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On a Product Semi-Symmetric Non-Metric Connection in a Hyperbolic Kähler Manifold

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Abstract

The object of the present paper is to characterize a type of product semi-symmetric non-metric connection in a hyperbolic Kähler manifold and to study some of its curvature properties.

AMS Subject Classification[2010]: 53C15, 53C55

Keyword and Phrases: Hyperbolic Kähler manifold, product semi-symmetric non-metric connection, projective curvature tensor, conformal curvature tensor, concircular curvature tensor, m-projective curvature tensor.

Introduction

In 1924, A. Friedmann and J.A. Schouten [3] introduced the idea of semi-symmetric connection on differentiable manifold. In 1932, H.A. Hayden [5] studied semi-symmetric metric connection on a Riemannian manifold. K. Yano [10] initiated systematic study of semi-symmetric metric connection and later on it was followed by several other geometers ([4], [2]). In 1975, S. Golab [4] defined and studied quarter-symmetric connection in manifolds with affine connection. K. Yano and T. Imai [11] studied semi-symmetric metric connection in complex manifold. M. Pravanovic' [8] extended the idea of semi-symmetric connection to product semi-symmetric connection in a locally decomposable Riemannian manifold and studied topics analogous to Yano and Imai [11]. R.N. Singh, M.K. Pandey and D. Gautam [9] have defined a type of product semi-symmetric non-metric connection in a locally decomposable Riemannian manifold and studied some of its curvature properties.

In this paper, we have defined a product semi-

symmetric non-metric connection in a hyperbolic Kähler manifold and studied its curvature properties.

Preliminaries

Let M^n be a C^∞ -complete real differentiable manifold of dimension n endowed with a real vector valued function F such that

$$\bar{X} = X, \quad (2.1)$$

for arbitrary vector field X , where $\bar{X} = FX$.

If there exists pseudo Riemannian metric g such that

$$g(\bar{X}, \bar{Y}) = -g(X, Y), \quad (2.2)$$

then M^n is called an almost hyperbolic Hermite manifold.

An almost hyperbolic Hermite manifold M^n is called a hyperbolic Kähler manifold if

$$\nabla_X F = 0,$$

where ∇ is the Riemannian connection.

The 2-form F defined by

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$${}^*F(X, Y) = g(\bar{X}, Y), \quad (2.4)$$

satisfies

$${}^*F(\bar{X}, Y) = g(\bar{X}, Y) = -g(X, \bar{Y}) = -{}^*F(Y, X) \quad (2.5)$$

and

$${}^*F(\bar{X}, \bar{Y}) = -{}^*F(X, Y). \quad (2.6)$$

A linear connection ∇^* on (M^n, g) is termed as product semi-symmetric connection if its torsion tensor T^* has the form [8]

$$T^*(X, Y) = u(Y)X - u(X)Y + u(\bar{Y})\bar{X} - u(\bar{X})\bar{Y}, \quad (2.7)$$

where u is a non-zero 1-form associated with the vector field U on M^n by

$$u(X) = g(X, U) \quad (2.8)$$

and non-metric connection if

$$(\nabla_X^* g)(Y, Z) \neq 0. \quad (2.9)$$

A Product Semi-Symmetric Non-Metric Connection
Consider a connection ∇^* in a hyperbolic Kähler manifold M^n given by [9]

$$\nabla_X^* Y = \nabla_X Y + u(\bar{Y})\bar{X} + u(Y)X - g(X, Y)U, \quad (3.1)$$

where u is a non-zero 1-form associated with the vector field U defined by equation (2.8). From equation (3.1), it can be obtained that the torsion tensor

$$T^*(X, Y) = \nabla_X^* Y - \nabla_Y^* X - [X, Y] \quad (3.2)$$

of the connection ∇^* has the form

$$T^*(X, Y) = u(Y)X - u(X)Y + u(\bar{Y})\bar{X} - u(\bar{X})\bar{Y}, \quad (3.3)$$

