NumericalPropagationWithAttitude

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```
public class NumericalPropagationWithAttitude {

    public static void main(String[] args) throws PatriusException {

        // Patrius Dataset initialization (needed for example to get the UTC
time)
        PatriusDataset.addResourcesFromPatriusDataset() ;

        // Recovery of the UTC time scale using a "factory" (not to duplicate
such unique object)
        final TimeScale TUC = TimeScalesFactory.getUTC();

        // Date of the orbit given in UTC time scale)
        final AbsoluteDate date = new AbsoluteDate("2010-01-01T12:00:00.000",
TUC);

        // Getting the frame with wich will defined the orbit parameters
        // As for time scale, we will use also a "factory".
        final Frame GCRF = FramesFactory.getGCRF();

        // Initial orbit
        final double sma = 7200.e+3;
        final double exc = 0.01;
        final double per = sma*(1.-exc);
        final double apo = sma*(1.+exc);
        final double inc = FastMath.toRadians(98.);
        final double pa = FastMath.toRadians(0.);
        final double raan = FastMath.toRadians(0.);
        final double anm = FastMath.toRadians(0.);
        final double MU = Constants.WGS84_EARTH_MU;

        final ApsisRadiusParameters par = new ApsisRadiusParameters(per, apo,
inc, pa, raan, anm, PositionAngle.MEAN, MU);
        final Orbit iniOrbit = new ApsisOrbit(par, GCRF, date);

        // We create a spacecratftstate
        final SpacecraftState iniState = new SpacecraftState(iniOrbit);

        // Initialization of the Runge Kutta integrator with a 2 s step
        final double pasRk = 2.;
        final FirstOrderIntegrator integrator = new
ClassicalRungeKuttaIntegrator(pasRk);

        // Initialization of the propagator
```

```
        final NumericalPropagator propagator = new
NumericalPropagator(integrator);
        propagator.resetInitialState(iniState);

        // Forcing integration using cartesian equations
        propagator.setOrbitType(OrbitType.CARTESIAN);

//SPECIFIC
        // Adding an attitude law
        final AttitudeLaw attitudeLaw = new LofOffset(LOFType.TNW,
RotationOrder.ZYX, 0., 0., 0.);
        propagator.setAttitudeProvider(attitudeLaw);
//SPECIFIC

        // Propagating 100s
        final double dt = 100.;
        final AbsoluteDate finalDate = date.shiftedBy(dt);
        final SpacecraftState finalState = propagator.propagate(finalDate);
        final Orbit finalOrbit = finalState.getOrbit();

        // Printing new date and true latitude argument
        System.out.println();
        System.out.println("Initial true latitude argument =
"+FastMath.toDegrees(iniOrbit.getLv())+" deg");
        System.out.println("New date = "+finalOrbit.getDate().toString(TUC)+"
deg");
        System.out.println("True latitude argument =
"+FastMath.toDegrees(finalOrbit.getLv())+" deg");
        // Printing attitude
        final double psi  =
finalState.getAttitude().getRotation().getAngles(RotationOrder.ZYX)[0];
        final double teta =
finalState.getAttitude().getRotation().getAngles(RotationOrder.ZYX)[1];
        final double phi  =
finalState.getAttitude().getRotation().getAngles(RotationOrder.ZYX)[2];
        System.out.println("Psi / GCRF  = "+FastMath.toDegrees(psi)+" deg");
        System.out.println("Teta / GCRF = "+FastMath.toDegrees(teta)+" deg");
        System.out.println("Phi / GCRF  = "+FastMath.toDegrees(phi)+" deg");

    }

}
```


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