dMapLE for Android

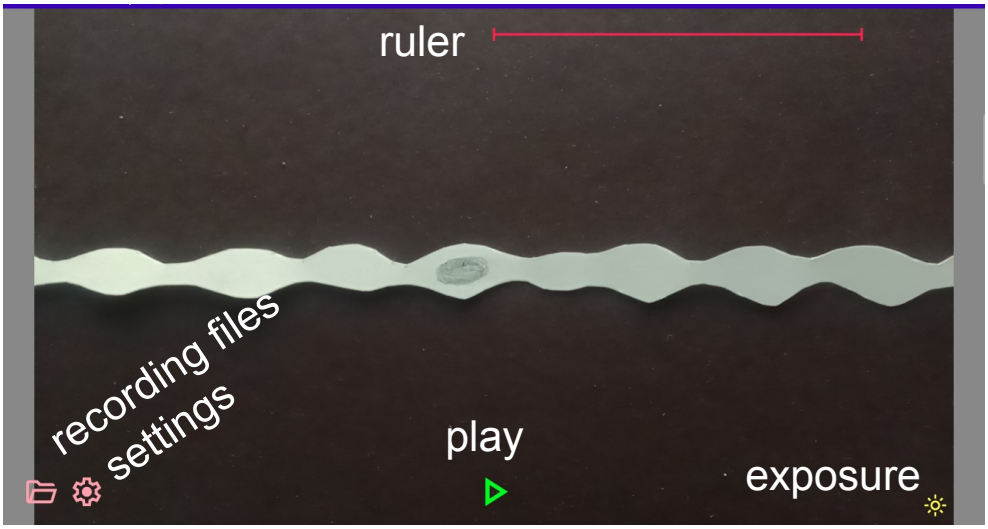
Version 1.0 User Guide

Some text

This is not meant as a guide/into to diameter mapping…. See ….

Create regions of interest (ROIs) to map

The app opens with a live feed of the camera's field of view (FOV) overlaid with buttons and a ruler.



Rectangular regions of interest (ROIs) are drawn on the FOV to define lengths of gut that are to be mapped:

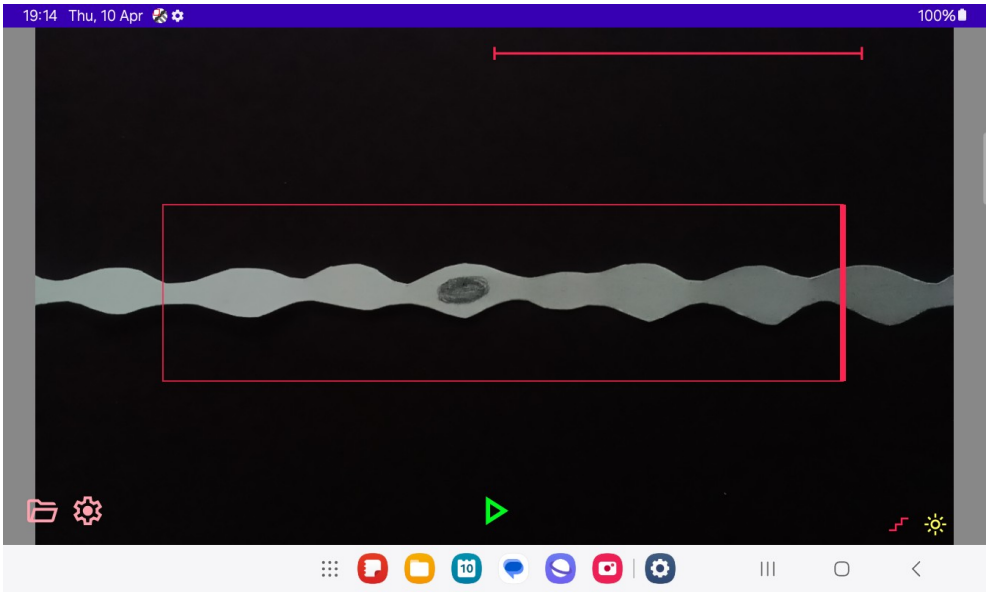
1) Double-tap anywhere on the FOV. An ROI appears as a red square centred on the tap.

