Orbit Determination Using Satellite Gravity Gradiometry

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The Satellite Gravity Gradiometry is a observation technics, which enables determining of the second derivatives of the Earth's gravity potential. They can be used for example to improve the orbits of satellites, to obtain their attitude and coefficients of the Earth's gravity field.

In the first part of this report we present a short description of the orbit determination method using measurements of the gravity gradient tensor components. These components are the functions of the gravity field coefficients and the gradiometric satellite position. It allows to make a system of the linear observation equations where the influence of the gravity field coefficient is neglected. Using the least squares adjustment method it can be obtain the normal equations, from which the corrections to the initial state dynamic vector compenents are estimated. The corrected initial state dynamic vector enables determining of the more accurate satellite orbit by means of the numerical integration method.

The report second part contains the simulation results of the determining orbit process using the simulations of the gravity tensor components. The various variants computation results are compared and some practical conclusions are given.