Drones detect local variations and provide tools for agriculture

Drone technologies provide tools for improving processes in agriculture and horticulture. Drones are utilized to gain knowledge for precision farming actions, document interesting phenomenon and to get general information from the fields. Drones can contribute the farming firstly by providing relative information about variation within the studied area like the yield amount, secondly by providing absolute information about the studied phenomenon like infestation status and thirdly by accomplishing small works like reseeding. The first two examples are based on imaging and the third applies specific tools developed for the drone.

The drone imaging is based on passive remote sensing. The imaging data is processed to georeferenced orthomosaic of the studied area and then classified to relative classes that can be converted to absolute values by additional information. Results are like a yield map, a specific nutrient status map, soil moisture map, vegetation density or crop loss map, a weed area map or a relative infestation map. Spatial analysis methodologies or machine learning technologies are used for the classification. Additional methodologies are needed to put the classification information into actions. By the decision support systems by the detected nitrogen level variation is adjusted to the additional nitrogen fertilizer application plan. The drones that accomplish works are fully integrated systems with maximum payload being tens of kilograms. Drones do not harm the cultivated vegetation, so they can work on demand. The drones are doing pollination, fertilizer application, spraying, seeding, biological plant protection. The aviation rules regulate these operations. Drones will not replace heavy machinery and new approaches are under development. The potential of reducing chemical usage and reducing nutrient leach with working drones is huge since their capability of working repeatedly on demand without disrupting the primary vegetation.

KEY WORDS

Remote sensing, drones, decision support systems, precision agriculture

COUNTRY

Finland

AUTHORS

Jere Kaivosoja
Oiva Niemeläinen

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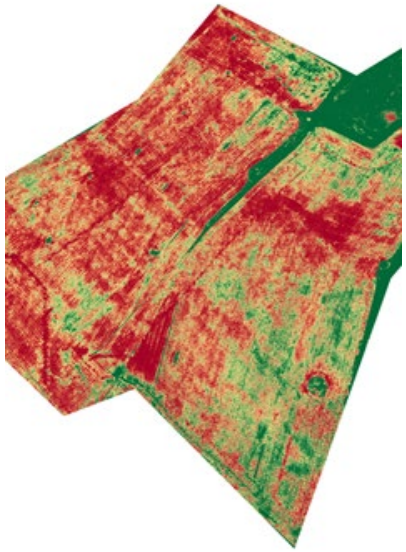
ADDITIONAL INFORMATION



The drone imaging is based on passive remote sensing from vegetation reflected solar radiation. Various sensors are used to detect reflection at different wavelengths to observe vegetation specific information. Normal cameras and multispectral or hyperspectral instruments are utilized. The result of imaging depends highly on the imaging conditions: the weather, sunlight and the growth stage and conditions of the vegetations. The absolute values can be attained also with special instruments like lidars or radars, or by image analysing methods like photogrammetric 3d construction or close-range imaging to detect individual pests, weeds or vegetation damages. The absolute values don't need additional reference data. Machine learning solutions are at the core of the object detections.

Research is producing new application possibilities and improving classification results. Currently, the consumer level tools provide sufficient data for specific applications but due to nature of passive imaging, the results are highly case dependent.

Coordinator: Johanna Routa - (Luke) johanna.routa@luke.fi
Dissemination: itabia@mclink.it
www.branchesproject.eu

ABOUT BRANCHES

BRANCHES is a H2020 "Coordinaton Support Action" project, that brings together 12 partners from 5 different countries. The overall objective of **BRANCHES** is to foster knowledge transfer and innovation in rural areas (agricolture and forestry), enhancing the viability and competitiveness of biomass supply chains and promoting innovative technologies, rural bioeconomy solutions and sustainable agricultural and forest management.

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THE PARTNERSHIP

Luke Luonnonvarakeskus
National Research Council of Italy Institute of BioEconomy Department of Biology, Agriculture and Food Science
VTT
University of Warmia and Mazury in Olsztyn
DBFZ
circe Research Centre for Energy Resources and Consumption
ITABIA Italian Biomass Association
MTK
aveBiom Spanish Biomass Association
UFZ
W-MODR
BioEconomy Cluster