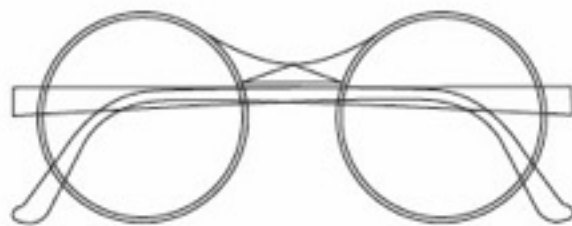


REPORT  
3D PRINTED GLASSES / A PROTOTYPE



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## 1.BENDING PROBLEM

Three factors play a role when it comes to the problem, that the object bends.

1. The long and flat composition of the object itself promotes bending.
2. The material thickness of the frame. thicker lines make the object more stabil and therefore less prone to bend.
3. Heating the buildplate is the main reason why the Object bends. This is a problem in itself, because a object with fine lines has naturally not alot of grip and needs a heated bed. Therefor I recommend to use tape and to heat the bed moderatly to about 40 to 50 degrees. If possible let the print cool down while it is still attached to the bed and tape.

Material: Pla Termo  
Printer: Ultimaker 2  
Programm: Cura



## 2.GAP PROBLEM

The reason why the Gap problem occurs is pretty simple. The width of the nozzle is 0.4 millimeters. The outer shell thickness is in picture 1 is 0.8 millimeters and the width of the line is about 2.2 millimeters. What happens is , that the gap between the two shell is 0.6 millimeters ( $2.2\text{mm} - (0.8\text{mm} + 0.8\text{mm}) = 0.6\text{mm}$ ). In my interpretation the programm interpreates this space as too small to fill it up with material, Because we have an infill of 25%. As a result it sees it as massiv and doesn't add a toplayer.

The Solution was simply to increase the shellthickness.

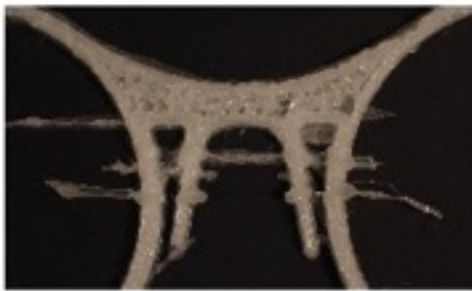
Material: Pla black  
Printer: Wanhao  
Programm: MakerBot



## 4.HEAD MOVEMENT PROBLEM

Often we find an excess of material, where we don't want it. This has something to do with the way the head travels. Either you change the settings of the way the head travels, or you change the printing settings. In my case I increased the Ven speed, and slowed the outline speed down in order to improve my print. The result is that the material is getting cooled and has more time to settle down.

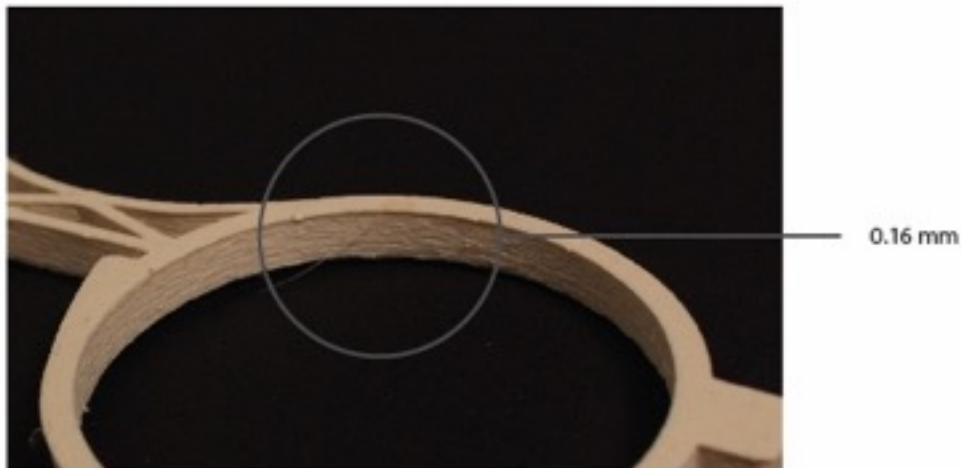
This worked on the Wanhao aswell on the Ultimaker.



### 3.LINE PROBLEM

Too many lines make the model look bad. The main Problem is usually the layerthickness, which is adjustable from 0.06mm to 0.2mm. The best results and my personal "sweetspot" is at about 0.1mm. Under 0.06 I couldn't see significant changes, just that the print time increases. Especially with the flex material the results were good at 0.1mm layerthickness.

Material: Flex white  
Printer: Ultimaker 2  
Programm: Cura



## 5. MATERIALS AND RESULTS ULTIMAKER



Thermo material.

For this Material I used the recommended standard setting. It's a little bit see through if it gets warm, so I increased the outer shell thickness to 1.2mm in order to hide the infill structure.



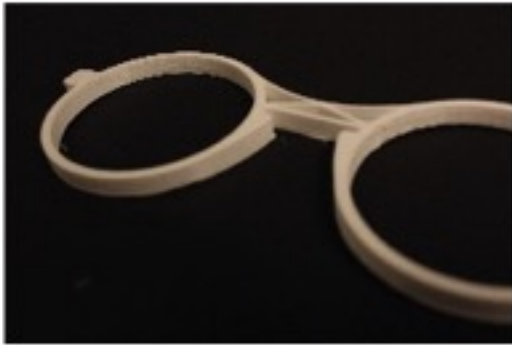
PLA white.

I think the white PLA was a bit lower in quality. The settings were set for a qualitatively high print, still the surfaces were very ruff and the lines very well visible.



PLA white 2.

This seems to be another white PLA, because with the same settings the print got much better.



#### Flex white.

With the white Flex material I was able to get very good prints. I used the standart settings of the PLA and just cooled the bed a bit down on 30 degrees, plus I used tape. This material is very easy removable from the tape.



#### Pla transparant.

This material prints very well. Just like the good Pla white.

#### Hips White.

I forgot to take a picute, but anyways it was almost impossible to print with hips. it just would not stuck to the tape or bed. Even with a 80 degree hot bed, tape and some glew it lost contact to the bed after a few layers.



## 6.MATERIALS AND RESULTS WANHAO



Pla black.

This is an example, that you can make good prints in a Wanhao. The glasses are a little bit bend, but that's my fault, because I took the print out while it was still warm. So in the process of cooling down it started to bend.

My theorie why the Wanhao usually don't print that well is that the cooling vens are not working was well as on the ultimaker. So increasing the cooling vens on a Wanhao sometimes makes a big difference. Furthermore I printed in this case with a nozzle heat of 215 instead of 210.



Pla white.

The Pla white printed ok. I'm not a hundred percent shure why the print is just 80 percent good, because I didn't change the settings compared to the black Pla.

## 8.THOUGHTS

I personally don't think that casual PLA 3d prints aren't good enough to produce sunglasses for a longterm use. In order to create a functional model it is a handy technology.

Furthermore I found the thermo material pretty inspiring. Especially for sunglasses. When you go in the sun it turns white and when you enter a room they get dark. this would be a great combination with actual lenses that change the color the wrong way round. So outside the glasses appear to be white, with dark lenses and when you enter a room they turn dark and the lenses transparent.

All in all the process of modeling with a 3d printer was not just handy to create the right form, but also an insiration for the final model.