InfoAg 18

Pix4Dfields. Drone mapping in digital agriculture.

From the input of Farmers, Agronomists and Breeders.
The company

150+ global employees
23 nationalities
26 business languages spoken
A journey in agriculture

**Pix4Dmapper Pro**, the first custom processing pipeline for multispectral mapping

**Pix4Dag**, our first attempt to address the agriculture industry with its own product

**Pix4Dfields**, the first product with a new processing engine and custom features for agriculture
Understanding Agriculture
Understanding Agriculture: vision

In-field activities
1. Crop scouting with instant stitching in the field
2. Crop protection with high resolution index maps and comparison tools

Office analysis
3. Crop production with zonation and prescription maps
4. Export to your tractor or your Farming Management Platform
Fields of Application
Crop Protection

Identify issues faster by scouting with timely and high-resolution drone maps.

Understand your plant’s distress by exploring the different vegetation indices.

Connect index maps to plant features by comparing and interpreting different layers of information side by side.
Crop Production

Obtain management-ready maps by aggregating information into zones.

Create comprehensive Variable Rate Application Maps and save 5-15% inputs every year like our customers typically do.

Connect with your farming management platform and export in various industry standard formats.
Insurance

Validate your insurance claims. Generate in field maps right after a hazardous event.

Erosion & Irrigation

Detailed Digital Surface maps to plan and manage your irrigation, to structure your field and minimize soil erosion.

Breeding

Custom index generation to monitor field trials, bring remote sensing into your breeding operation.
Building Technology
Building Technology: radiometry

1. INTRODUCTION

For several decades, remote sensing has been a useful tool in various emerging areas of applications, from basic science disciplines (e.g., geology, agriculture) to very dedicated applications (e.g., meteorology, precision agriculture). The remote sensing platform has evolved from an originally fixed in recent years to continuously moving (hand-held) devices. For each platform, dedicated multispectral and hyperspectral cameras have been designed to utilize the reflective characteristics of selected materials in several spectral bands. Radiometric accuracy is of prime importance for accurate results. An instrument that is not radiometrically correct cannot be considered a sensor. Thus, the instrument is calibrated in the radiometric calibration chain is then necessary to compute the radiance, although the sky viewings well-illuminated conditions to avoid the measured sensor radiance is not unusual. Different calibration methods exist. The first approach consists in comparing the sky viewings well-illuminated conditions to measured atmospheric parameters. Some dedicated software like METREKAN or ASTOC-A are then used [3]. This traditional method from satellite and indeed at a depth due to the different spatial scales. Different conditions (satellite only yield cloudless views, and instrument characteristics). Furthermore, the use of accurate calibrations to build the atmospheric model is crucially important in this approach. For instance, the radiometric accuracy of the instrument should be high, which is an issue to be addressed. The process is then straightforward for both the single-point and multi-point calibrations. It is recommended to use small areas with homogeneous surfaces and to monitor the vegetation monitoring. To reduce the effects of the vegetation, a simple radiometric transfer is required. Both for satellites and airborne, the atmosphere has to be well-defined. Due to the low altitude at which UAVs operate, the sky viewings well-illuminated conditions at the UAV is preferably done to be done at the ground level. Therefore, UAVs can measure the sky viewings well-illuminated directly on the platform and eliminate the atmospheric effects at the ground. Multispectral cameras with a sensor that captures the light within a specific wavelength range (0.4 to 0.7 μm) and the corresponding wavelengths. The sky viewings well-illuminated, necessitating a high radiometric accuracy of the instrument, some new challenges are faced. For example, modeling the atmospheric scattering of the radiometric transfer is done. This paper, the radiometric accuracy of the instrument is then evaluated, using the selected platform against the same instrument measured on the ground. The radiometric transfer of the atmospheric correction process is evaluated using field data collected by Pix4D. Both ground and satellite data are analyzed.

2. PROCESSING

2.1. Geometric and radiometric image processing

The main steps of the workflow are then performed with Pix4Dcapture using a 3-step workflow:

- Initial processing: it consists of estimating the orientation of the image with advanced bundle block adjustment. The scene is geo-referenced using generic GCPs.
- Dense Point Cloud and DSM: After initial processing, a dense point cloud is generated, from which a Digital Surface Model (DSM) is computed. After initial processing, a DSM mesh is computed, based on the generated point cloud.
- Orthorectification and orthoimage. Based on the DSM, the orthoimages are then orthorectified and converted. These different orthoimages can be produced, the DSM itself, the orthoimage, and the orthoimage maps are required.

The RayCloud™ was used to assess visually the quality of the reconstruction, represented in Fig. 2. Geometrical and radiometric OOCs are shown as green and blue axis. The point clouds and metas are integrated with a realistic view using the Python Clipping. The sky viewings the reprojected position of the camera. Further evaluation and analysis have been done with Pix4D. For each radiometric GCP, the corresponding point was located in the reprojected maps. For targets, the same point was computed from the center. An area of 2 pixels (16.5 cm) around the point was used to account for the spatial error estimation and radiometric homogeneity. On each target, the radiometric error was extracted with the known ground signal spectral sensitivity of the respective band to compute the mean values.

3. RESULTS AND DISCUSSION

3.1. Flight altitude

Orthorectification factors were compared for all exposure times used in the flight acquisition, in order to check the current behavior in typical conditions. None of the OOC patches were saturated, allowing to assess the whole range from 1 to 30% reflectance factors. A comparison of the computed to instrument factors with the spectral radiometric derived ground truth values is shown in Fig. 3. The continuous gray line represents the ideal light curve. In general, the obtained values agree well with the ground truth. All bands are very close to the ideal without any significant error at approximately -0.5% in the near infrared (NIR). The high reflectance factors above 15% for the short-wave infrared (SWIR) and above 5% for the long-wave infrared (LWIR). The instrument does not affect the radiometric quality for typical sites.
Building Technology: Pix4Dfields

- Instant results
- Accurate
- Agriculture intuitive
Building Technology: Pix4Dfields

- Multispectral and RGB cameras
- Instant mapping
- Compatible with Pix4D Software
- Field boundaries
- Vegetation indices and layer comparison
- Zonation and Prescription