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ifgi
Institute for Geoinformatics
University of Münster



Studying Plant Communities and Phenotypic Traits by UAV-Based Close Range Remote Sensing and Image Analysis

*Christian Knoth, Torsten Prinz
Institute for Geoinformatics, University of Muenster*

Developers' Workshop: "Novel Sensor Technologies for Plant Phenotyping"

Wageningen, 2012-9-14

<http://purl.net/ifgi/copter>

Overview

- I. Introduction
- II. Quadrotor Sensor Platforms
- III. Sensor Technique
- IV. Monitoring of Bog Ecosystems
- V. Precision Agriculture
- VI. Perspectives for Phenotyping

Introduction

The ifgicopter project:

Aim: using multicopters as platforms for gathering all kinds of sensor data

- high flexibility
- VTOL (hovering)
- little operating costs
- variable spatial and temporal resolution



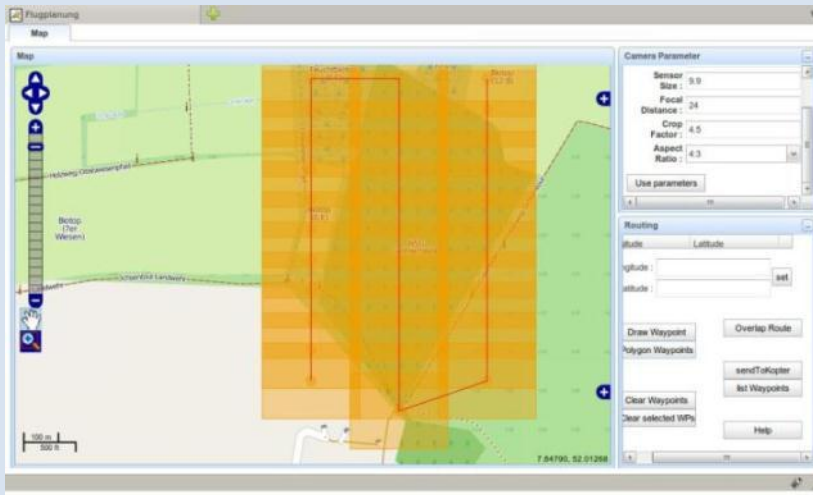
www.borkenerzeitung.de

Introduction

Fields of work:

- flight planning software
- communication framework
- accurate positioning via enhanced differential GPS (DGPS)
- creation of (infrared) remote sensing products
- analysis of climate phenomena
- ...

Quadrotor Sensor Platforms

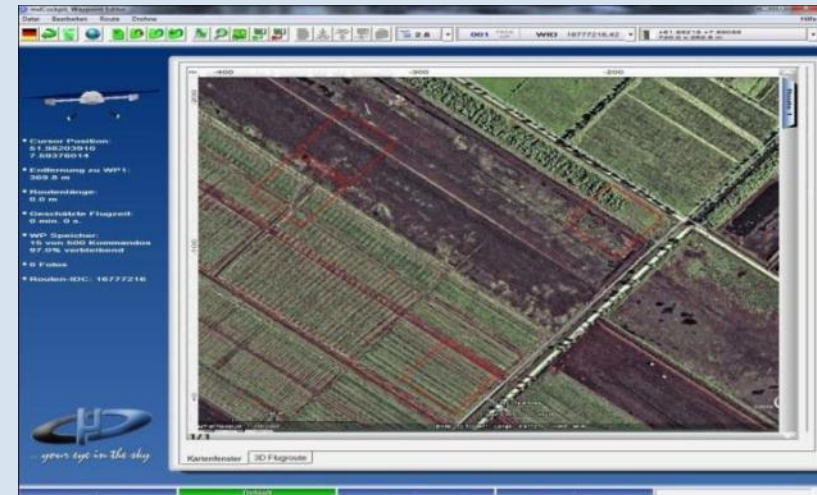


“Mikrokopter”
(building kit)

→ carries IXUS400 or
(NIR only, natural colour)



(semi-) autonomous navigation via GPS and flight planning software



“Microdrones”
(ready-to-use product)

→ carries LUMIX LX3
(VIS-NIR)

