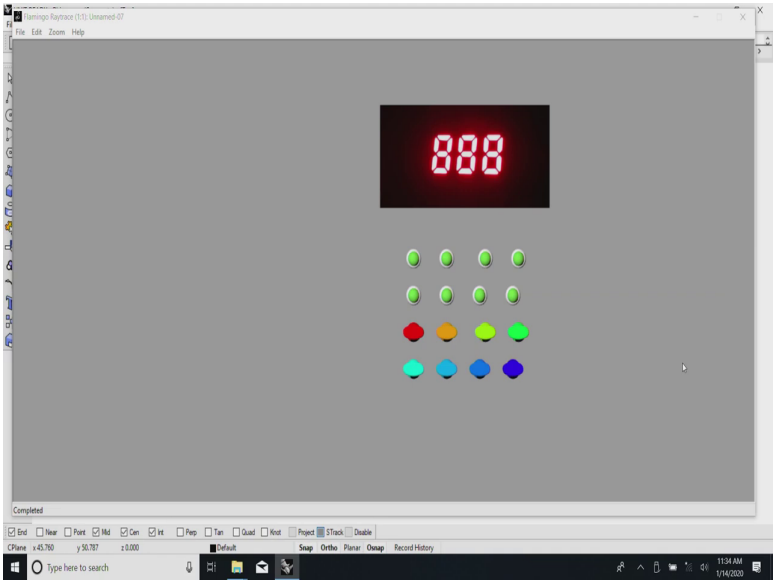

Looks different and already I have another variant of it. Looks ok, is it not? But it is really not that as we would like to think, because there is no 1 is to 1 correspondence between the switches and the corresponding display there the LED. So; obviously, it is not a I mean it is one of the solutions, but it still continues to be a freak solution.

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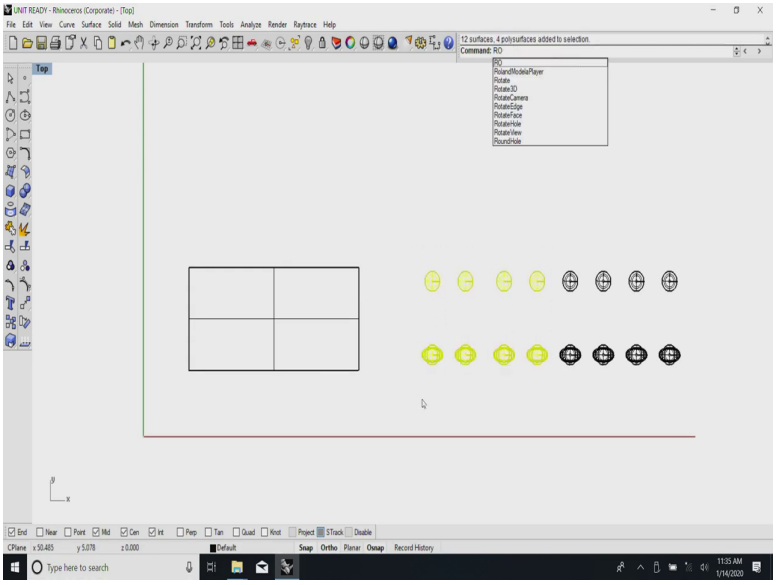

Maybe, it would have been better instead I move all these things and make it instead I rotate it about this. I do the same thing for this here.

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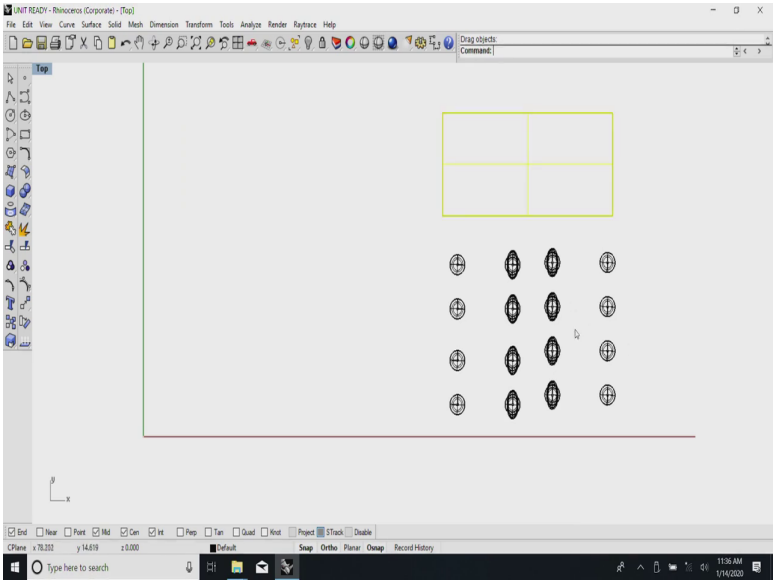

