LTG-IDB: Set-up image acquisition scene

This document offers a short description on the main steps that have to be followed to acquire Labial Teeth and Gingiva (LTG) images, according to the method described in [ECK].

1 Basic scene set-up

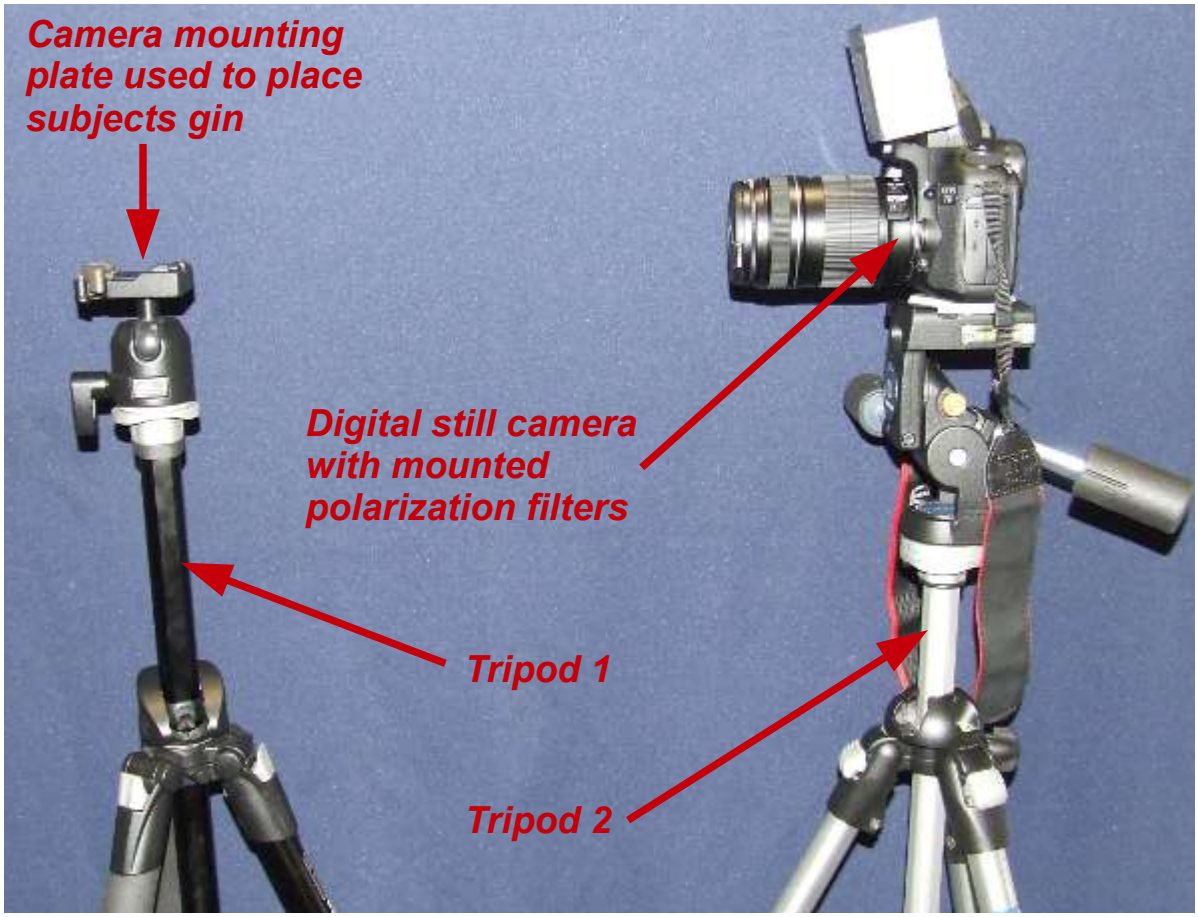

Figure 1: Basic scene set-up

The camera (Canon EOS 7D) has to be mounted on a tripod (tripod 2, see figure 1) with adjustable height. A second tripod (tripod 1) is used for the subject to place its gin on, during the image capturing.

