Machinery Performance Assessment Based on Records of Geographic Position

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Background

- **Records of geographic position (traffic pattern) of farm machinery accompany numerous spatial data layers generated through precision agriculture practices**
- **Traffic pattern itself can be used to determine valuable information for improved decision - making strategies**
- **Capacity, efficiency, and cost of operation are conventional machinery performance terms that used to be defined on a field basis**


Objective

- **Explore opportunities for using farm machinery position records to evaluate the spatial variability of machinery performance**
- **Develop analytical tools to construct maps representing the variability of machinery usage in various field locations**
- **Utilize field coverage category to ensure determination of machinery performance estimates in every point of the field**
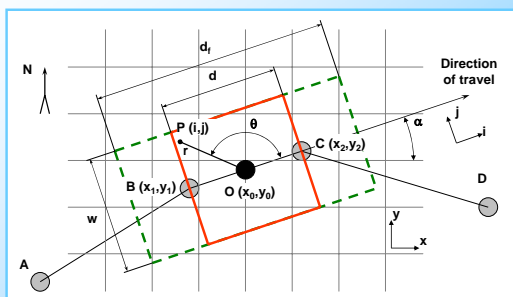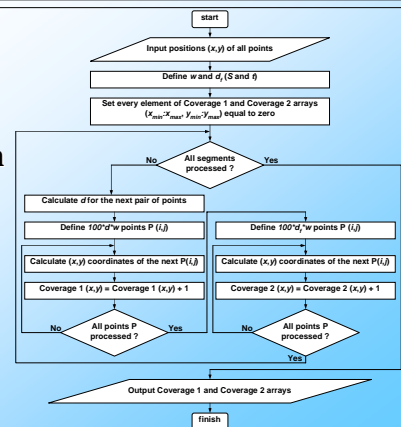

Representation of a Recorded Route

Variable Speed

Fixed Speed
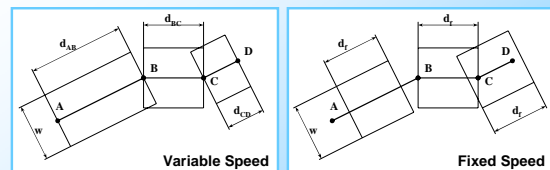
Machinery performance can be affected by:
- **Travel (operation) speed**
- **Effective swath width**
- **Traffic pattern**

Coverage Calculation
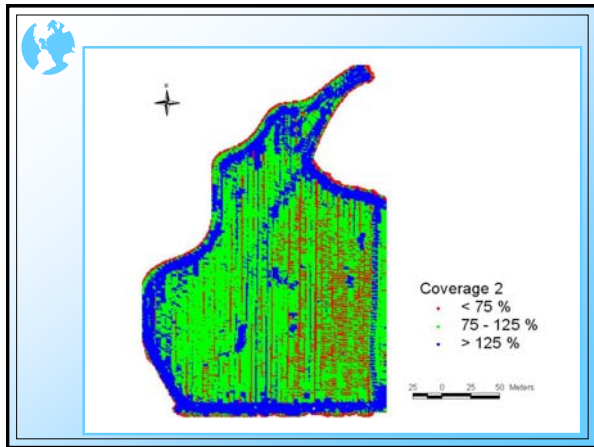

Coverage Calculation Algorithm

Field Data

Continuous log (1 Hz)   Yield monitor output (0.25 Hz)

Coverage 1
- < 75 %
- 75 - 125 %
- > 125 %

Coverage 2
- < 75 %
- 75 - 125 %
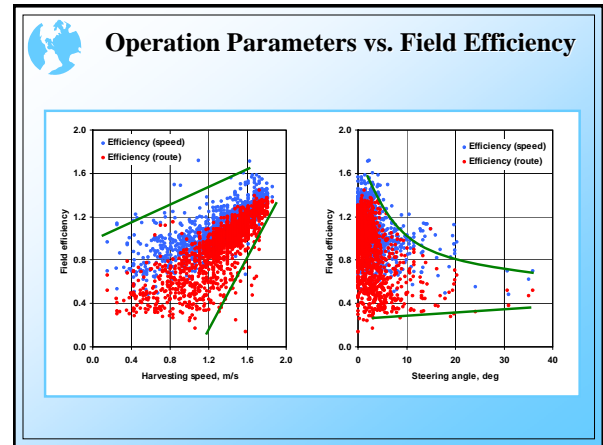- > 125 %

