ShellShaper user guide

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1   Preparation

- You need MATLAB (version 2018b or later) on your computer. Including the curve fitting toolbox, and image processing toolbox.
- Download the MATLAB-files here: ShellShaper
- Save this in a subfolder of the folder called MATLAB.

2   Setup

1. Start MATLAB

2. Change directory to the folder where you saved the scripts and open the following file:

   `ShellShaper.m`

3. Change all paths of folders and files to ones that are correct for your file setup. All folders need to exist before running the program.

4. Make sure to not accidentally overwrite already existing files unless you want to. MATLAB will do this without asking for permission.

3 Running the program

Run the program by either pressing F5 or the big green arrow button in the tool strip. Make sure to do the above setup first, and that the current directory is set to the folder containing the scripts.

1. A new window opens containing an image from the selected image folder.

2. Click on the image to position the first point at the apex. Press enter when done.

3. Position the right and left extreme points of the latest whorls similar to figure 1b, enter will let you position the next one.

4. Position the circle, press enter, then extend the elliptic part and press enter, see figure 1b.

5. To get the scale correct, find a known distance using the line L, press enter, and input the value in the dialogue box.

6. There will be a pink shell model on top of the image. A dialogue window will open on top of the image asking if the model is good enough. You have 2 options:

   - Yes. This is good, saves images of model and model on original image, go to next one.
   - No. This is not good, will let you reposition all the objects to find a better approximation. This will also let you rotate the model to inspect it further. Reposition until happy, when it looks good press yes in the pop-up instead.

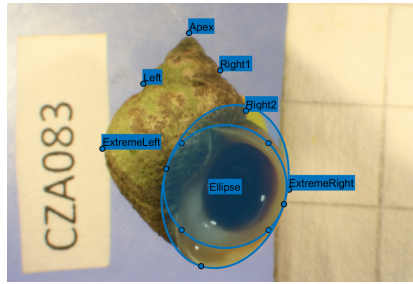7. This will open the next image in the folder, repeat procedure.
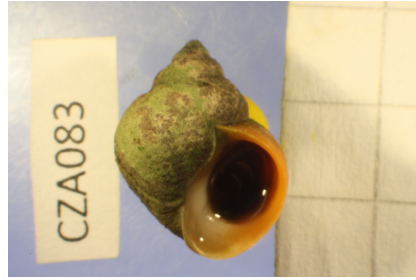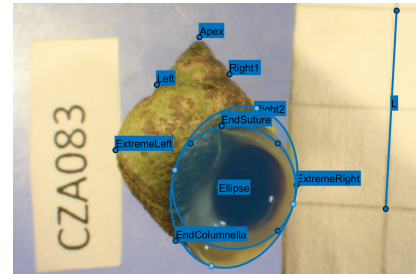
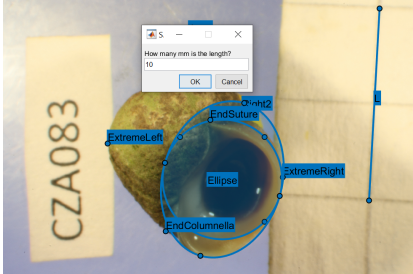(a) Original image.
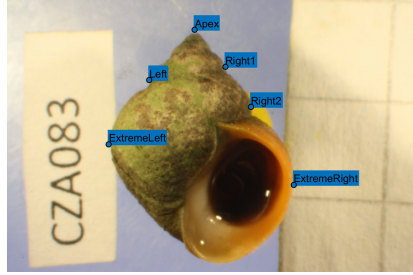
(b) Positioning the points.
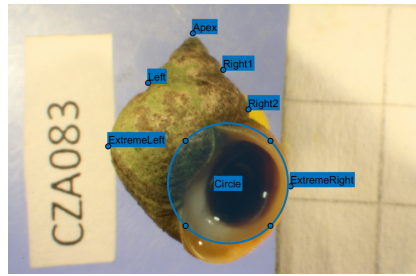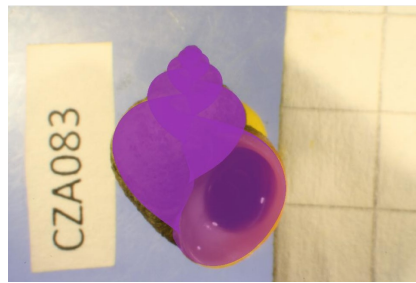
(c) Positioning the circle.

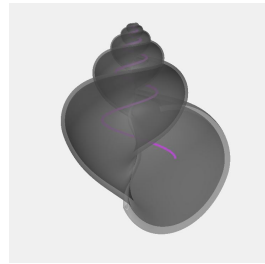(d) Rotation and extension of ellipse.

(e) Find a known length.

(f) Input value of length in mm.

(g) Model visualised on image.

(h) Semi-transparent model with internal spiral in pink.

Figure 1: Input image (a), interactive positioning of objects (b)-(f), output images (g)-(h).