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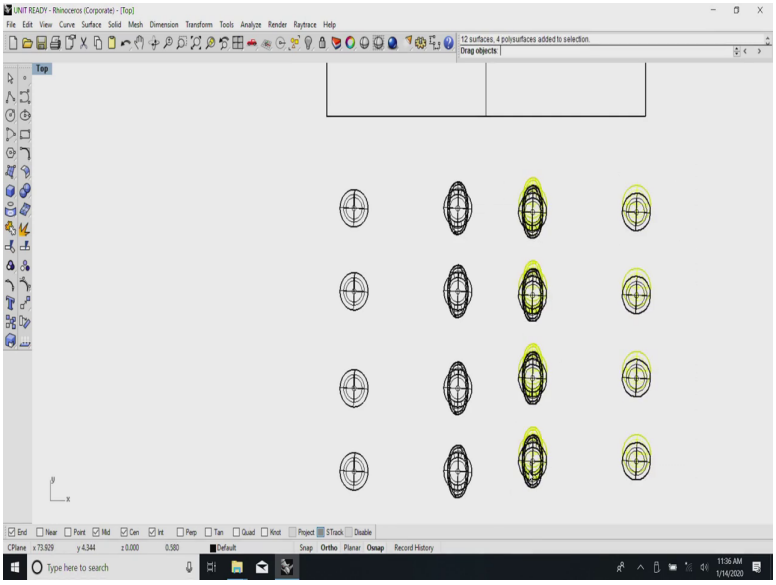

Yes I agree it is not the best, but still at least to me it looks slightly better.

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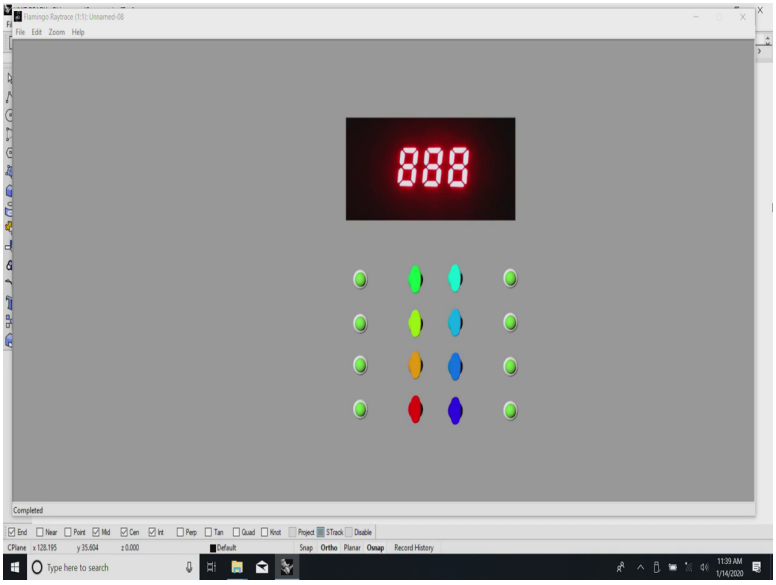

By just rearranging this things I have made something which has got a slightly different type of aspect ratio. You have seen this again, the focus in this is nothing to do with the what do you call other thing. In this case I am trying to show you that once if make one of these small components the necessary drawing with it, I can carry around everything with it and selectively if I what do you call enable or disable the connected layers at the back.

