Determining Semi-Major Axis Scalar for Ellipse passing through SN

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We first determine the relative position ($\Delta\vec{d}_{RD}$) of the center of the supernovae, $\vec{S}_{RD}$, in terms of the center of the galaxy, $\vec{G}_{RD}$, where 'RD' implies the right acsencion, declination coordinates (in degrees).

$$\Delta\vec{d}_{RD} = \vec{S}_{RD} - \vec{G}_{RD} \tag{1}$$

We then convert this relative position vector in terms of pixel coordinates 'XY'

$$\Delta\vec{d}_{XY} = \mathbf{T_1} \cdot \Delta\vec{d}_{RD} \tag{2}$$

Where $\mathbf{T_1}$ is the scalar transformation, with P the arcsecond–pixel ratio;

$$\mathbf{T_1} = \frac{1}{3600P} \cdot \mathbb{1} \tag{3}$$

We can then determine the supernovae's position in terms of the semi-major and semi-minor axies through a rotation matrix;

$$\begin{pmatrix} b \\ a \end{pmatrix}_{SN} = \mathbf{T_2} \cdot \Delta\vec{d}_{XY} \tag{4a}$$

$$\mathbf{T_2} = \begin{pmatrix} \cos\theta & -\sin\theta \\ R\sin\theta & R\cos\theta \end{pmatrix} \tag{4b}$$

Where θ is the position angle and R is the axial ratio