which shows that the connection given by equation (3.1) is a product semi-symmetric connection. Also, we have

$$(\nabla_X^* g)(Y, Z) = X(g(Y, Z)) - g(\nabla_X^* Y, Z) - g(Y, \nabla_X^* Z), \quad (3.4)$$

which on using equations (2.4) and (3.1), gives

$$(\nabla_X^* g)(Y, Z) = -u(\bar{Y})'F(X, Z) - u(\bar{Z})'F(X, Y). \quad (3.5)$$

This shows that the connection under consideration is a non-metric one. Conversely it can be shown that a connection ∇^* satisfying equations (3.3) and (3.5) has the form given by the equation (3.1). Let $R^*(X, Y)Z$ be the curvature tensor of the hyperbolic Kähler manifold with respect to the product-semi-symmetric non-metric connection ∇^* . Then we have

$$R^*(X, Y)Z = \nabla_X^* \nabla_Y^* Z - \nabla_Y^* \nabla_X^* Z - \nabla_{[X, Y]}^* Z, \quad (3.6)$$

which on using equations (2.1), (2.3), (2.4), (2.5) and (3.1) in the above equation, we get

$$\begin{aligned} R^*(X, Y)Z &= R(X, Y)Z + \alpha(X, Z)Y - \alpha(Y, Z)X \\ &\quad + \alpha(X, Z)\bar{Y} - \alpha(Y, Z)\bar{X} - g(Y, Z)LX \\ &\quad + g(X, Z)L\bar{Y} + \{u(X)g(Y, Z) - u(Y)g(X, Z)\}U \\ &\quad + \{g(X, Z)Y - g(Y, Z)X\}u(U) \\ &\quad + \{u(Y)X - u(X)Y\}u(Z) + \{u(Y)\bar{X} \\ &\quad - u(X)\bar{Y}\}u(Z) - 2u(Z)g(X, Y)U, \end{aligned} \quad (3.7)$$

where α is a tensor field of type (0, 2) given by

$$\alpha(X, Y) = (\nabla_X u)(Y) - u(X)u(Y) \quad (3.8)$$

and L is a tensor field of type (1, 1) given by

$$LX = \nabla_X U + u(\bar{U})\bar{X}. \quad (3.9)$$

If we put

$${}^*R^*(X, Y, Z, W) = g(R^*(X, Y)Z, W).$$

then in view of equation (3.7), above equation reduces to

$$\begin{aligned} {}^*R^*(X, Y, Z, W) &= {}^*R(X, Y, Z, W) + \alpha(X, Z)g(Y, W) \\ &\quad - \alpha(Y, Z)g(X, W) + \alpha(X, \bar{Z})'F(Y, W) - \alpha(Y, \bar{Z})'F(X, W) \\ &\quad - g(Y, Z)\beta(X, W) + g(X, Z)\beta(Y, W) \\ &\quad + u(W)\{u(X)g(Y, Z) - u(Y)g(X, Z)\} \\ &\quad + u(\bar{Z})\{u(\bar{Y})g(X, W) - u(\bar{X})g(Y, W)\} \\ &\quad + u(U)\{g(X, Z)g(Y, W) - g(Y, Z)g(X, W)\} \\ &\quad + u(Z)\{u(\bar{Y})'F(X, W) - u(\bar{X})'F(Y, W)\} \\ &\quad - 2u(\bar{Z})u(W)'F(Y, \bar{X}), \end{aligned} \quad (3.10)$$

where $\beta(Y, Z)$ is a tensor of type (0, 2) given by $\beta(Y, Z) = g(LY, Z) = (\nabla_Y u)(Z) + u(\bar{U})'F(Y, Z)$. (3.11)

