

Subsurface targets detection using EM sensors

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In recent years, unexploded ordnances and metallic mines detection and discrimination technologies have made significant progress in using electromagnetic induction [1]. But, case of plastic mines remains problematic.

It is better to consider the problem: Instead of detecting non-metallic mines, the cavities in the soil where potentially mines can be found. Such an approach allows to determine the areas of soil where there are no mines. Such information is important. If the emptiness of the soil repeats the shape of the mines, it is possible to determine the expected electromagnetic response and discriminate the object. But such approach can be fatal. In the soil the mines can be surrounded by some space and cannot be discriminated. But size of cavity and possible presence of the mines in a cavity can be assessed.

For this purpose, it is important to develop a new type of electromagnetic sensor, which can detect metal objects and cavities in the soil.

Numerical experiments are carried out using computer modeling. As a result, capabilities of the electromagnetic induction to invert the soil electromagnetic parameters are demonstrated. Soil modeling was done using approach [2] and the parameters are inverted using the Gauss-Newton method. Using Method of Auxiliary Source, interaction between electromagnetic sensors and the spherical cavity in the conductive environment is studied.

References

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