

# Assignment 2: Modelling with OpenSCAD

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## The design

I wish to model and fabricate something that is truly useful in daily life. The earbud holder came into my mind.

The earbud case (figure 1) is not convenient to use or carry around: it is large and has a transparent lid that needs to be opened and closed every time when taking out the earbuds.



Figure 1. Original earbud case (<http://www.apptactics.net/wp-content/uploads/2014/03/EarPods.jpg>)

The new earbud holder is smaller and much easier to use as shown in figure 2. Even a few of my friends requested me to print the same for them.



Figure 1. 3D printed earbud holder (photo taken by myself, with background removed in MS Word)

The model views are shown below in 3D builder viewport:



Figure 1. Front view of the earbud holder (screenshot from 3D Builder)

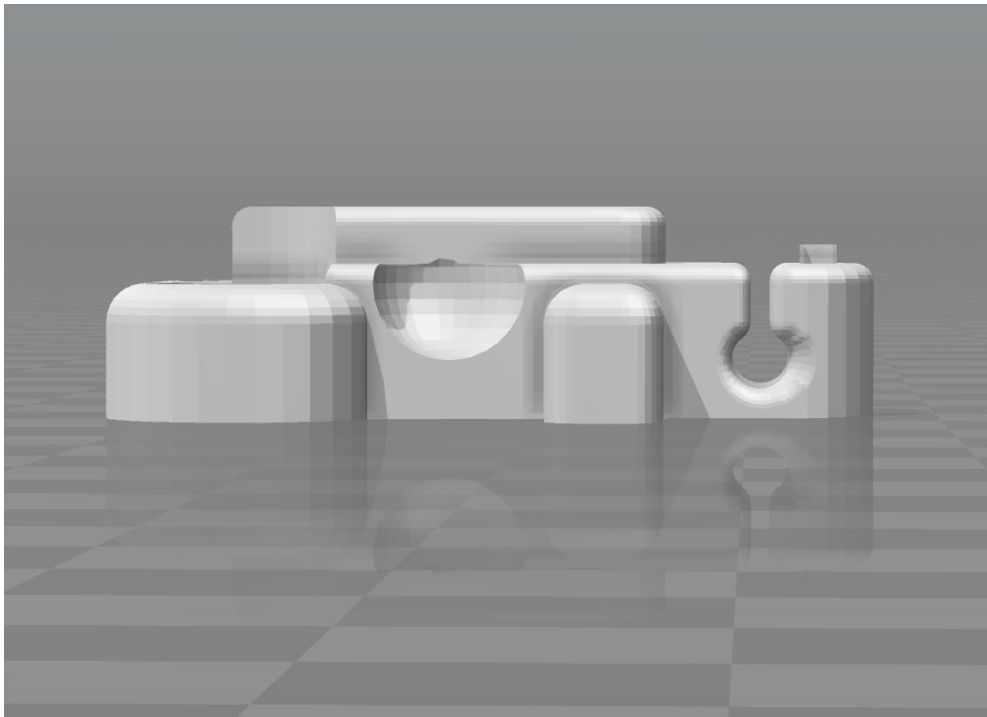


Figure 1. Side view of the earbud holder (screenshot from 3D Builder)

## Design considerations

- **Use of loops:** For loops are used to avoid code repetition, reduce the code length, and create a neater structure by reusing the same code blocks as much as possible
- **Use of CSG:** Constructive solid geometry is used to create complex and interesting shapes in the earbud holder. I divided the holder into “base” (which is further divided into top, middle, and bottom), “top\_divider” and “subtracted\_shape”. Union and difference are the two operations used to combine the basic modules together.
- **Modular:** the entire code for the holder is encapsulated in the “earbud\_holder” module, which has the following modules:
  - basic\_shape
    - base\_top
    - base\_middle
    - base\_bottom
  - top\_divider
  - subtracted\_shape
    - earbud\_container
    - fingertip\_container
  - text
- **Advanced modelling:** to increase the complexity and ease of use of the design, “hull” and “minkowski” are used extensively to create rounded corners and more smooth structure. Text are also added for customization.
- **Adjustable parameters:** height, earbud\_radius, and text\_content are the three parameters that may be adjusted directly in the earbud\_holder module. The details of the parameters, the approximate range, as well as examples of the same design with different parameters will be shown in the extra credit section below.