Now, putting $X = W = e_i$ in equation (3.10) and summing over i , $1 \leq i \leq n$, we get

$$\begin{aligned} Ric^*(Y, Z) &= Ric(Y, Z) - (n-1)\alpha(Y, Z) + \alpha(\bar{Y}, \bar{Z}) \\ &\quad - \psi\alpha(Y, \bar{Z}) + \beta(Y, Z) - \delta g(Y, Z) \\ &\quad - u(Y)u(Z) + (n-3)u(\bar{Y})u(\bar{Z}) + (\psi-1)u(Z)u(\bar{Y}). \end{aligned} \quad (3.12)$$

where

$$\delta = b + (n-2)u(U) \quad (3.13)$$

and $\psi = \sum_{i=1}^n {}^*F(e_i, e_i)$ and $b = \sum_{i=1}^n \beta(e_i, e_i)$ are the traces of the tensors *F and β respectively.



On a Product Semi-Symmetric
Non-Metric Connection in a Hyperbolic Kähler Manifold

A Type of Product Semi-Symmetric Non-Metric Connection

We consider a product semi-symmetric non-metric connection whose associated vector field U is recurrent with respect to Levi-Civita connection ∇ with u as a 1-form of recurrence i.e.

$$\nabla_X U = u(X)U \quad (4.1)$$

and prove some results concerning such connection. Now, differentiating equation (2.8) and using equation (4.1), we obtain

$$(\nabla_X u)(Y) = u(X)u(Y), \quad (4.2)$$

which on using equation (3.8), gives

$$a = 0. \quad (4.3)$$

In this case tensors L and β reduces to

$$LX = u(X)U + u(\bar{U})\bar{X} \quad (4.4)$$

and

$$\beta(Y, Z) = u(Y)u(Z) + u(\bar{U})'F(Y, Z). \quad (4.5)$$

Therefore, using equations (4.3) and (4.4) in equation (3.7), we obtain

$$\begin{aligned} R^*(X, Y)Z &= R(X, Y)Z + u(\bar{U})\{g(X, Z)\bar{Y} - g(Y, Z)\bar{X}\} \\ &+ u(U)\{g(X, Z)Y - g(Y, Z)X\} + u(\bar{Z})\{u(\bar{Y})X - u(\bar{X})Y\} \\ &+ u(Z)\{u(\bar{Y})\bar{X} - u(\bar{X})\bar{Y}\} - 2u(\bar{Z})g(X, \bar{Y})U, \end{aligned} \quad (4.6)$$

from which, we get

$$\begin{aligned} R^*(X, Y, Z, W) &= R(X, Y, Z, W) + u(\bar{U})\{g(X, Z)F(Y, W) \\ &- g(Y, Z)F(X, W)\} + u(U)\{g(X, Z)g(Y, W) \\ &- g(Y, Z)g(X, W)\} + u(\bar{Z})\{u(\bar{Y})g(X, W) \\ &- u(\bar{X})g(Y, W)\} + u(Z)\{u(\bar{Y})F(X, W) \\ &- u(\bar{X})F(Y, W)\} - 2u(\bar{Z})g(X, \bar{Y})u(W). \end{aligned} \quad (4.7)$$

Putting $X = W = e_i$ in above equation and summing over i , $1 \leq i \leq n$, we get

$$\begin{aligned} Ric^*(Y, Z) &= Ric(Y, Z) + u(\bar{U})'F(Y, Z) - \delta g(Y, Z) \\ &+ (n-3)u(\bar{Y})u(Z) + (\psi-1)u(\bar{Y})u(Z), \end{aligned} \quad (4.8)$$

which gives

$$\begin{aligned} Q^*Y &= QY + u(\bar{U})Y - \delta Y - (n-3)u(Y)u(U) \\ &+ (\psi-1)u(\bar{Y})U. \end{aligned} \quad (4.9)$$

Further, putting $Y = Z = e_i$ in equation (4.8) and summing over i , $1 \leq i \leq n$, we get

$$r^* = r - bn - (n^2 - n - 3)u(U) + (2\psi - 1)u(\bar{U}), \quad (4.10)$$

where r^* and r are the scalar curvatures of the hyperbolic Kähler manifold relative to the connections ∇^* and ∇ respectively.