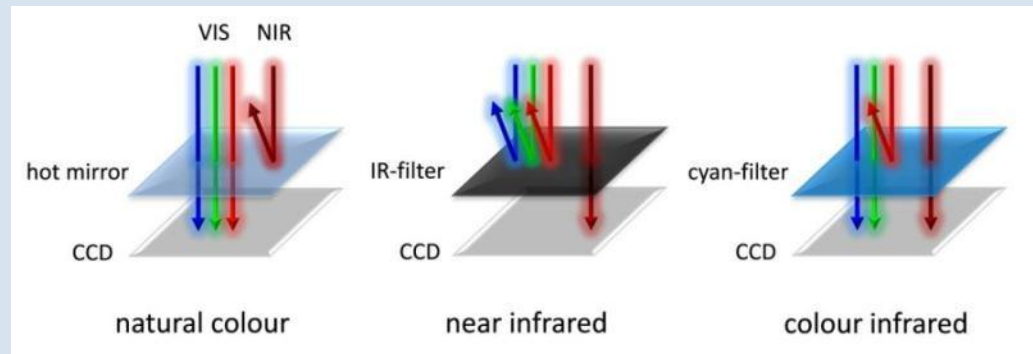


(semi-) autonomous navigation via GPS and flight planning software

Sensor Technique

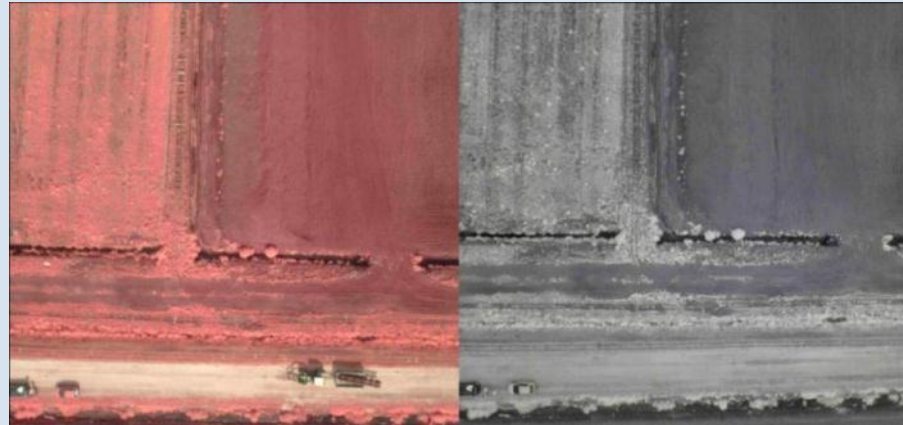
LUMIX LX3:

- modified digital compact camera
- hot mirror removed
- captures light between 400 and 1100 nm wavelength
- natural colour, NIR or CIR images (external filter)

