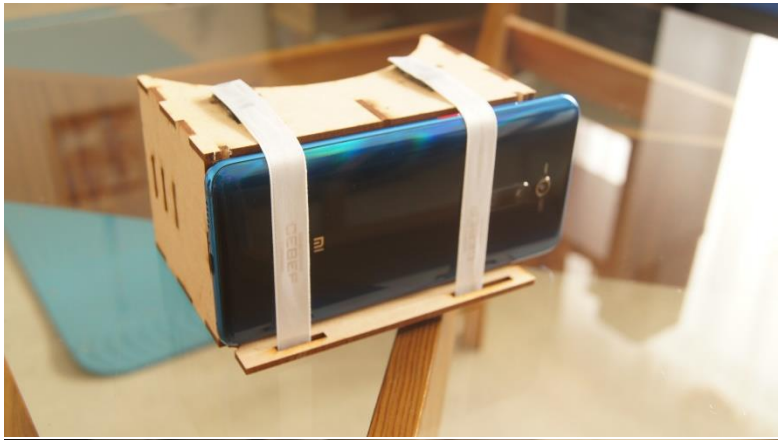
DIV virtual reality headset

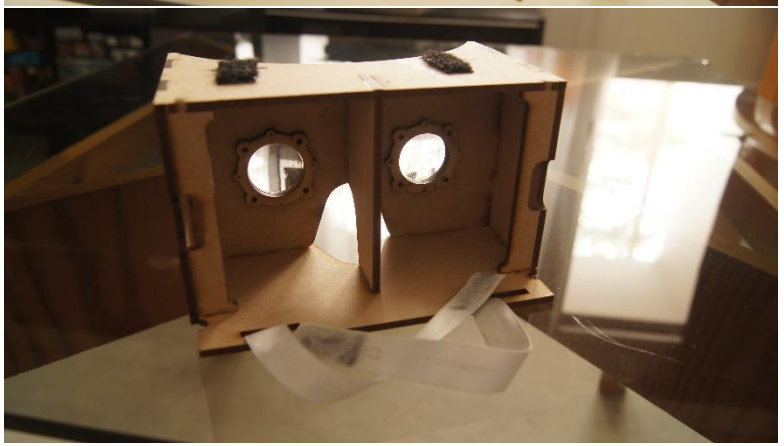
Materials:

- 3mm MDF: 280 x 265 mm – 1pcs
- 8mm clear acrylic: 36 x 36 mm – 2pcs
- Fabric strip: 200 mm – 2pcs
- Velcro (Textile ribbon hook&loop): 5mm – 2pcs
- Super glue
- PVA glue

Equipment:

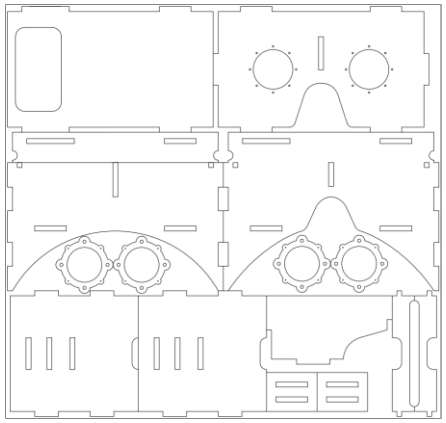
- Roland SRM-20 milling machine
- Epilog Fusion M2 40 (75W)
- Sandpaper: 400, 600, 800, 1000, 1200
- Hot air gun/ Gas torch
- Scissors



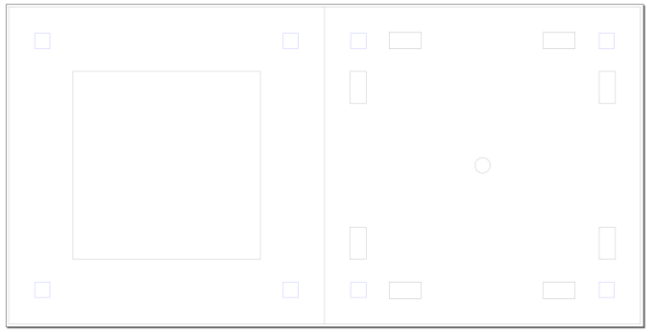


Instructions

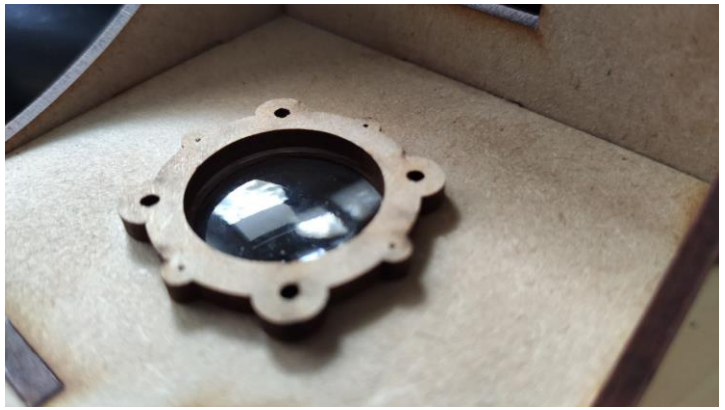
- Laser cut the VR set body from 3mm mdf (vr_set.pdf)