Theorem 4.1 In a hyperbolic Kähler manifold, torsion tensor of the product semi-symmetric non-metric connection is recurrent with respect to the Levi-Civita connection.

Proof: Differentiating equation (3.3) with respect to Levi-Civita connection ∇ and using equation (4.2), we get

$$(\nabla_X T^*)(Y, Z) = u(X)T^*(Y, Z), \quad (4.11)$$

which completes the theorem.

Theorem 4.2 In a hyperbolic Kähler manifold, the curvature tensor of the product semi-symmetric non-metric connection satisfies

$$u(X)T^*(Y, Z) + u(Y)T^*(Z, X) + u(Z)T^*(X, Y), \quad (4.12)$$

which on using equations (3.3) and (4.12) gives required result.

Projective Curvature Tensor of a Hyperbolic Kähler Manifold with Connection ∇^*

Projective curvature tensor P of the manifold M^n is given by [6]

$$P(X, Y)Z = R(X, Y)Z - \frac{1}{(n-1)}[Ric(Y, Z)X - Ric(X, Z)Y], \quad (5.1)$$

Projective curvature tensor of a hyperbolic Kähler manifold admitting product semi-symmetric non-metric connection ∇^* is given by

$$P^*(X, Y)Z = R^*(X, Y)Z - \frac{1}{(n-1)}[Ric^*(Y, Z)X - Ric^*(X, Z)Y], \quad (5.2)$$

which on using equations (4.6) and (4.8), gives

$$\begin{aligned} P^*(X, Y)Z &= P(X, Y)Z + u(\bar{U})\{g(X, Z)\bar{Y} - g(Y, Z)\bar{X}\} \\ &- \frac{1}{(n-1)}\{g(\bar{Y}, Z)X - g(\bar{X}, Z)Y\} + u(U)\{g(X, Z)Y - g(Y, Z)X\} \\ &+ \frac{2}{(n-1)}u(\bar{Z})\{u(\bar{Y})X - u(\bar{X})Y\} + u(Z)\{u(\bar{Y})\bar{X} - u(\bar{X})\bar{Y}\} \\ &- \frac{\psi-1}{(n-1)}u(Z)\{u(\bar{Y})X - u(\bar{X})Y\} - 2u(\bar{Z})g(X, \bar{Y})U \end{aligned} \quad (5.3)$$

Theorem 5.1 A hyperbolic Kähler manifold with product semi-symmetric non-metric connection ∇^* satisfies

$$P^*(X, Y)Z + P^*(Y, X)Z = 0. \quad (5.4)$$

Proof: Interchanging X and Y in equation (5.3) and using the fact that

$$P(X, Y)Z = -P(Y, X)Z,$$

we obtain the required result.

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Conformal Curvature Tensor of a Hyperbolic Kähler Manifold with Connection ∇^* .

Conformal curvature tensor C of the manifold M^n is given by [6]

$$C(X, Y)Z = R(X, Y)Z - \frac{1}{(n-2)} [Ric(Y, Z)X - Ric(X, Z)Y + g(Y, Z)QX - g(X, Z)QY] + \frac{r}{(n-1)(n-2)} [g(Y, Z)X - g(X, Z)Y]. \quad (6.1)$$

Conformal curvature tensor of a hyperbolic Kähler manifold admitting product semi-symmetric non-metric connection ∇^* is given by

$$C^*(X, Y)Z = R^*(X, Y)Z - \frac{1}{(n-2)} [Ric^*(Y, Z)X - Ric^*(X, Z)Y + g(Y, Z)Q^*X - g(X, Z)Q^*Y] + \frac{r^*}{(n-1)(n-2)} [g(Y, Z)X - g(X, Z)Y]. \quad (6.2)$$

