

Line Incidence Relations In this section, we explore the trifocal tensor's perspective through the incidence relationship among three corresponding lines. When a 3D line appears in three different views, it imposes constraints on the resulting image lines. These constraints are grounded in geometry: the back-projected planes from each view's lines must converge at a single line in 3D space, corresponding to the 3D line projected onto the matched lines in the images. This geometric condition imposes genuine constraints on sets of corresponding lines, which we then translate into algebraic form.

We examine a set of corresponding lines denoted as $l \leftrightarrow l' \leftrightarrow l''$, alongside camera matrices for the three views: $P = [I|0]$, $P' = [A|a]$, and $P'' = [B|b]$, where A and B are 3×3 matrices, and a_i and b_i represent the columns of their respective P' and P'' , where C is the first camera center.

figure[h] [width=0.5]Figures/three-views.png A line L in 3-space is imaged as the corresponding triplet $l \leftrightarrow l' \leftrightarrow l''$ in three views indicated by their centres, C, C', C'' , and image planes. Conversely, corresponding lines back-projected from the first, second and third images all intersect in a single 3D line in space.