I can get a beautiful drilling drawing which can be fabricated and if I take a printout of whatever is there I can probably make a small unit and show it to handy unit the especially physical dimensions and so on and show it to my other team members which I feel is a reasonably useful and good item. Now, we come to the other aspect of it saying if you go to the internet, we have a very large number of textures.

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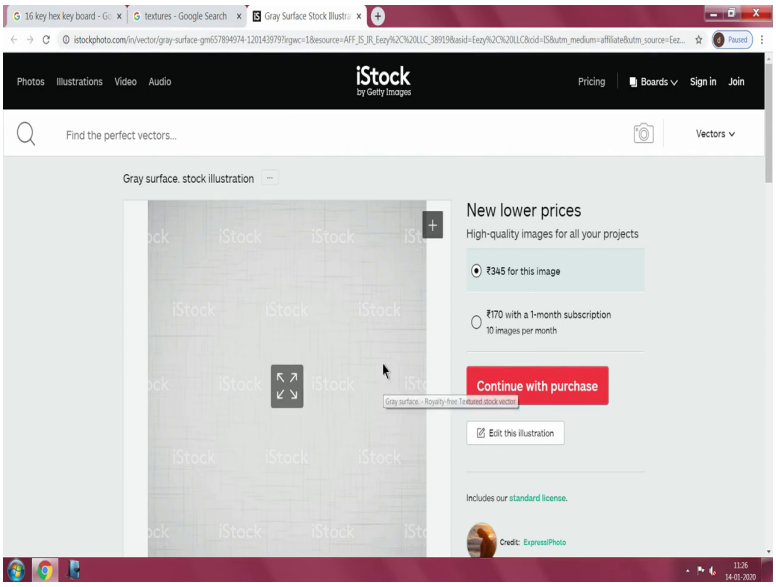

I will just go back to this you see this here, I have this large number of textures which are available here. Can you see here?

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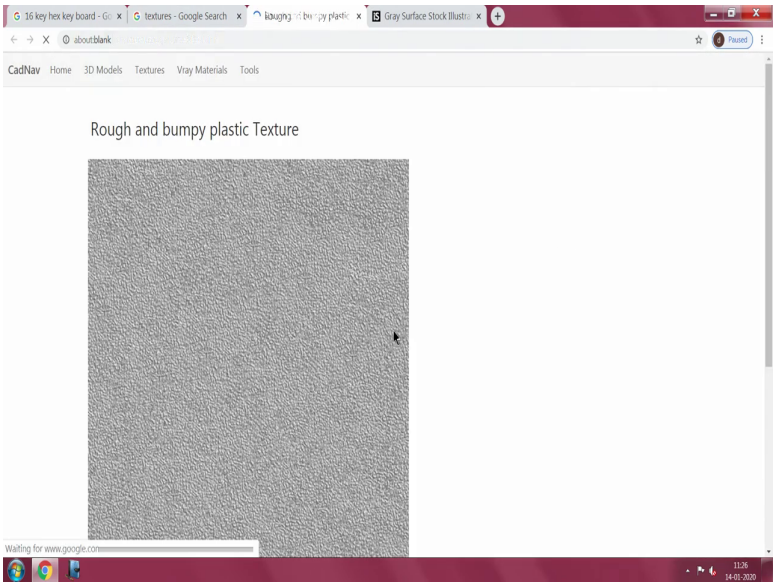

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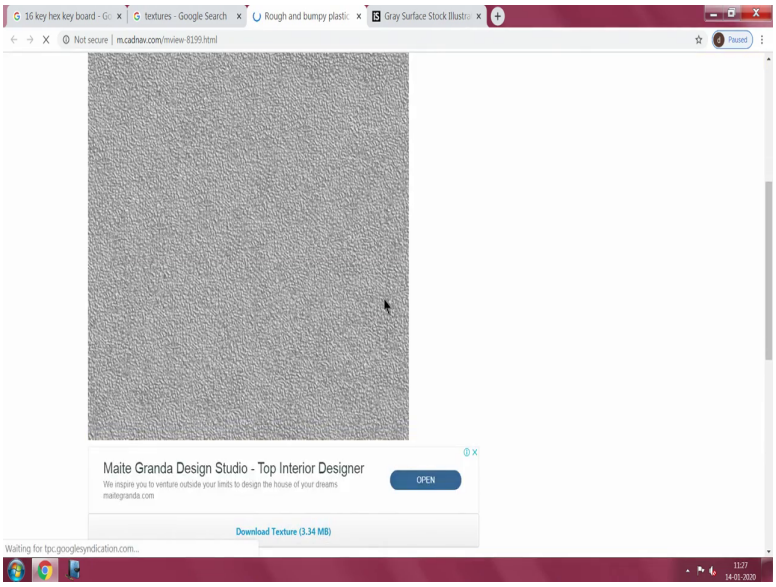