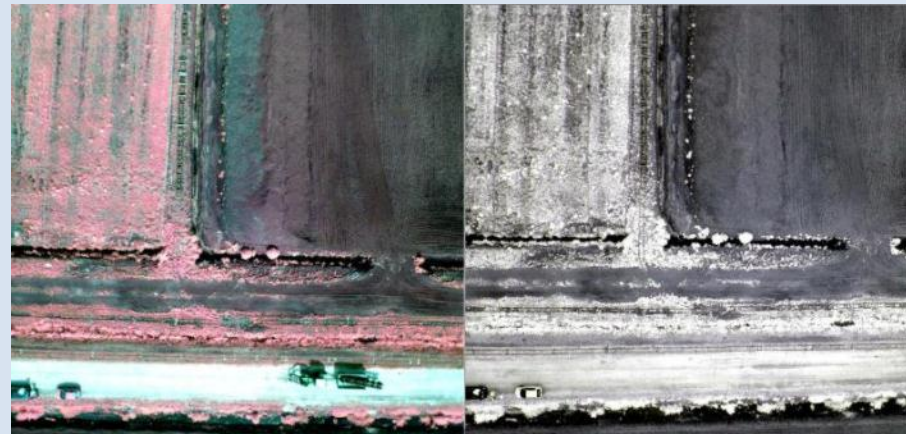


Sensor Technique

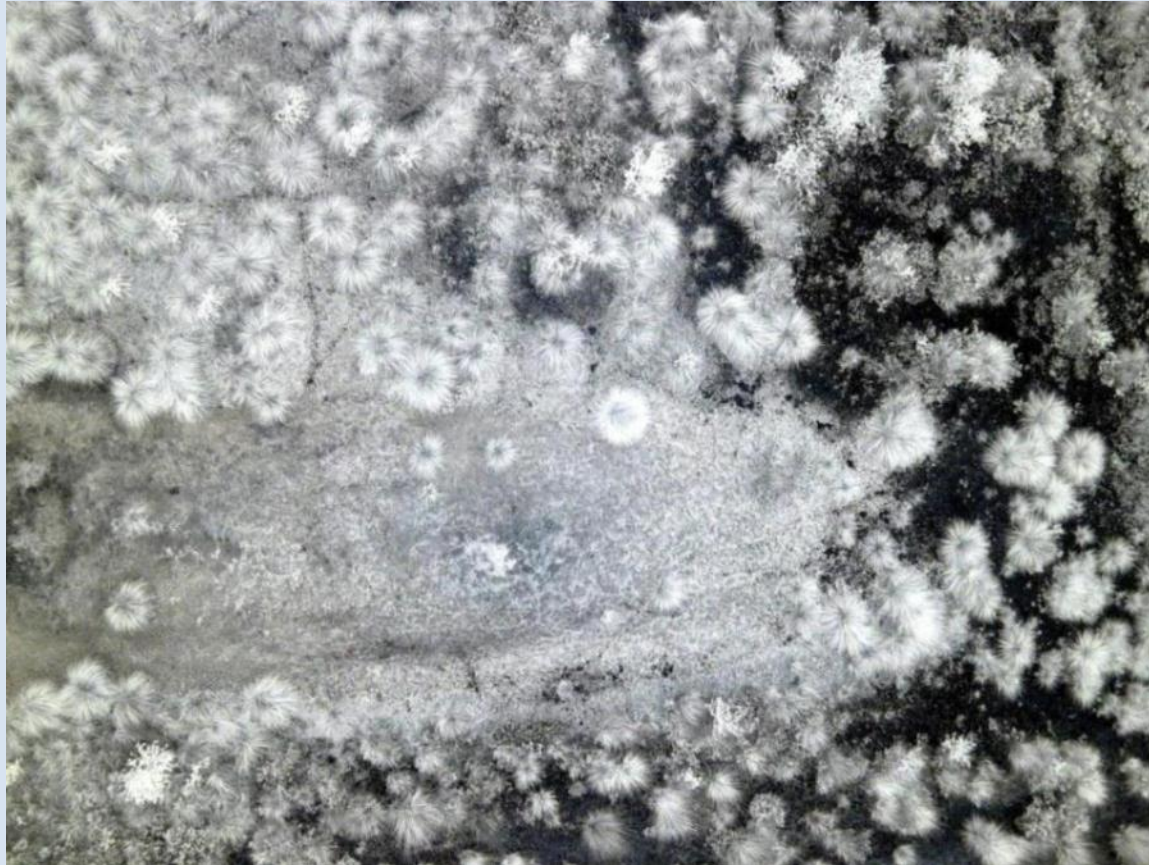
CIR



NIR



Monitoring of Bog Ecosystems

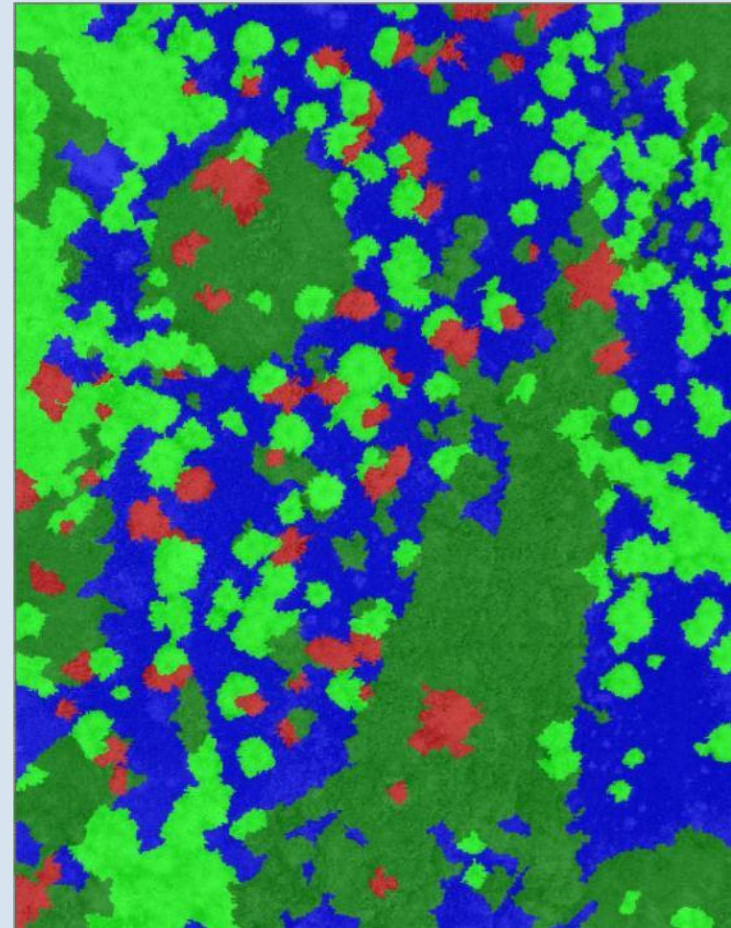


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Monitoring of Bog Ecosystems