Field coverage efficiency
- Maneuvering
- Overlaps
- Normal

Cost of harvesting
- Low
- Average
- High
- Very high

Field efficiency (speed)
- < 0.85
- 0.85 - 1.15
- > 1.15

Operation Parameters vs. Field Efficiency
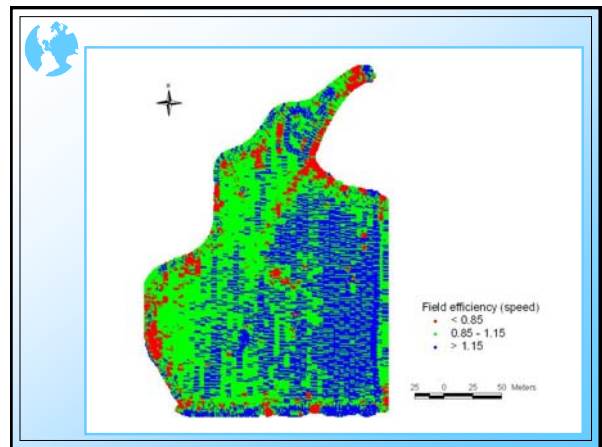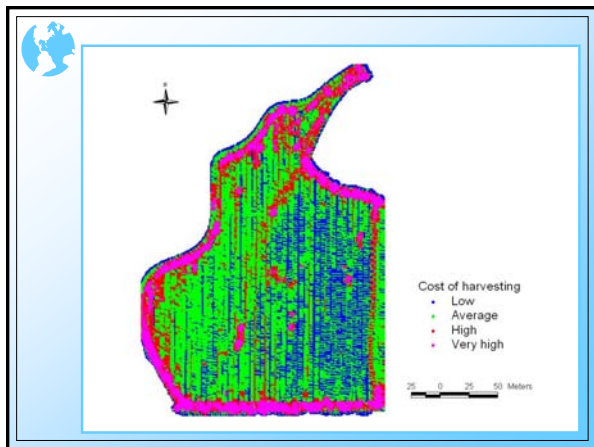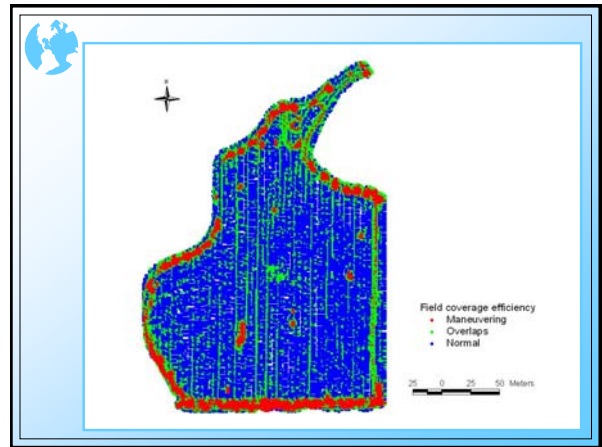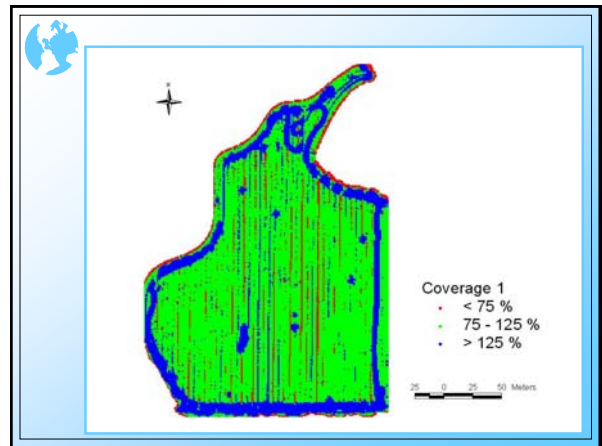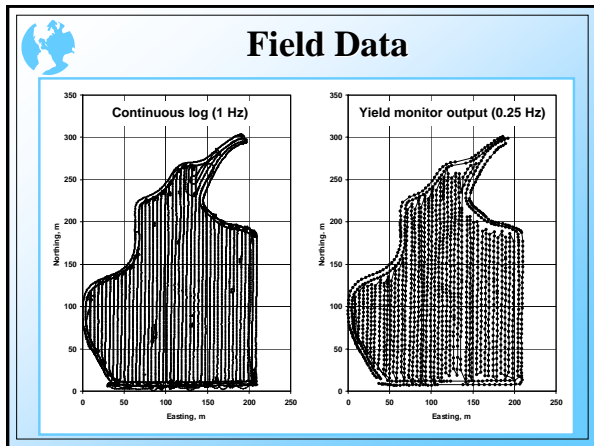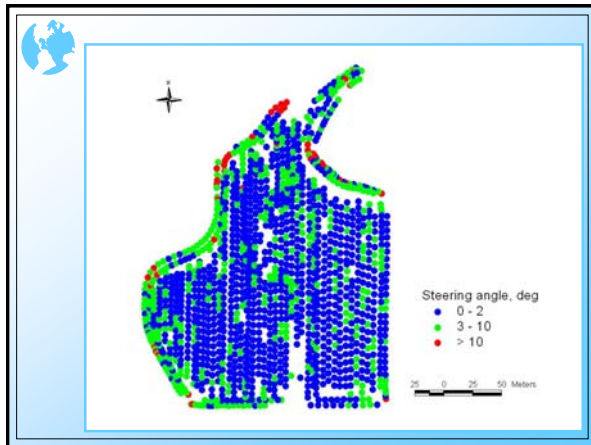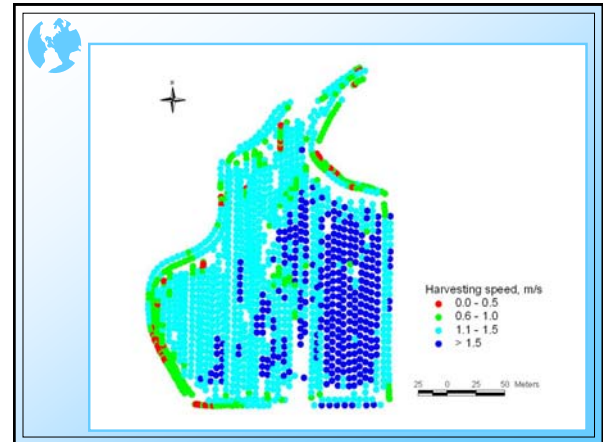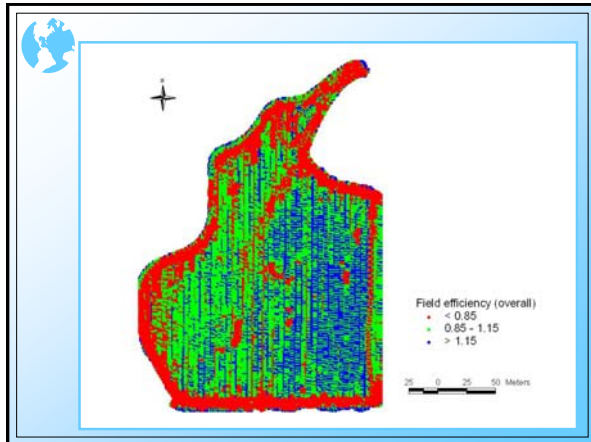
Conclusions

- **The algorithm developed allows transforming machinery position records into two coverage maps (Coverage 1 and Coverage 2)**
- **The first map indicates field areas affected by repeated passes and variable actual swath width and the second map also reflects the effect of variable travel speed**
- **The obtained maps can be converted into a set of data layers associated with conventional categories (cost of operation, capacity, efficiency, etc.)**
- **Various types of analytical methods can be used in the future to utilize these data while developing decision - making strategies**

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