2) With your finger on the centre of the ROI, drag to move the ROI about the FOV.

3) With your finger on an edge/corner of the ROI, drag to move that edge/corner, enlarging or contracting the ROI.

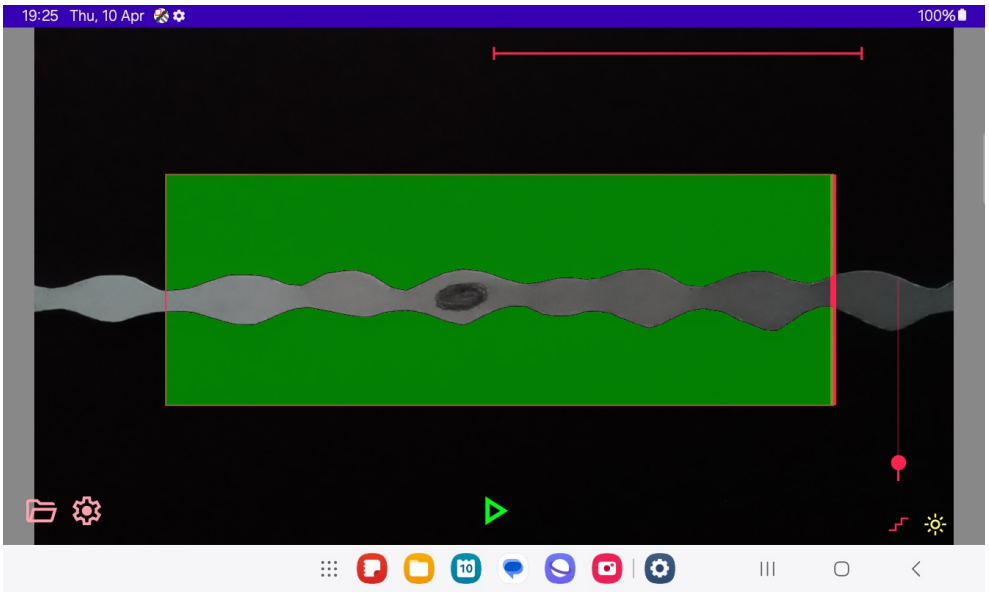
Adjust the ROI until it covers the length (*longitudinal axis*) of the gut you want to map. At at least one edge, the ROI must traverse the width (*transverse axis*) of the gut, with some space either side. Keep

your finger pressed down on this edge and the edge's line becomes thicker. This thicker edge is the *seeding edge*, the edge the mapping algorithm uses to detect the gut and its orientation.



You may have noticed that when the ROI first appeared a red staircase icon appeared at the bottom right of the FOV. Tap on the icon and a slider appears. This is used to set the pixel brightness threshold that the mapping algorithm uses to distinguish the gut from the background.

When you move the slider, the camera feed freezes and below threshold pixels are overlaid in green. Adjust the slider/threshold until the green defines the edges of the gut. Note that if your gut is dark against a light background, go to the setting page and select threshold inversion (see below). Also you can tap on the sunshine icon to adjust the camera exposure – after doing this, make sure the re-adjust the threshold.



Once you have set the threshold you can (if you wish) hide the slider by again tapping on the staircase icon. Now you have set the length of the gut you wish to map and the threshold which distinguishes it from the background, you should set the types of maps you want to create.

Keep your finger down (long press) within the ROI. A dialog appears from which you set:

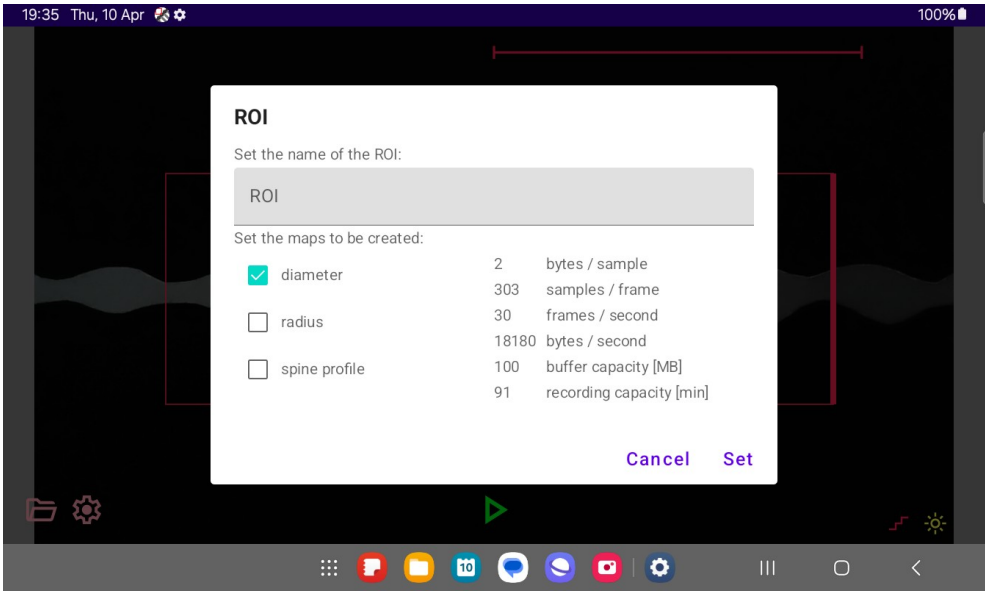
1) Which types of map to create. These are:

a) **Diameter**. The transverse distance between the edges of the gut is measured. This is the "classical", and still most common, map type.

b) **Radius**. The mapping algorithm calculates the gut's *spine* – the mid-point between the edges of the gut along its length. The distances (radii) from the spine to either edge of the gut are thus equal. However in settings (see below) you can set the spine to be smoothed such that the radii will be unequal and will measure asymmetric contractions on either edge, such as occur in the rabbit colon. Two maps are made for the lower and upper edge radii.

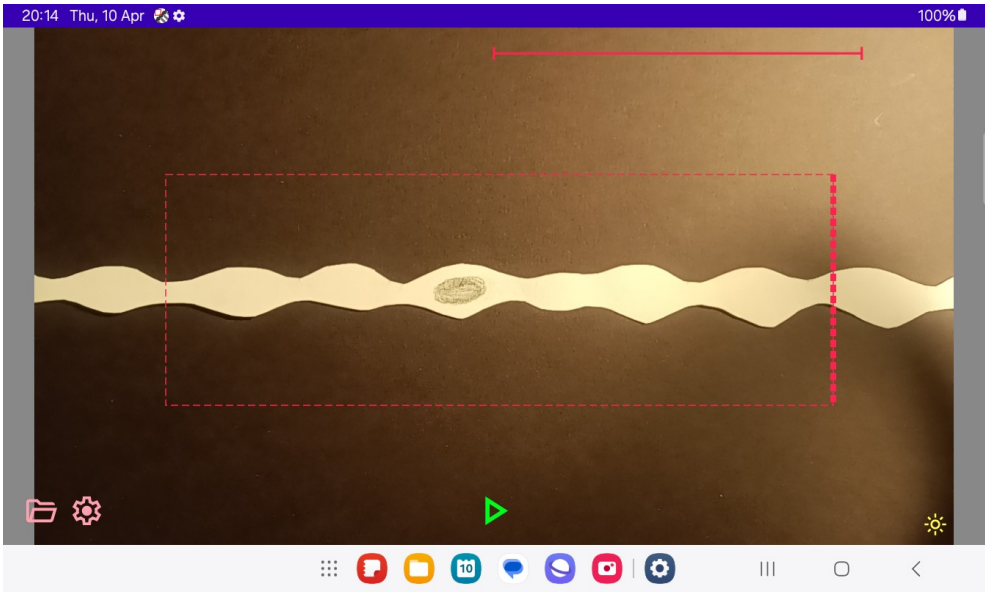
c) **Spine profile**. The pixel colour values on the spine itself. This can be used for tracking pellets.

