EIGER Geometry

Throughout the present document we use the notations from DectrisGeometryDocumentation. This document defines the rotation matrix $\mathbf{R}$ and the translation vector $\mathbf{t}$, which transform the position $\mathbf{P'}$ in the detector system to its equivalent position $\mathbf{P}$ in the lab system through:

$$P_i = R_{ij} {P'}_j + t_i \tag{1}$$

In addition we introduce the coordinates of the beam centre in the detector system $\mathbf{c} = (c_0, c_1, 0)$ and the distance between the detector and the sample d. $\mathbf{c}$ and d are related to $\mathbf{R}$ and $\mathbf{t}$ through

$$R_{ij} c_j + t_i = \delta_{i3} d \tag{2}$$

where $\delta_{ij} = 1$ if $i = j$ else 0.

Given $\mathbf{R}$ and $\mathbf{t}$ (2) defines $\mathbf{c}$ and d, which is not true vice versa. So the EIGER API adopts the convention that whenever $\mathbf{c}$ or d changes, $\mathbf{R}$ is kept constant and $\mathbf{t}$ is computed from (2):

$$t_0 = -R_{00} c_0 - R_{01} c_1 \tag{3}$$
$$t_1 = -R_{10} c_0 - R_{11} c_1 \tag{4}$$
$$t_2 = R_{20} c_0 + R_{21} c_1 - d \tag{5}$$

Whenever $\mathbf{R}$ or $\mathbf{t}$ changes $\mathbf{c}$ and d is computed from (2):

$$c_0 = \frac{R_{01} t_1 - R_{11} t_0}{R_{00} R_{11} - R_{01} R_{10}} \tag{6}$$
$$c_1 = \frac{R_{10} t_0 - R_{00} t_1}{R_{00} R_{11} - R_{01} R_{10}} \tag{7}$$
$$d = R_{20} c_0 + R_{21} c_1 - t_2 \tag{8}$$