So, rough and bumpy plastic it says. These textures can directly be applied to that background which is been shown there. Hence, you can even print this onto those things. I hope you are with me, you can print this texture along with the other front panel and the items which I have shown there. Make a very simple cardboard this thing all with the local resources available with you.

You need not physically try to make it and with the same thing just in front of you I showed you how I could play with the small what you call elements around I can keep coming out with alternatives and remove certain things which are obviously not that what do you call very very presentable or nice and I can even have what is looking like a implementable thing and the second point of it is in a very qualitative way I can remove certain what do you call what look like freak solutions.

You understand there, I try to you know put all the those devices in a row and then put the switches, now we see the correspondences last instead if I rotate it the correspondence is still maintained, but still there are certain things to be worked about, but only thing you will notice is it looks a little like what we can do.

Now, see here this looks very much like a small unit which can easily be produced as we like. And if you apply a texture to the that back device at the back, we also have a beautiful working model, not physically working at least something which is a touch and feel model and all it needs is a very simple low cost printer and all the every item which you have made here only one instance need to be met.

For example, my display that display three characters have been just brought from there from the internet some where I have taken it from of the one of the suppliers and here yesterday if you remember, I was talking to about this justifying or making these things interesting.

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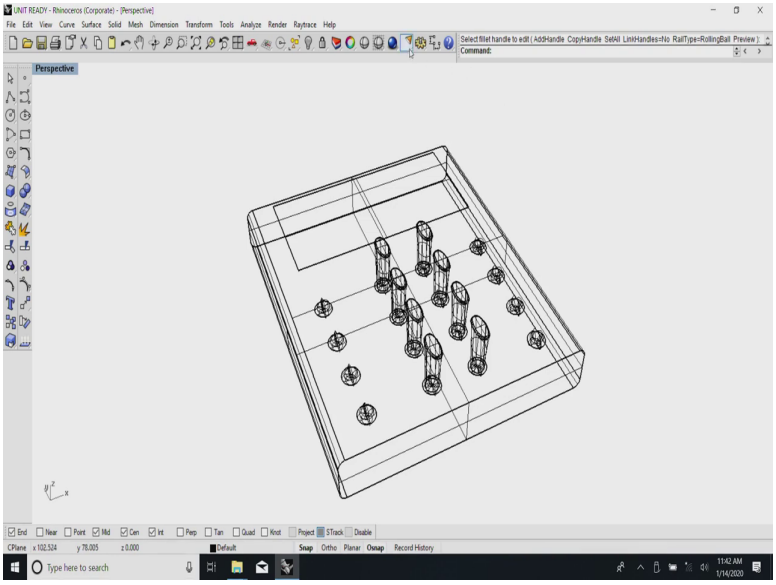

So, if I have to make, I will just see if I will be able to it looks approximately like the type of box you can think about.

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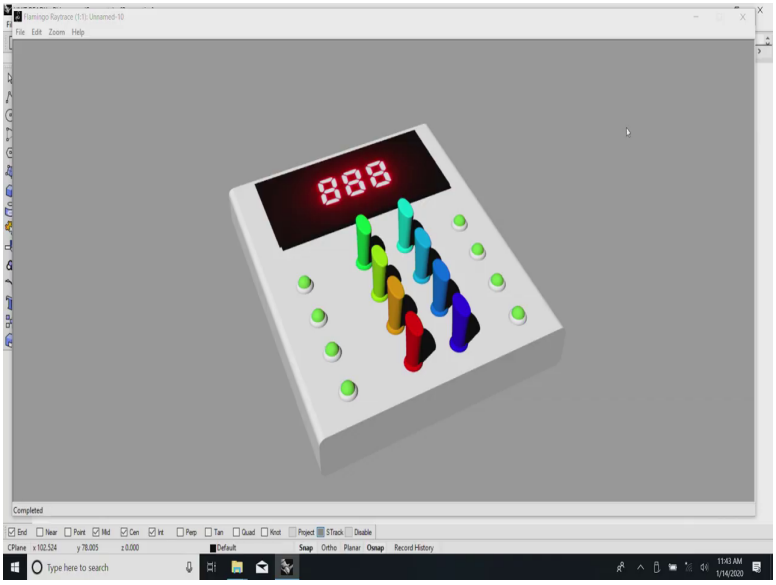