2) A name for the ROI. This name will appear at start of each map's image file, followed by the map type. You might want to use something descriptive like "colon_proximal". If you do not provide a name the ROIs will be named ROI_1, ROI_2,.. etc. Note non-alphanumeric characters are replaced automatically by underscores.



Each map is recorded into a memory buffer with a pre-defined capacity of 100 MB. This typically gives an hour's worth of recording but the exact value depends a number of factors which are summarised at the right of the dialog. The last item in this summary is an estimate of the maximum recording length. If this is too short you should reduce the spatial or temporal resolution of mapping in the settings (see below).

Once you are happy with the ROI name and map selection, press Set, or otherwise press Cancel. Now you need to "fix" the ROI. Double-tap within the ROI and its boundary will become dashed. The ROI will now not be responsive to any finger gestures, except double-tap if you want to edit it again.



Once you have created and fixed one ROI you can create further ROIs in the same manner.

You can also define the spatial scale of the FOV using the ruler. Move the ruler about by dragging its ends until each end is positioned at the ends of a known scale in the FOV (e.g. a section of a real ruler or pre-measured marks). Then double-tap one of the ends and a dialog appears from which you can set the length of the ruler and the units (mm, cm or inch). Doing this means that the map images will include the their real spatial resolution.

When you are ready to record, press the green play icon.

As mentioned, each map is recorded into a pre-defined memory buffer and there are a fixed number of these so a fixed number of maps you can record at one time, no matter how many ROIs you create. If you exceed the number of buffers/allowed-maps the app will warn you of this with a dialog when you press to record and will block recording. In this case you should reduce the number of ROIs or maps per ROI. At present there are ten buffers and so ten maps can be recorded at once.

Before getting to the recording itself, it will be useful to go through the settings.

Settings

Tap the cogwheel icon to open the settings page.

1) **Screen**.

a) **Orientation**. The app will work whatever the tablets orientation. If you rotate the tablet, the app, including the ROIs will reorientate appropriately. In some (if not all) experimental set-ups, the tablet will be kept fixed in a flat position above the gut. The tablet when then not be able to detect the appropriate screen orientation. You can set the orientation here – the four possible orientations (the orientation will then be fixed) or "auto" to allow the tablet to detect an appropriate orientation again.

b) **Keep on**. If you want to stop the screen from ever going to sleep.

2) **Mapping resolution**.

a) **Frame rate**. The number of frames the camera captures in a second and thus the temporal resolution of the maps.

b) Spatial pixel skip. Instead of using each pixel along the length of the gut's ROIs, you can skip pixels to reduce spatial resolution. This will increase the allowable recording time – the total number of pixels sampled along the ROIs length is reported in the ROI dialog as "samples/frame" (see above).

3) **Mapping algorithm**.

a) **Threshold inversion**. Contrast between the gut and background should be maximised to improve the thresholding performance of the mapping algorithm. Either the gut is light against a dark background (the more usual configuration) or dark against a light background. In the latter case, set threshold as inverted.

b) **Minimum detection width**. When recording is started, each gut is detected by thresholding along the seeding edge (see above). To be considered a "gut" the thresholded width along the edge must exceed a minimum number of pixels. A minimum width of 10 is fine for most circumstances, but if you have quite a bit of "flotsam and jetsam" in the bath, you might want to increase the width so that the algorithm does not confuse these bits for guts.

c) **Spine gap**. Sometimes there might be the odd pixel within the bounds of the gut that is below threshold (or above, if the threshold in "inverted" - see above). For instance there might be small bubbles that pass across the gut, or a thin wire used to keep the gut in place. In these cases the algorithm needs to allowed to skip a "gap" of below-threshold pixels. A gap skip of 4 or 5 pixels is usually enough.

d) S**pine smooth**. The gut spine is smoothed by a number of pixels, thus differentiating the distances measured each side of the spine in the radii maps – see above.

Record maps

press start

change field-of-view size

change map viewed

zoom/scroll

how long maps will record – map will stop if limit reached.

stop

save

Look at old recordings