object-based classification

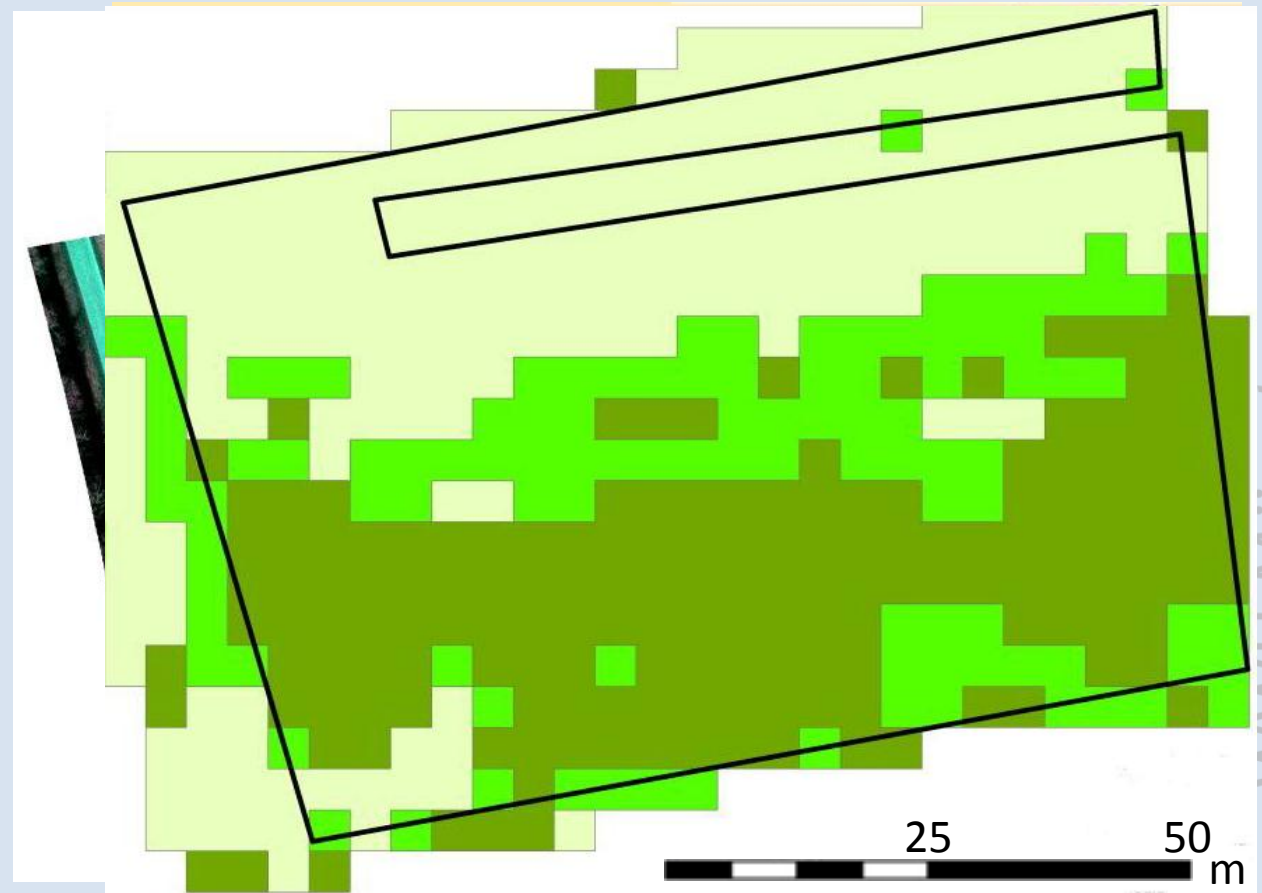
- waterlogged bare peat
- birch trees
(*Betula pubescens*)
- cotton grass
(*Eriophorum vaginatum*)
- sphagnum moss
(*Sphagnum spec.*)
- result