- Laser cut two 36 x 36 mm pieces of 8 mm clear acrylic – it is stock material for the lenses
- Laser cut frame.pdf from 3mm acrylic – this part helps to align lens stock material for double-side milling

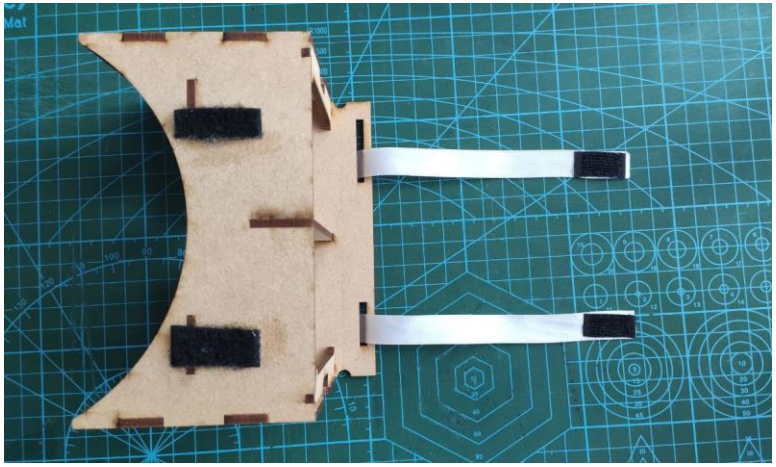


- Using double-sided tape and aligning pins put together the frame. Put double-sided tape on one side of the stock material for the lens and put it into the frame
- Place the frame with the blank into milling machine (Roland SRM-20 in our case)
- Mill one side of the lens (go to Lens manufacturing for more detailed instructions)
- Flip the blank in the frame and mill the second side of the lens
- Repeat the process for the second lens. **Do not remove the lens from the frame yet!**
- Using abrasive paper consistently from 400 to 1200 grit sand both sides of the lens
- Using heat gun or gas torch flame polish the lens. You need to gently heat the surface of the lens more than the melting point of acrylic (160°C, 320°F) but less than the boiling point (200°C, 392°F). It takes practice to make it right so it's recommended to try it on a test piece first
- Cut the lens from the frame
- Put the lens between mounting rings and fix them with PVA glue

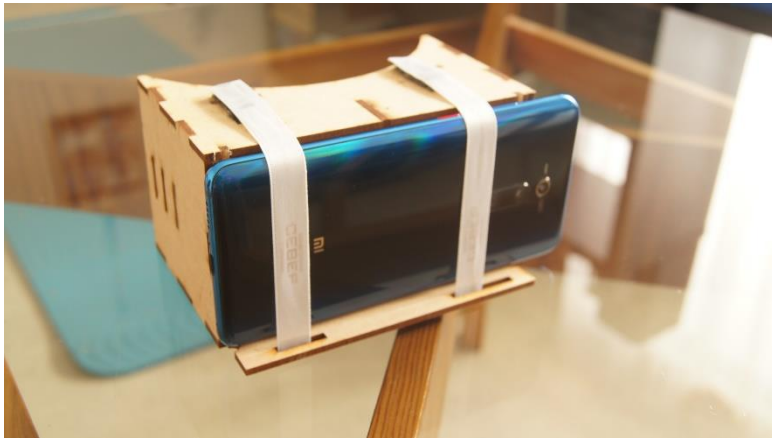


- Using PVA glue put the VR set frame together

- Glue Velcro pieces to the strips of fabric and to the VR set frame



- Measure the needed length for your phone and glue the other end of the fabric strip to the VR set frame
- Put your phone to the VR set



LENS MANUFACTORING

Here I will explain how to mill a lens from a clear acrylic stock.