It is almost ready. So, you can have it directly on the screen and you will notice that there is various things here are looking too sharp would it make sense instead if I try to fillet these edges slightly more presentable unit. Right (Refer Time: 25:24) I mean this is no magic or anything I am sure all of you would like it.

In this case I happen to have used a program which for which you know as a teacher, I have had a access otherwise you can freely download it. The only thing which I would like to one more time you know repeat about it is saying, we have all the various small elements which you frequently use while these are all front panel elements if when they are front panel elements they have something to do with your interaction and organization of the control panel.

And this is how what do you call life started 30 or 40 years back before this full fledged apps and these sort of things you know did not come about. Now some of those things that are also available, but you will notice that if you want to make the childs this thing, I mean it is some small learning toy if you wanted to make still it is too expensive to go and get them addicted to a what do you call a dumb smartphone.

It is much better the children are not allowed to play with the other devices and first of all nothing they are very very inexpensive and you would not mind handing it over to a child to play with it. So, several of days, non expensive and you know something which goes through the roof are all can easily be made.

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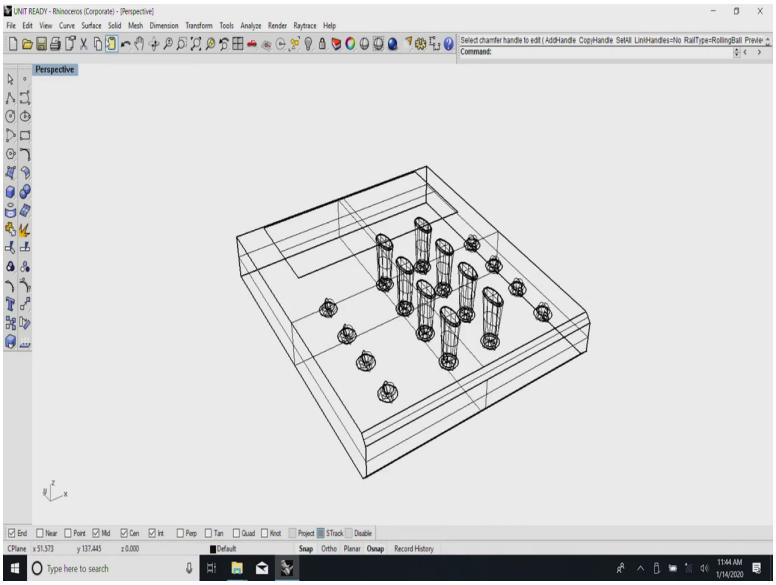

So, I if you now go back to this here is it that is one of the things, now imagine I would like to know I will undo this and then I go to the other thing saying probably if I put the chamfer edge, see slightly different look has happened already.

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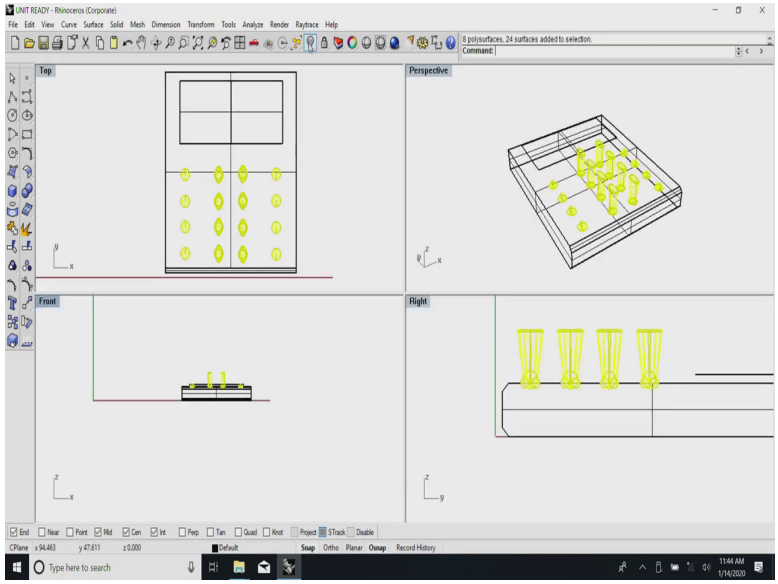

