

## **Utilizing repeated gps surveys from field operations for development of agricultural field dems.**

### **ABSTRACT**

Topographic data collected using RTK-DGPS-equipped farm vehicles during field operations could add additional benefits to the original capital investment in the equipment through the development of high-accuracy field DEMs. Repeated surveys of elevation data from field operations may improve DEM accuracy over time. However, minimizing the amount of data to be processed and stored is also an important goal for practical implementation. A method was developed to utilize repeated GPS surveys acquired during field operations for generating field-level DEMs. Elevation measurement error was corrected through a continuity analysis. Fuzzy logic (FL) and weighted averaging (WA) methods were used to combine new surveys with past elevation estimates without requiring storage and reprocessing of past survey data. After 20 surveys were included, the DEM of the study area generated with FL and WA methods had an average root mean squared error (RMSE) of 0.08 m, which was substantially lower than the RMSE of 0.16 m associated with the DEM developed by averaging all data points in each grid. With minimum control of errors in elevation measurements, the effect of these errors can be reduced with appropriate data processing, including continuity analysis, fuzzy logic, and weighted averaging. Two years of GPS surveys of elevation data from field operations could reduce elevation error by 50% in field DEMs.

**Keyword:** Digital elevation model; Fuzzy logic; GPS; Topography.