## References that I found particularly helpful for completing this assignment

Lecture notes & course webpage: <http://people.sutd.edu.sg/~saikit/courses/01.110/>

MankatiUM manual in Fab Lab: <http://10.12.147.144/mankati-fullscale-xt/slicing-mankatium/>

Sample of other earbud holder (no source code available; it is used for reverse-engineering):  
<https://www.thingiverse.com/thing:13678>

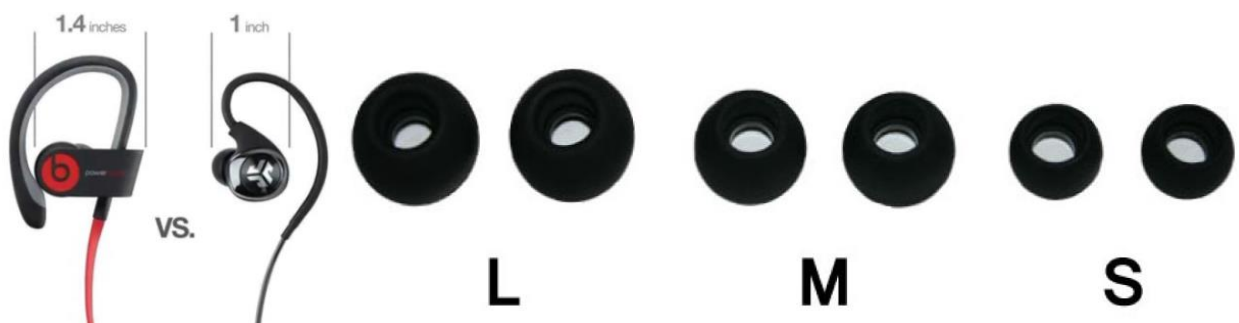
**Known problems with my code:** none, as far as I know

### Extra credit

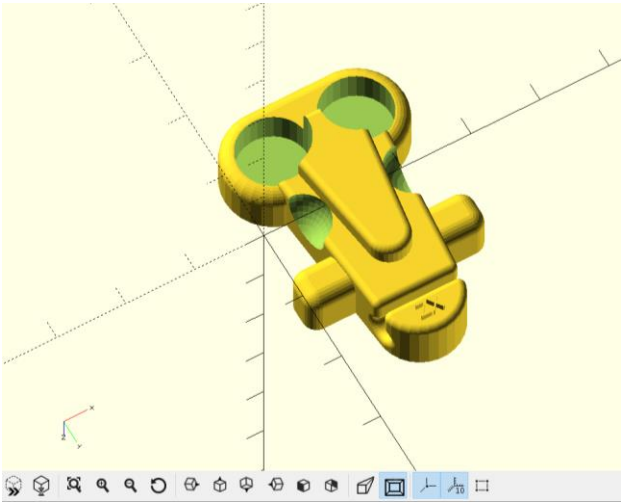
The design includes parts that are closely linked to each other, i.e. the earbuds and the wire that need to exactly fit into the holder. To achieve this, I added tolerance to the modelled sizing (earbud radius, wire separator height etc) and printed small samples to test the fit.



The adjustable parameters include height and earbud radius, to accommodate different earbud designs and sizes as shown:

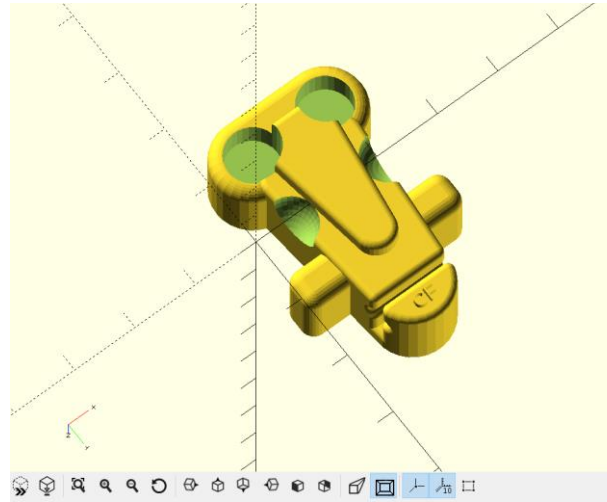


Examples of designs with different parameter:



Design A:

- Height: 5
- Earbud\_radius: 5
- Text\_content: "ZX"



Design B:

- Height: 10
- Earbud\_radius: 4
- Text\_content: "CF"