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Underground Soil Sensing Using Subsurface Radio Wave Propagation

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Abstract

Continuous sensing of soil moisture is essential for smart agriculture variable rate irrigation (VRI), real-time agricultural decision making, and water conservation. Therefore, development of simple techniques to measure the in-situ properties of soil is of vital importance. Moreover, permittivity estimation has applications in electromagnetic (EM) wave propagation analysis in the soil medium, depth analysis, subsurface imaging, and UG localization. Different methods for soil permittivity and moisture estimation are time-domain reflectometry (TDR), ground-penetrating radar (GPR) measurements, and remote sensing. One major bottleneck in the current laboratory-based permittivity estimation techniques is off-line measurement of the collected soil samples. At that, the remote sensing approaches are limited to shallow depths of 20cm. In this paper¹, we have presented an underground soil sensing approach using subsurface radio wave propagation.

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