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## The RITAS algorithm: a constructive yield monitor data processing algorithm

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**The RITAS algorithm: a constructive yield monitor data processing algorithm**

by

**Luis Damiano**

A Creative Component submitted to the graduate faculty  
in partial fulfillment of the requirements for the degree of  
MASTER OF SCIENCE

Major: Statistics

Program of Study Committee:  
Jarad Niemi, Major Professor  
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Iowa State University

Ames, Iowa

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## DEDICATION

To those who have helped me, those who presently help me, and those who will help me grow.

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## ABSTRACT

Yield monitor datasets are known to contain a high percentage of unreliable records. The current tool set is mostly limited to observation cleaning procedures based on heuristic or empirically-motivated statistical rules for extreme value identification and removal. We propose a constructive algorithm for handling well-documented yield monitor data artifacts without resorting to data deletion. The four-step Rectangle creation, Intersection assignment and Tessellation, Apportioning, and Smoothing (RITAS) algorithm models sample observations as overlapping, unequally-shaped, irregularly-sized, time-ordered, areal spatial units to better replicate the nature of the destructive sampling process. Positional data is used to create rectangular areal spatial units. Time-ordered intersecting area tessellation and harvested mass apportioning generate regularly -shaped and -sized polygons partitioning the entire harvested area. Finally, smoothing via a Gaussian process is used to provide map users with spatial-trend visualization. The intermediate steps as well as the algorithm output are illustrated in maize and soybean grain yield maps for five years of yield monitor data collected at a research agricultural site located in the US Fish and Wildlife Service Neal Smith National Wildlife Refuge.