Microsensors, Implantable Devices and Rodent Surgeries for Biomedical Applications
TA: Ajay Krishnan A, Course Instructor: Dr. Hardik J. Pandya
Department of Electronic Systems Engineering
Indian Institute of Science, Bangalore
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Welcome to this class. In this class, we will see a little bit about 3D printing. You have seen in detail how 3D printing works, whether we are looking at the history of 3D printing or subtractive or say additive manufacturing or types of 3D printing, whether it is SLS 3D printing, SLS 3D printing, or FDM 3D printing. We have also seen the modelling software, ah printing workflow, 3D printing techniques, application of 3D printing ah and how the solidity works demonstration ah has also been covered in the TA class. Now, this is a very small lab video where we will show you a quick demonstration of how the 3D printer works. So, you enjoy the video ah and see how the 3D printer that we have at our lab ah works ah and and do try to understand that whatever is taught in TA, how it will help to finally, design a casing or a component ah in which you can put your sensors or electronics.

So, it is like 3D prototyping right you need to have a prototype before we go for the mold and actual product. So, I hope you will like the lab video that we have recorded for you ah. Please see the video. Thank you very much.

Greetings everyone. Welcome back to our NPTEL lecture on 3D printers. In this lecture, we will be having a lab session on 3D printers. So, in our previous lab sessions, we have discussed different kinds of 3D printers, what are its advantages, disadvantages, and limitations and where all these 3D printers can be specifically used. Here we will be looking at SLA 3D printers.

SLA stands for stereolithography 3D printers. So, here we have a SLA 3D printer from Formlabs. The particular model is Formlabs 3BL. So, now we take a closer look at some of the important parts of a SLA 3D printer. So, on the top of the printer, we will be having our print bed.

It is here our print will be stuck onto while it is printing. On coming down at the bottom we will be having our resin vat. It is inside the resin vat we will be pouring our liquid resin which is a photopolymer. It can be either by automatic means or by manual means depending upon which kind of printer we are using. Formlabs 3BL will have an automatic feeding system where we will keep our resin cartridge and it will be automatically fed to the resin tank on demand.

So, beneath the resin tank, we will be having our laser processing unit or LPU. LPU consists of a complex laser system and optical arrangement. The optical arrangement is used to scan the laser dot in X and Y direction completing the cross-section of that particular layer. So, by scanning the entire cross-section we can convert that liquid resin into solid raw material. So, once every layer is completed our print bed will be raised by a particular amount for example 0.

1 mm or even 0.025 mm and then there will be a gap between our resin bed the surface of the resin bed and our previously printed layer. So, in that gap, our new resin will be coming and then again the process repeats to create a model that we upload to our printer. So, each printer will have having different kind of GUI but the generic workflow remains the same. In our Formlabs 3BL, we have a printer GUI screen.

So, before putting it for printing we must make sure that our key components are in place like the print bed is locked, our resin bed is properly secured or our resin characteristic is in place and it has enough resin to complete the print. So, once making sure everything is done then we can put our print for printing. So, here I can just press the print button to start the printing. So, now a particular case this print will take around 1, 1 and a half hours to complete the printing. So, once it is done we will be assuming the lectures.

Now, that the print is completed we can remove the print from the print bed. We can see the print that is attached to the print bed. Now, we are removing it with a scrapper. Once the print is removed we must make sure to keep our print bed back to the printer itself. So, it will avoid any unnecessary dust on the print bed.

Now, we can see the residual resin that is stuck onto the printed part. So, we need to give it an IPA bath or a rubbing alcohol bath for around 50 minutes. So, here we have a rubbing alcohol station. At the bottom of this bath station, we will have blades that will be continuously rotating to create a vortex effect. So, it will make sure that IPA will reach every corner of our printed part to clean it thoroughly.

So, I am placing it in the station. We can keep it for around 50 minutes for a complete cleanup. Once the washing is completed I have kept the print part outside for around 30 minutes. So, it will help in evaporating of IPA. Now, we can remove the support materials.

So, I am using a snipping tool to cut the support materials. Once the support materials are removed if want we can give a little bit of sanding. So, we will be having much more smoother surface finish. Now, the final step is curing our printed part. We will be keeping

it under the UV light for around 30 minutes with a temperature of around 60 degrees Celsius to completely cure our part.

So, we will be having a UV squaring station here. We keep our parts here. Once squaring is completed your end up post-processing procedures are completed. So, now you can use this part in your actual use cases. This end-up procedure might differ a little bit depending on which kind of printer you are using, but the end-up workflow remains the same.

So, this is actually how you can convert your idea into a 3D part in the real world using SLA 3D printers. So, that is all for this lecture. If you have any doubts you can contact us through our portals. We will be happy to assist you. Thank you.