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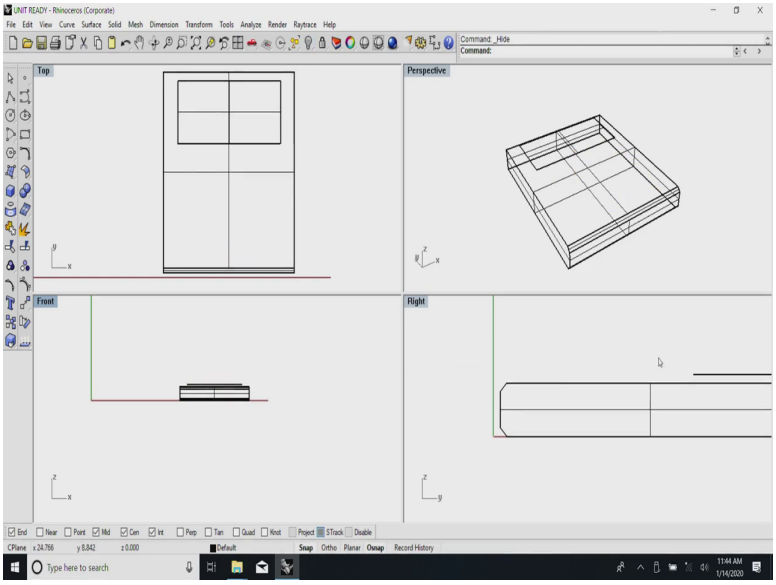

Now, temporarily, I will hide these various details which are here.

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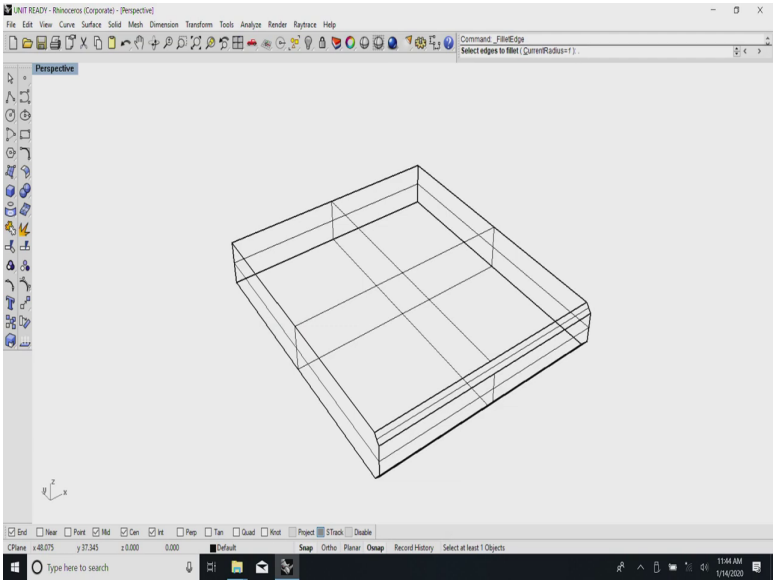

