**ROTATE-SCALE-TRANSLATE (RST)**

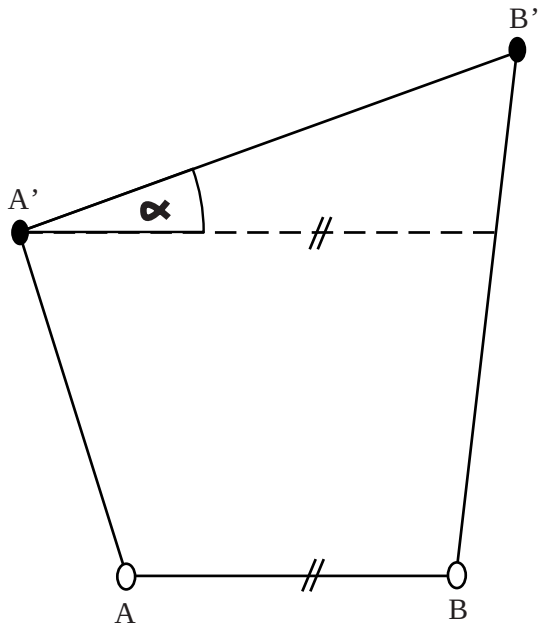


FIGURE 1. Two touch Rotate-Scale-Translate (RST) algorithm

The two touch RST algorithm: the initial two touch points $A$ and $B$ are dragged to the current two touch points $A'$ and $B'$. From these four points we can calculate rotation, scaling and translation as follows. First, the rotation angle $\alpha$ is defined by the angle between $AB$ and $A'B'$. $\alpha$ is calculated using the dot prduct: $AB \cdot A'B' = |AB||A'B'| \cos \alpha$. The scale factor is calculated from the ratio of the lengths of $A'B'$ and $AB$. For rotation as well as for scaling, the centre of transformation is $A$. This plays a role only from the algorithmic point of view. For the user, it does not make a difference whether $A$ is held fixed or $B$ or even both touch points are dragged simultaneously. Translation is specified by the vector $AA'$. Once calculated, the three transformations can be accumulated into one transformation matrix.