A Group of Invariant Equations

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Abstract

In classical mechanics, this paper presents a group of
equations, which are invariant under transformations
between reference frames.

Group of Invariant Equations

If we consider two particles A and B then the group of invariant equations is:

$$(\mathbf{r}_a - \mathbf{r}_b) \cdot (\mathbf{r}_a - \mathbf{r}_b) = invariant$$

$$(\mathbf{r}_a - \mathbf{r}_b) \cdot (\mathbf{v}_a - \mathbf{v}_b) = invariant$$

$$(\mathbf{v}_a - \mathbf{v}_b) \cdot (\mathbf{v}_a - \mathbf{v}_b) + (\mathbf{r}_a - \mathbf{r}_b) \cdot (\mathbf{a}_a - \mathbf{a}_b) = invariant$$

where $\mathbf{r}_a$ and $\mathbf{r}_b$ are the positions of particles A and B, $\mathbf{v}_a$ and $\mathbf{v}_b$ are the velocities
of particles A and B, and $\mathbf{a}_a$ and $\mathbf{a}_b$ are the accelerations of particles A and B.