3D subsurface imaging without ground reflection and direct wave by using bistatic GPR

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Ground penetrating radar (GPR) is one of the subsurface measurement techniques which utilizes a reflection of the electromagnetic wave from a buried object, and allows a visualization of a subsurface structure. The application of GPR varies widely such as landmine detection, subsurface exploration of moon, and so on. In order to utilize GPR effectively, it is the most important to receive the reflection from the buried objects. However, amplitudes of a ground surface reflection and a direct wave which propagates directory between a transmitting and a receiving antennas are stronger than that of the reflection from the buried object, which often becomes a problem especially in a search near the ground surface.

In this presentation, a bistatic GPR system is proposed with an aim of the subsurface visualization without the ground reflection and the direct wave. The bistatic radar means a radar system whose transmitting antenna and receiving antenna are separately located, and the transmitting antenna is fixed in one position in our system. Thus, a suppression of the ground reflection by using Brewster angle can be realized. Besides, Frequency-Spatial frequency domain filter (FK Filter) which works from a position information of the transmitting and a receiving antennas is applied to suppress the direct wave. Then, three-dimensional subsurface image is reconstructed with a migration technique. A laboratory experiment demonstrates an imaging capability of a landmine model with a depth of 10cm by using the proposed system.