Detecting Land Mines by Underground Radar Compression Sensing

The target detection capacity of underground radars was improved using model reference type compression sensing, and this was applied to land mine detection. Conventional compression sensing technology had merits using this method—some radar data include only several targets, and making use of sparse subspaces of image space and the amount of observed data was substantially reduced, making no need to make short data acquisition intervals. However, without some improvements, it could not be applied to land mine detection by the underground radar. The reasons were that land mines are not point scatterers and the propagation property of the electromagnetic wave was very complex and had a very strong clutter structure. M. Sato then developed a model reference type compression sensing algorithm taking into account physical architecture and further employed a block structure which assumes radiowave scattering from the land mine as a set of scattering from several pixels, thereby succeeding in the imaging of buried land mines. He tested the effectiveness of the proposed method using data actually acquired in the real minefields in Cambodia when he carried out field research as a member of the team of Tohoku University, in addition to data obtained in experimental laboratories.

In 2016, he received the IEICE's Zen-ichi Kiyasu Award for this study.