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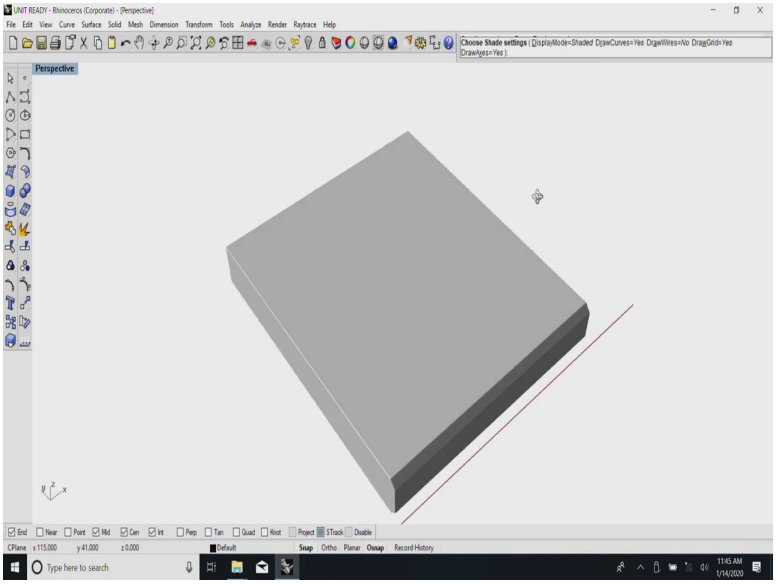

And try to now try to give a softer to the whole equipment, there may be a small error kindly because it sometimes it not able to build those things you see here now.

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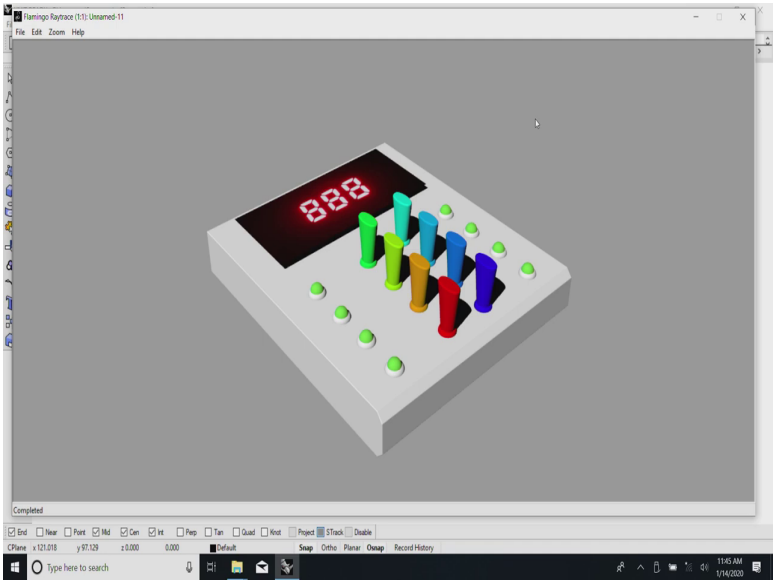

Slightly, all the corners are little rounded. Front and the back has been chamfered like this. This part of it is a little do with aesthetics design a little to with how we actually handle these objects and so on. So, in the end without too much effort you have all these things ready with you. The starting point of course, is that you should appreciate that you as the designer should be on top. The designer should be able to bring things down and this is genuinely the top down design approach we are talking about.

And as one of the designer, so remember that you are in a team you should be sensitized to how the other people will work with it saying. Now, if you give any of these things and in. In fact, all those solid models and to the people downstream, they can very easily get on with manufacturing the thing and there will be very negligible a very small amount of surprises in spite of it.

If some products fail it is not the design area that failure has happened the failure has happened in the market or sales area because, we could not foresee what it is in spite of all the what you call hype around successful products a lot of unsuccessful products also have been there from anything best known is probably automobiles then you also know the various types of cell phones. And finally, it is a wonder that a simple flat brick like thing is the current cell phone and suddenly, the functionality has become improved. And now people talk about all that what you call flexible and all are not really a point.

So, I will stop here thank you. I will get along well what I have covered here in this is saying, how to make this simple solid models, how you can give slight different things and color and then how you can add texture to it how you can make a something which is directly on the screen how you can interact with your teammates and it is all very low resource consuming except your time nothing else is required and somebody can make all those items and keep it to you.

And the same files can you can extract the electrical layout like I showed you all those what do you call Arduino items and all that you can extract all this information and happily you will be able to maintain these things for a long time.

Thank you, we will meet again