Measuring Agricultural Surface Roughness with Terrestrial LiDAR

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Context
Adaptations must be made to agricultural practices to navigate the urgent challenges of:

- dwindling global fresh water supply
- growing food demands
- increasing global populations

Soil Moisture Maps
Accurate soil moisture maps benefit Ontario farmers by:

- Improving the efficiency of irrigation
- Reducing soil erosion and chemical runoff
- Optimizing fertilizer, pesticide and insecticide applications
- Promoting maximum yields

Light Detection and Ranging (LiDAR) systems use reflected light to characterize a surface in three dimensions. LiDAR can yield a tremendous number of omnidirectional surface profiles from a single surface model of a field.

LiDAR Roughness Tool
An open-source GIS plug-in was developed to extract surface roughness parameters from terrestrial LiDAR scans using data collected over 10 agricultural fields within the Elora Research Station (University of Guelph).

Roughness statistics are extracted along profiles similar to those illustrated above.

Purpose of Research
Roughness has been challenging to define; however better understanding of its affect would improve soil moisture monitoring from RADAR systems.

The purpose of this work is to closely characterize roughness on fields using an open source GIS plug-in.

Conclusions
Advancing the quality of surface roughness characterization improves the accuracy of satellite-obtained soil moisture maps.

Improved characterization of surface roughness and soil moisture maps can be used to promote best management agricultural practices and build environmental, economic and social resilience.

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