Stereoscopy

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Version	Date	Change
.1	21 febraury 2019	added par. Process & par. Calibration
.2	11 march 2019	added par. determination

1 Process

The aim of this project is to measure the length of an infant in an artificial incubator. This will be done by taking 2 images of the infant simultaneously and marking interest points. These interest points can be used in a triangulation function to determine the length of the infant. The body is divided in 4 key dimensions:

1. tip of the heel - knee
2. knee - center of the genitals
3. center of the genitals - base of the neck
4. base of the neck - tip of the head

These are then summed up to get the length of the infant [1, p.2-3]. There are 2 phases to the stereoscopic processing:

1. **calibration**: Getting the reference points/dimensions.
2. **determination**: Determining the spatial position for each point to make a depth map.

2 Calibration

To determine the spatial dimension between the interest points there must be a reference object/dimension. Something with a fixed dimension which can be used to calibrate the camera. A possible canidate for the reference object/dimenson is the red knobs within incubator as seen in figure 1.

Figure 1: picture of the incubator

The knobs are found on every incubator and the distance between them is fixed.

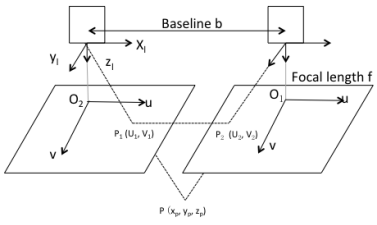
Another option is a checkerboard, the opencv library for python has a calibration method that uses a checkerboard to calibrate.

3 determination

In this image the point P appears on the two image planes. The V value (y coordinate) for both P1 & P2 are the same. The baseline B is the distance between the cameras. The distance between the points on the image planes is called disparity. The focal length of the camera is F. The x, y & z coordinates can be calculated as followed:

$$x_p = \frac{B*u_1}{D}$$
$$y_p = \frac{B*v_1}{D}$$
$$z_p = \frac{B*F}{D}$$

Figure 2: example image from `https://en.wikipedia.org/wiki/3D_reconstruction#/media/File:Stereoscopic_schematic.png`



When this has been done for every image, the acquired information is used to make a depth map.

References

[1] N. Sokolover, et al. 'A novel technique for infant length measurement based on stereoscopic vision'. referenced on: 21 febraury 2019.