Precision Agriculture

Nitrogen Management

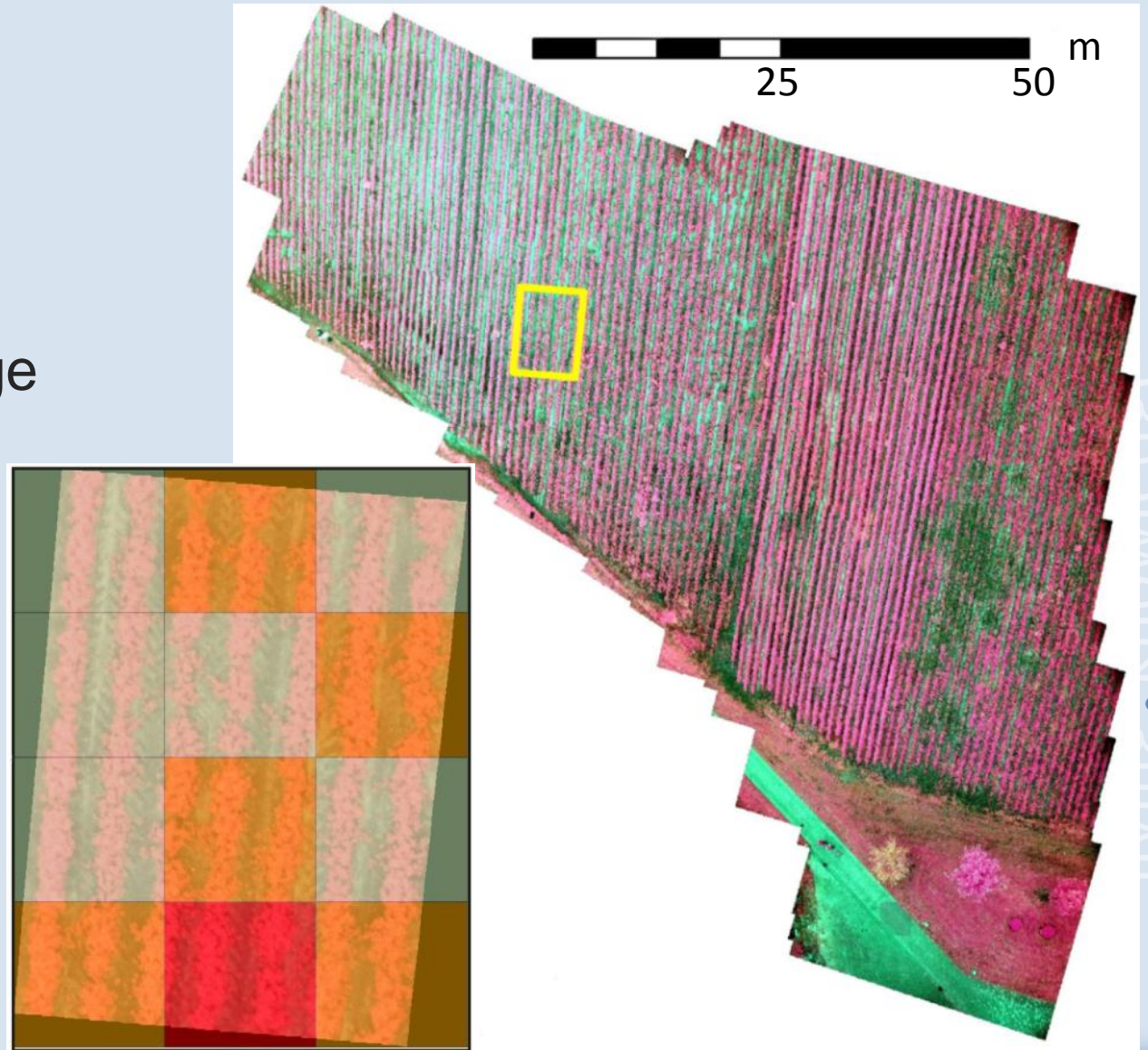
- CIR Image
- GNDVI image
- application map



Precision Agriculture

Weed Detection

- CIR Image
- high resolution image
- crop row detection
- weed detection
- application map



Perspectives for Phenotyping



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Perspectives for Phenotyping

- variable ground resolution
- enhanced CIR sensor technique
- payload extension ($> 1,5$ kg)
- 3D imaging (growth height)
- LIDAR
- ...



www.digitalkamera.de

Thank you for your kind attention!

Questions?



<http://purl.net/ifgi/copter>