Now, using equations (4.6), (4.8), (4.9) and (4.10) in above equation, we get

$$C^*(X, Y)Z = C(X, Y)Z + \frac{1}{n-2} \{ u(\bar{U}) \{ g(\bar{X}, Z)Y - g(\bar{Y}, Z)X \} + \frac{(n-1)}{(n-2)} u(\bar{U}) \{ g(X, Z)\bar{Y} - g(Y, Z)\bar{X} \} + u(Z) \{ u(\bar{Y})\bar{X} - u(\bar{X})\bar{Y} \} - 2u(\bar{Z})g(X, \bar{Y})U - \frac{1}{(n-2)} \{ u(\bar{X})u(\bar{Z})Y - u(\bar{Y})u(\bar{Z})X \} + \frac{(n-3)}{(n-2)} \bar{U} \{ u(\bar{X})g(Y, Z) - u(\bar{Y})g(X, Z) \} - \frac{2\delta(n-1) - (\psi+n-3)u(\bar{U}) + (2n^2+5n-nb+\psi-1)u(U)}{(n-1)(n-2)} \times \{ g(X, Z)Y - g(Y, Z)X \} \}. \quad (6.3)$$

Theorem 6.1 A hyperbolic Kähler manifold with product semi-symmetric non-metric connection ∇^* satisfies

$$C^*(X, Y)Z + C^*(Y, X)Z = 0. \quad (6.4)$$

Proof: Interchanging X and Y in equation (6.3) and using the fact that $C(X, Y)Z = -C(Y, X)Z$, we obtain the required result.

Concircular Curvature Tensor of a Hyperbolic Kähler Manifold with Connection ∇^* .

Concircular curvature tensor V of the manifold M^n is given by [6]

$$V(X, Y)Z = R(X, Y)Z - \frac{r}{n(n-1)} [g(Y, Z)X - g(X, Z)Y]. \quad (7.1)$$

Concircular curvature tensor of a hyperbolic Kähler manifold with product semi-symmetric non-metric connection ∇^* is given by

$$V^*(X, Y)Z = R^*(X, Y)Z - \frac{r^*}{n(n-1)} [g(Y, Z)X - g(X, Z)Y]. \quad (7.2)$$

which on using equations (4.6) and (4.10), gives

$$V^*(X, Y)Z = V(X, Y)Z + u(\bar{U}) \{ g(Y, Z)\bar{X} - g(X, Z)\bar{Y} \} + \frac{(n^2-n+1)}{n(n-1)} u(U) \{ g(X, Z)\bar{Y} - g(Y, Z)\bar{X} \} + u(Z) \{ u(\bar{Y})\bar{X} - u(\bar{X})\bar{Y} \} + u(\bar{Z})u(\bar{Y})X - u(\bar{X})Y - 2u(\bar{Z})g(X, \bar{Y})U - \frac{(\psi+n-3)u(\bar{U}) - (n(n-1)-2-\psi)u(U)}{n(n-1)} \times \{ g(Y, Z)X - g(X, Z)Y \}. \quad (7.3)$$

Theorem 7.1 A hyperbolic Kähler manifold with product semi-symmetric non-metric connection ∇^* satisfies

$$V^*(X, Y)Z + V^*(Y, X)Z = 0. \quad (7.4)$$

Proof: Interchanging X and Y in equation (7.3) and using the fact that $V(X, Y)Z = -V(Y, X)Z$, we obtain the required result.

m-Projective Curvature Tensor of a Hyperbolic Kähler Manifold with Connection ∇^* .

In 1971, Pokhariyal and Mishra [7] defined a tensor field \tilde{W} on a Riemannian manifold M^n as

$$\tilde{W}(X, Y)Z = R(X, Y)Z - \frac{1}{2(n-1)} [Ric(Y, Z)X - Ric(X, Z)Y + g(Y, Z)QX - g(X, Z)QY]. \quad (8.1)$$

for arbitrary vector fields X, Y and Z , where Ric is the Ricci tensor of type $(0, 2)$, Q is the Ricci operator and $\tilde{W}(X, Y, Z, U) = g(\tilde{W}(X, Y)Z, U)$. Such a tensor field is known as m-projective curvature tensor. m-projective curvature tensor of a hyperbolic Kähler manifold with product semi-symmetric non-metric connection ∇^* is given by

