Abstract

It is generally believed that basic physical equations in general relativity, the fundamental laws of nature should be invariant (or covariant) under general coordinate transformations. In this research work we considered a reference transformation from the flat space to curved space which satisfies the necessity to be an allowed transformation. The behavior of the transformations of basic quantities in relativity such as affine connection, Riemann tensor and Einstein tensor were discussed. We see the violation of the general covariance, when there is a non-homogeneous term in the transformed equations in new coordinate system under the defined transformation matrix. In other words, basic physical equations do not transform invariantly under the new transformation. With this new metric the transformation of affine connection which consist of non-homogeneous term differs from those in general relativity. There after, the transformation rules for the basic physical equations in an arbitrary curved spacetime are different from those in general relativity because of the non-homogeneous term. All the non-homogeneous terms have been found explicitly in this research work for the two cases when the parameter of the coordinate transformation u in the transformation matrix is a function of (r,t) and (r,t,θ). According to the new forms of curvature tensor, Ricci tensor and scalar curvature a new form of Einstein tensor have been introduced through this work and the relevant Einstein field equation is written.

Further more, we have obtained an exact solution for spherically symmetric and slowly rotating dust spacetime by using tetrad method for the space defined by line-element

$$ds^2 = e^{2\nu}dt^2 - e^{2\lambda}dr^2 - r^2d\theta^2 - r^2\sin^2\theta(d\phi - \Omega dt)^2,$$

which we have assumed in this study, where Ω is the dragging velocity of inertial frames.