The height of tripod 1 has to be adjusted so that the subject can sit comfortable on a chair and have its head in a straight position with direction to the camera. This approach is not ideal, because of many degrees of freedom to change the position of the subjects head. For future work, a device to reduce the degrees of freedom for rotation and flipping of the subjects

head might be useful. Tripod 2 has to be adjusted by the cameraman individually to fit the scene of the oral cavity.

The distance from the gin holder to the front plane of the polarization filter has been fixed at 34 cm (see figure 2). This distance in combination with the used lens (Canon EFS 18-135mm) is suitable for acquiring images where oral cavity and reference patch can be captured in one scene at the same time.

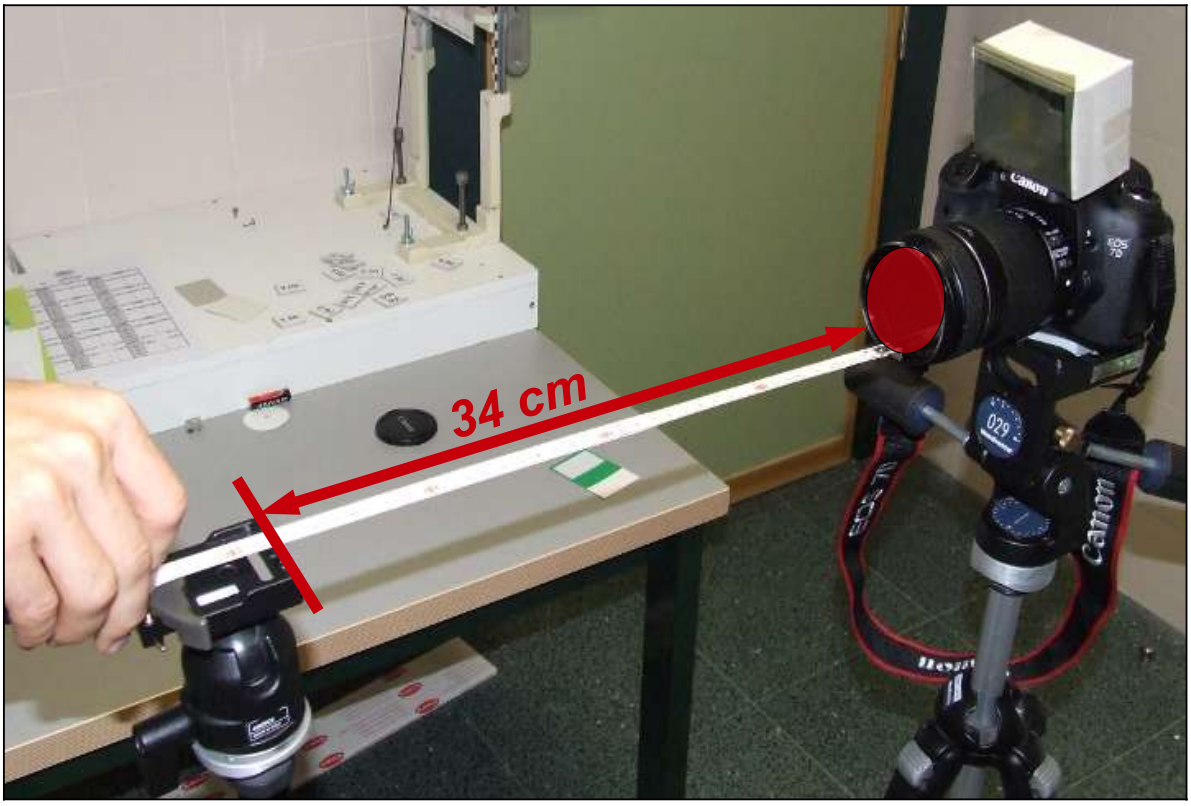

Figure 2: imaging distance

2 Adjusting the polarization filters

The system uses two polarization filters. One is used to polarize light impinging the scene, the other one is used to block unpolarized light from the imaging sensor of the camera.