$$\tilde{W}^*(X, Y)Z = R^*(X, Y)Z - \frac{1}{2(n-1)} [Ric^*(Y, Z)X - Ric^*(X, Z)Y + g(Y, Z)Q^*X - g(X, Z)Q^*Y]. \quad (8.2)$$

which on using equations (4.6) and (4.10), gives

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$$\begin{aligned}\tilde{W}^*(X, Y)Z &= \tilde{W}(X, Y)Z + \frac{(2n-1)}{2(n-1)} u(U)\{g(X, Z)Y \\ &- g(Y, Z)\bar{X}\} + u(U)\{g(X, Z)Y \\ &- g(Y, Z)\bar{X}\} - \frac{(n+1)}{2(n-1)} u(\bar{Z})u(\bar{X})Y - u(\bar{Y})X \\ &- u(Z)\{u(\bar{X})\bar{Y} - u(\bar{Y})\bar{X}\} - 2u(\bar{Z})g(X, Y)U \\ &+ \frac{1}{2(n-1)} u(\bar{U})\{g(X, Z)Y - g(Y, Z)\bar{X}\} \\ &- \frac{\delta}{(n-1)} \{g(X, Z)Y - g(Y, Z)\bar{X}\} \\ &+ \frac{(\psi-1)}{2(n-1)} u(Z)\{u(\bar{X})Y - u(\bar{Y})X\} \\ &+ \frac{(n-3)}{2(n-1)} \bar{U}\{u(\bar{X})g(Y, Z) - u(\bar{Y})g(X, Z)\} \\ &- \frac{(\psi-1)}{2(n-1)} U\{u(\bar{X})g(Y, Z) - u(\bar{Y})g(X, Z)\}.\end{aligned}\quad (8.3)$$

Theorem 8.1 A hyperbolic Kähler manifold with product semi-symmetric non-metric connection ∇^* satisfies

$$\tilde{W}^*(X, Y)Z + \tilde{W}^*(Y, X)Z = 0. \quad (8.4)$$

Proof: Interchanging X and Y in equation (8.3) and using the fact that

$$\tilde{W}(X, Y)Z = -\tilde{W}(Y, X)Z,$$

we obtain the required result.

References

1. I. Das, U.C. De, P.N. Singh and M.K. Pandey, Lorentzian manifold admitting a type of semi-symmetric non-metric connection, *Tensor (N.S.)*, 34(1980R), 78-85.
2. U.C. De, On a type of semi-symmetric metric connection on a Riemannian manifold, *Indian J. Pure Appl. Math.*, 21(4)1990, 133-138.
3. Friedmann and J. A. Schouten, Über die geometrie der halbsymmetrischen übertragung, *Math. Zetscher*, 21(1924), 211-233.
4. S. Golab, On semi-symmetric and quarter-symmetric linear connections, *Tensor (N.S.)*, 29(1975), 249-254.
5. H. A. Hayden, Subspaces of space with torsion, *Proc. London Math. Soc.* 34(1932), 27-50.
6. R.S. Mishra, Structures on differentiable manifold and their applications, Chandrama Prakashan Allahabad, India, 1984.
7. G.P. Pokhariyal and R.S. Mishra, Curvature tensors and their relativistic significance II, *Yokohama Mathematical Journal*, 19(1971), 97-103.
8. M. Prvanovi.
9. R.N. Singh, M.K. Pandey and D. Gautam, On a product semi-symmetric non-metric connection in a locally decomposable Riemannian manifold, *International Mathematical Forum*, 6(38)2011, 1897-1902.
10. K. Yano, On semi-symmetric connection, *Revue Roumanie de Mathematiques Pures et appliques*, 15(1970), 1579-1581.
11. K. Yano and T. Imai, On semi-symmetric metric F-connection, *Tensor (N.S.)*, 29(1975), 134-138.

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