Acrylic refractive index: 1.492

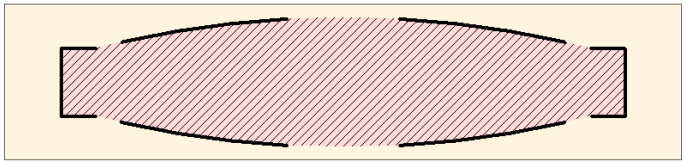
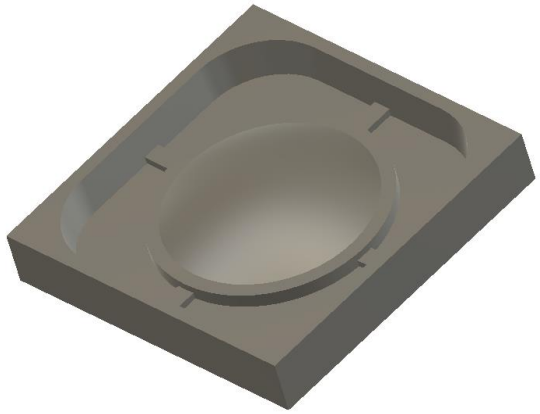
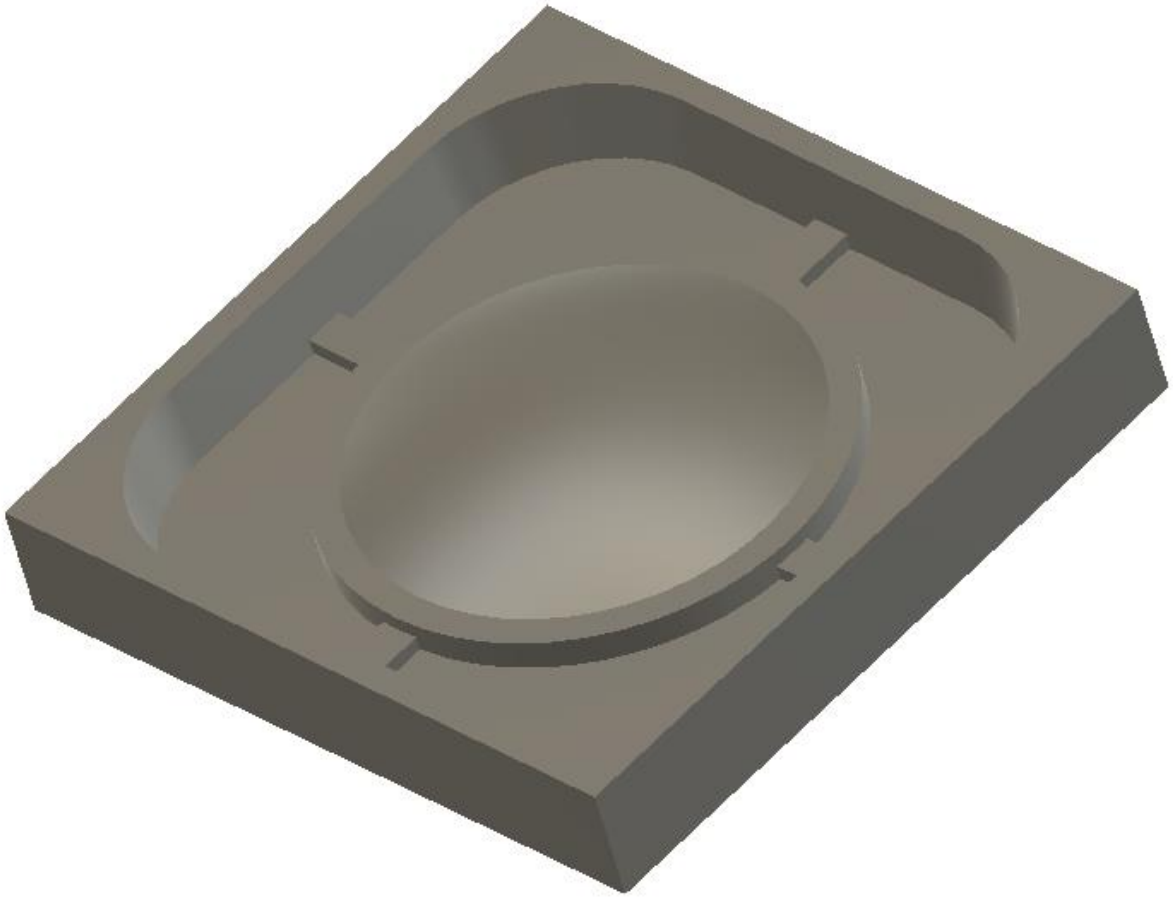
I will use:

- Roland SRM-20 milling machine for milling the lens
- 8 mm clear acrylic as lens material
- 3 mm acrylic to make a frame for double-sided milling
- Fusion 360 for the lens design
- Inkscape to create files for laser cutting
- **Modela player** and **V-Panel** prepare my model for the milling and to operate the milling machine
- Epilog Fusion M2 40 (75W) to cut the blanc and the frame
- S andpaper: 400, 600, 800, 1000, 1200 grit, hot air gun/ gas torch to polish the lens

Effective focal length **f** is given by the Lensmaker's equation where **n** is the refractive index of the lens medium, R1 and R2 - Radius of curvature:

$$\frac{1}{f} = (n-1)\left(\frac{1}{R_1} - \frac{1}{R_2} + \frac{(n-1)d}{nR_1R_2}\right)$$

The lens I designed for this project is 23mm wide and has 45mm focal length. The lens is symmetric so R1=R2=45mm



To make the milling process easier I split the lens in half and designed a frame around it. This is the model I used to mill the lens.