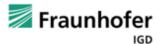# Greenland Monitoring

Name of the Organisations Involved

- Fraunhofer Institute for Computer Graphics Smart Farming, Germany

Challenges Identified

Around 40% of the earth's land mass is covered by grassland, on which the prosperity of around 2 billion people worldwide is directly dependent. Grassland serves as pasture, provides important ecosystem functions such as carbon storage and ensures food security for a growing global population.

Through digitized and automated recognition of plant species and analysis of biomass growth, both grassland management and funding opportunities for ecological measures should be made easier. This is where UAS (drone) technology shows great potential: various camera and sensor technologies collect spatially and temporally high-resolution information in the visible and infrared spectrum. With the help of machine learning and artificial intelligence, the species composition as well as the quantity and quality of growth in the grassland can be derived from the 2D images and the 3D models.

This information is a prerequisite for precision farming and can therefore help to reduce the number of fertilizers and pesticides and optimize pasture management.

Goals and Solution

Machine learning and AI algorithms are used to detect and locate plant species from the composite drone images and sensor data. Certain individuals or groups of individual plant species can be identified and located with centimetre precision, so that maps of the flown and scanned field with the distribution of the plant species can then be created.

This detection is relevant in practice, on the one hand, for agriculturally relevant species such as the distribution of nutritious fodder plants, which are indicators of high-quality grassland, and, on the other hand, the quantity and distribution of harmful and even poisonous plants, which reduce the quality of the forage or are even dangerous can be for the health of the animals.

Actions taken

Ecologically, species recognition is particularly important for biodiversity monitoring of grassland areas from intensively to extensively cultivated areas. Specifically, extensively managed grassland, i.e. the low use of fertilizers and mowing or grazing a grassland area once or twice, promotes plant biodiversity on these areas, which also has a positive effect on the insect and bird population. The new eco-regulations of the EU's Common Agricultural Policy (CAP) have been in effect since the beginning of 2023, which means farmers can have extensive pasture supported in order to maintain or even expand it. The Smart Farming department at Fraunhofer IGD trains specific species recognition models using AI algorithms that not only recognize the so-called identifiers for species-rich grassland, but can also localize their distribution and, in some cases,

individual plants with centimetre precision. This application will also be certified as proof of government funding in the near future.

Benefits and Impact

Certain individuals or groups of individual plant species can be identified and located with centimeter precision, so that maps of the flown and scanned field with the distribution of the plant species can then be created.

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Other applications served by the Smart Farming department in the area of drone-based visual computing include biomass assessment and feed quality monitoring in grassland, disease detection and wild or storm damage assessment in arable land and grassland, as well as monitoring carbon sequestration when rewetting moors.

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Application Area
☒ Plants   ☒ Terrain

Digital Technology in the Value Chain
☒ Agronomic Services   ☒ Agricultural Inputs and Services

Digital Technologies
☒ Sensor Technology   ☒ Drones and AGVs   ☒ Artificial Intelligence (AI)