Geophysical Research Abstracts
Vol. 17, EGU2015-9260, 2015
EGU General Assembly 2015

A method for real time detecting of non-uniform magnetic field

Andriy Marusenkov
Lviv Centre of Institute of Space Research NANU and SSAU, Lviv, Ukraine (marand@isr.lviv.ua)

The principle of measuring magnetic signatures for observing diverse objects is widely used in Near Surface work (unexploded ordnance (UXO); engineering & environmental; archaeology) and security and vehicle detection systems as well. As a rule, the magnitude of the signals to be measured is much lower than that of the quasi-uniform Earth magnetic field.
Usually magnetometers for these purposes contain two or more spatially separated sensors to estimate the full tensor gradient of the magnetic field or, more frequently, only partial gradient components. The both types (scalar and vector) of magnetic sensors could be used. The identity of the scale factors and proper alignment of the sensitivity axes of the vector sensors are very important for deep suppression of the ambient field and detection of weak target signals. As a rule, the periodical calibration procedure is used to keep matching sensors' parameters as close as possible.
In the present report we propose the technique for detection magnetic anomalies, which is almost insensitive to imperfect matching of the sensors.
This method based on the idea that the difference signals between two sensors are considerably different when the instrument is rotated or moved in uniform and non-uniform fields. Due to the misfit of calibration parameters the difference signal observed at the rotation in the uniform field is similar to the total signal - the sum of the signals of both sensors. Zero change of the difference and total signals is expected, if the instrument moves in the uniform field along a straight line. In contrast, the same move in the non-uniform field produces some response of each of the sensors. In case one measures dB/dx and moves along x direction, the sensors signals is shifted in time with the lag proportional to the distance between sensors and the speed of move. It means that the difference signal looks like derivative of the total signal at move in the non-uniform field.
So, using quite simple electronic schematic it is possible to detect the lag between the total and difference signals and to trigger alarms, when the instrument passes near a magnetized object.
The proposed method was successfully applied in the two instruments: the low-power search coil magnetometer for vehicle detection system and the low-noise flux-gate magnetometer for magnetocardiograph. Author believes that this approach could be also useful for the fast inspection of the area during the engineering, archaeology, UXO surveys.