The first filter is mounted on the screw thread in front of the lens of the camera. It is important to use a circular polarization filter (often found as 'CPL' or 'Digital Polarization Filter') and not a linear polarization filter. In combination with a SLR camera, linear polarization filters can cause errors when using the auto focus function of the camera or wrong measurements of the illumination that is present at the scene [GOL]. Exposure and aperture settings might be

selected wrong and blurred images might result. Due to the fact that cameras exposure and aperture settings have to be fixed for this experiment, false illumination condition measurements do not affect the imaging. Anyhow, errors in auto focusing drastically affect the sharpness of the resulting images and therefore have to be avoided.

The second filter is mounted in front of the flash of the camera. A linear polarization filter should be used. It is possible to use a circular polarization filter as well (A circular polarization filter in photography is anyway simply a combination of a linear polarization filter and a quarter-wavelength retarder plate), but in that case the correct side of the sheet has to be used. For a linear polarization filter, the side of the sheet does not matter. When using linear polarizing laminated film, a distance of about 3cm between the flash light and the sheet should be assured. It has been shown that depending on the power of the flash, the laminated film can get damaged and the polarizing effect can vanish permanently. This defect shows itself with a change in color of the film (from gray to yellow in our case) and can be verified by placing a second polarization sheet behind the first one with perpendicular transmission axis (Destroyed areas will not cancel light beams falling through the filter).

The two polarization filters have to be mounted in a way that their transmission axis are at 90° in respect to each other. The circular polarization filter in front of the camera lens can be rotated manually without screwing it off the thread. To adjust the transmission axis to the linear polarization filter in front of the flash light of the camera, following procedure can be done:

- Mount the linear polarization filter in front of the flash of the camera.
- Turn the circular polarization filter in a way that the thread of the filter is showing away from the camera lens, not to the camera lens.
- Rotate the circular polarization filter manually in front of the linear polarization filter until finding the position of minimal light transmission (see figure 3).

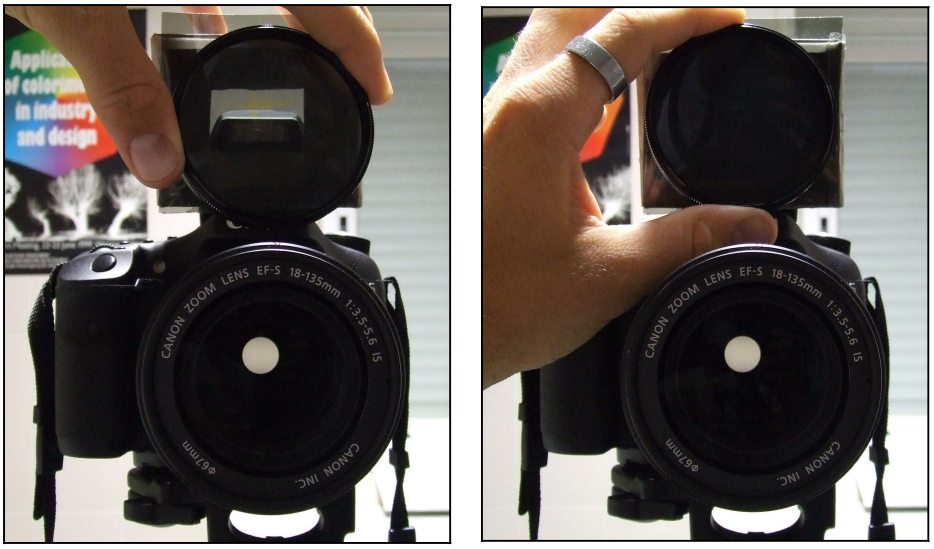

Figure 3: adjusting the polarization filters

Bibliography

ECK: Eckhard, T.; Valero, E.; Nieves, J., The Labial Teeth and Gingiva Photographic Image Database LTG-IDB, 2011

GOL: Norman Goldberg, Camera Technology – The dark side of the lens, 1992