Low-Cost Smart Tractor Control Options

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Precision Agriculture and Sensor Systems Team

- Development of Proximal Soil and Plant Sensing Systems
- Geospatial Data Processing and Management
- Practical Implementation of Precision Agriculture

Two-Level Control

- Advisory service to define site-specific needs
  - Cultivar and soil
  - Weather and economics
  - Risk management

- Variable rate technology
  - Distinct difference in site-specific needs
  - Means to recognize the variability
  - Responsive application tools

The Smart Tractor Concept

- Match tractor operation with local conditions according to operator-defined rules or direct operator input
- Use of internal or external sensors to replicate appropriate operation settings
ISOBUS Implementation

Sensor 2
Termination
Implement ECU
IBBC
Implement Bus
TECU
SCV (1-6)
Hitch
Vehicle Speed
Drive-strategy
Steering
Tractor Bus
Diff Lock
MFWD
PTO
iTEC
VI app
GPS
VT
Sensor 1

Principle of the Algorithm
Sensor 1
Sensor 2
Sensor Data
Travel path
Field

Stage Control
Variable Rate Liquid Cattle Manure Management
Allowed environmentally safe discharge of additional 30 % (150 m³) of liquid manure in this 11.1-ha alfalfa field

Proportional Control
Variable Rate Liquid Cattle Manure Management
Allowed environmentally safe discharge of additional 20 % (80 m³) of liquid manure in this 12.4-ha corn field

Map-Based Control
Variable Rate Liquid Cattle Manure Management
Variable Depth Planting

- Planting Depth Control
- Soil Water Content Sensing

New On-Line Soil Moisture Sensor

- SE = 3.8%

Sensor-Based Speed Control

- Active crop canopy sensor
- Normalized Difference Red Edge (NDRE) vegetation index

Crop Height Tractor Speed Control

- Ultrasonic proximity sensor
- Crop height

Machine Vision Cultivator Guidance

Quick-Attach Steering Mechanism
System Prototype

Trajectory Assessment

System Evaluation

Test Track

Test Result

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