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INVESTIGATION OF MAGNETIC FIELD

Earth's magnetic field – is a field around our planet, where there are magnetic forces. Magnetic field is characterized by intensity vector. Intensity vector "T" is the sum of the vectors strengths of several fields: The main magnetic field (dipole uniform) is formed by electric currents in the earth's core, the magnetization of the upper layers of the earth creates a so-called continental field, ferromagnetic ore unevenly located in the earth's surface create local anomalous, magnetic fields that distort the main field of the Earth.

Typically, the vector T is estimated from its projections, on the NED coordinate system (Mx, My, Mz components). Also important two angles: declination and inclination, which indicated position of intensity vector in space, horizontal H and vertical Z components indicate intensity of T.

Declination is positive for an eastward deviation of the field relative to true north. It can be estimated by comparing the magnetic north/south heading on a compass with the direction of a celestial pole.

The inclination is given by an angle that can assume values between -90° (up) to 90° (down). In the northern hemisphere, the field points downwards. It is straight down at the North Magnetic Pole and rotates upwards as the latitude decreases until it is horizontal (0°) at the magnetic equator.

Nowadays we have mathematical model of magnetic field of the Earth, which allows to model magnetic field intensity vector. It is possible to use two models: World Magnetic Model and IERF Model. These models represent a set of coefficients for systems of equations, the solution of which allows us to estimate Mx, My, Mz. In our work we used mobile phone Samsung Galaxy I9300, and application "Data Recording" for magnetic data colecting.

At first we launched a program, and began the measuring. With help of GPS receiver we measured: Height - A scalar value, in meters; Lat - A scalar geodetic latitude, in degrees, where north latitude is positive, and south latitude is negative; Lon - A scalar geodetic longitude, in degrees, where east longitude is positive, and west longitude is negative. Wiht the help of Magnetic Field sensors – xyz - Magnetic field vector in nanotesla (nT). With the help of Gyroscope – gyros data.

As a result we have got text files with measured data. But our phone measured all data in body coordinat system, its origin and axes are given by the following: The origin is located at the center of gravity (CG) of the device. The X-axis points forward, lying in the symmetric plane of the device. The Y-axis is starboard (the right side of the device). The Z-axis points downward to comply with the right-hand rule. So, we should transform our data to NED coordinate system, is also known as a navigation or ground coordinate system. It is a coordinate frame fixed to the earth's surface. Based on the WGS 84 ellipsoid model.

In summary a special software for magnetic fiel measurements has been developed. The input data has been processed and get appropriate graphs and results.

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REFERENCES

1. Ostroumov I.V. Interpolation of magnetic field characteristics by spline functions / I.V. Ostroumov, O.O. Mironyuk, M.V. Nychak // IV National Scientific Conference of young scientists and students «Problems and prospects of Aeronautics and Astronautics» 28 – 29 October 2015 y – Kyiv, 2015. – P. 5.

2. Nychak M.V. Investigation of magnetic field/ M.V. Nychak, O.O. Mironyuk, I.V. Ostroumov // Polit. Challenges of science today: XIV International Scientific and Practical Conference of Young Researchers and Students, April 2–3, 2014 : theses. – K., 2014. – 34p.

3. Ostroumov I. Local magnetic field data processing / Ostroumov I., Mironyuk O., Nychak M. // Proceeding of the NAU. – 2015. – № 1. – 23-28 p.

4. Nychak M.V Real time sensors data processing/ M.V. Nychak, V.I. Zaporozhets, I.V. Ostroumov // Polit. Challenges of science today: XIV International Scientific and Practical Conference of Young Researchers and Students, April 2–3, 2014 : theses. – K., 2014. – 35p.

5. Mironyuk O.O. Tablet location tracking by inertial sensors / O.O. Mironyuk, M.V. Nychak, V.I. Zaporozhets, I.V. Ostroumov // III National Scientific Conference of young scientists and students «Problems and prospects of Aeronautics and Astronautics» 23 – 24 October 2014 y – Kyiv, 2014. – P. 13.