KerrNullGeoFunction

KerrNullGeoFunction[*a, xs, ps,* M, *assoc*]
>   an object for storing the trajectory and its parameters in the *assoc* Association.

This object is returned by the KerrNullGeo function.

The object contains an association accessible in a regular fashion
through square brackets containing a key KerrNullGeoFunction["Key"]. If
the argument given in the square brackets is not a string, it is assumed to be the
Mino time and returns the coordinate value at that time.

The following keys are accepted:

"Trajectory"	Returns a list of trajectory coordinates {t, r, θ, φ} as functions of the Mino time λ.
"ConstantsOfMotion"	Returns a list of the constants of motion of the geodesic {l, η}.
"RadialRoots"	Returns the radial roots in a list {r1, r2, r3, r4}.
"EquatorIntersectionMinoTimes"	Returns the Mino times when $\theta=\pi/2$ in a list from smallest (closest to the observer) to largest.
"EquatorIntersectionCoordinates"	Returns the coordinates {t, r, φ} in "EquatorIntersectionMinoTimes".
"TrajectoryType"	Returns one of the following trajectory types: "PhotonCapture" if the trajectory crosses the horizon, or else "PhotonEscape".
"MinoTimeOfCapture"	Returns the Mino time,when the photon crosses the outer horizon if "TrajectoryType" is "PhotonCapture", or the Mino time when the photon scatters back to infinity.
"EscapeCoordinates"	If "TrajectoryType" is "PhotonEscape", returns the {θ, φ} coordinates in "MinoTimeOfCapture", otherwise returns {–1, –1}.
"EmissionCoordinates"	If the trajectory crosses the equatorial plane at some r>rISCO, returns a list of coordinates at the first occurrence.
"EmissionParameters"	If the trajectory crosses the equatorial plane at some r>rISCO, at the first occurrence returns a list {κ, θloc, φloc} defined as the ratio between energy at infinity and the locally measured energy on a circular equatorial geodesic, and the locally measured impact angles respectively. Otherwise returns {–1, –1, –1}.

Tech Notes ⓘ

KerrNullGeodesics

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See Also ⓘ

KerrNullGeo ▪ **KerrNullGeoDistantFunction** ▪ ⊕

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Examples Initialization ⓘ

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Needs["BlackHoleImages`"]
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Basic Examples   More Examples ▷

Compute a geodesic in geometry given by $a = 0.9$, with some initial position and momentum using the $\mathtt{KerrNullGeo}$ function:

In[25]:= **geod = KerrNullGeo[0.9, {0, 150, π/3, 0}, {-1, -1, Sqrt[10], 10}];**

Access the constant of motion l and the escape coordinates θ_x, ϕ_x:

In[26]:= **l = geod["ConstantsOfMotion"]["l"]**
           {θ_x, ϕ_x} = geod["EscapeCoordinates"]

Out[26]= 10

Out[27]= {1.99164, 3.49568}

Get the Boyer-Lindquist coordinates at Mino time λ=0.1:

In[28]:= **geod[0.1]**

Out[28]= {151.55, 12.0111, 1.60014, 1.12364}

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