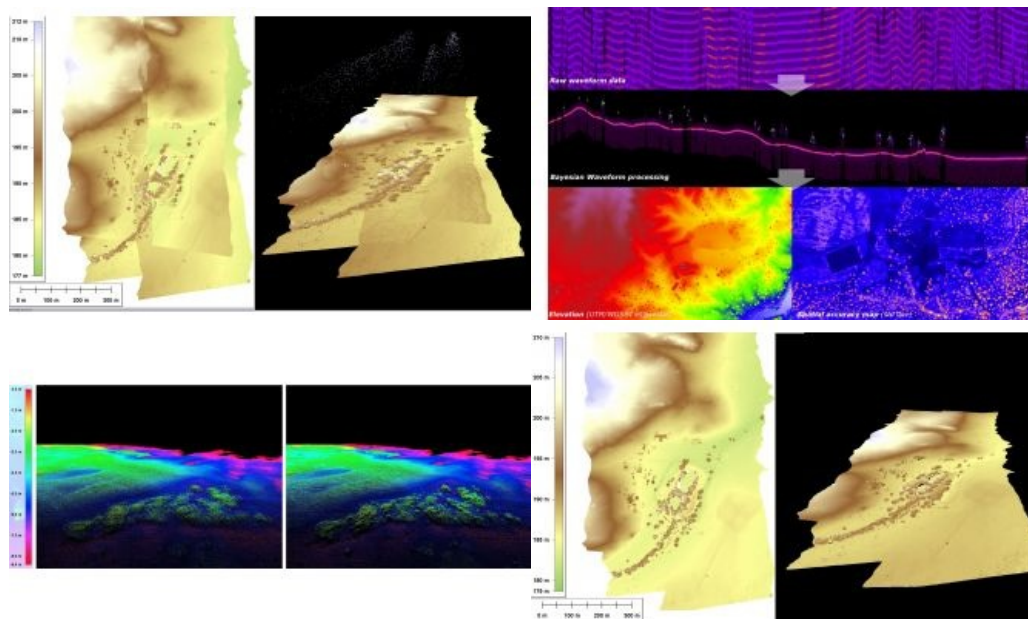


BAYESMAP SOLUTIONS

Extracting More Value from Lidar Data



The company BayesMap Solutions was established in October 2014 with the objective to provide unique consulting and software development services for the airborne Lidar industry. The main focus is data processing, providing fast and effective solutions to challenging problems. The company helps clients extract a maximum of information from large and complex datasets and to significantly increase the accuracy of data and derived products.

BayesMap Solutions was founded by André Jalobeanu, who obtained a PhD in image processing from INRIA Sophia Antipolis, France. Before starting BayesMap, he worked as a research scientist in France and Portugal, and then as a research fellow at the Naval Postgraduate School in Monterey, USA.

He has been doing research in data processing and analysis (images, signals, time series and point clouds) for more than 15 years, including in Lidar for the past six years. The methods he developed all use Bayesian inference, with an emphasis on automation and uncertainty estimation. In a Bayesian framework, rigorous sensor modelling combined with expert knowledge leads to optimal solutions, which can be point clouds, geometric parameters or elevation models depending on the needs. Probabilistic modelling enables the user to obtain something new: uncertainty attributes and spatial accuracy maps. This is achieved by propagating errors from input to end result. All data sources are combined in a consistent way and automatically weighted by the software, avoiding arbitrary cuts and losses and costly user interaction.

André Jalobeanu decided to start BayesMap to apply these concepts and recent research results to the Lidar mapping industry. In the early days, the first clients purchased consulting services to have strip alignment done using prototype BayesStripAlign software. Due to high demand, this package was the first to be developed (despite extensive experience with waveforms). Production-ready BayesWavEx followed one year later, offering vendor-neutral point cloud extraction from LAS 1.3 waveforms.

Current profile

BayesMap Solutions is a limited liability company (LLC), now based out of Pleasanton, California, USA. It is managed and operated by the founder, who is also the software engineer. Technical support is provided by the software developer (same day with a fast-lane production licence). BayesMap uses a client-centred approach to product design and development. The small size of the company allows for great flexibility, enabling client requests to be handled and new capabilities to be implemented in a short time. The company offers discounts depending on the client's corporate social responsibility statement and 'green' engagement. Academic pricing is available for research institutions.

The main business is software and consulting, with a focus on improving data quality and helping clients to reduce collection costs. While it started with traditional airborne Lidar, the company now also provides geometric correction for unmanned aerial vehicle (UAV) sensors, which often follow a more complex trajectory than large aircraft. Increasing the performance and reliability of software products is a priority, through algorithmic development and code optimisation as well as constant feedback from users. All packages are independent, use a simple yet powerful command-line interface and come with a free 30-day evaluation period and full support.

Many people are frustrated with money-wasting practices such as flight-line edge cutting, flying low and calibration lines. At BayesMap, the power of Bayesian inference is leveraged to make the best use of all available data without throwing away anything useful. This approach allows BayesMap to fly higher and still get high-quality results, thus reducing collection costs. And use only regular flight lines for sensor calibration.

Global scope

The target markets are mainly airborne Lidar data providers, systems builders and research institutions from all countries. Current clients are located in France, Germany, Australia, Canada and the USA. A simple licence management scheme allows the rapid set-up of node-locked trial and paid licences via email, after an EULA is signed electronically via [PandaDoc](#). Support is also provided by email, within one or two business days for production, depending on the licence tier. Quick to install (no dependencies) and compatible with 64-bit OS (Windows, MacOS), the software packages are simple to use for those familiar with [LAsTools](#). As the main input is raw data, or uncorrected georeferenced point clouds (billions of waveforms or points), having the software in the same location as the data saves time. This is why BayesMap does not currently provide cloud solutions.

The company offers the following software packages:

- **BayesStripAlign 2.0:** automatic point cloud registration, geometric correction, quality control – this is BayesMap's flagship product.
- **BayesWavEx 1.0:** waveform processing with original attribute extraction such as range uncertainty and target thickness, removes detector artefacts, robust to overlaps.
- **BayesCloudChange** (under development): automatic detection of significant changes between point clouds (vertical differences and horizontal displacements).
- **BayesAccuGrid** and other, smaller packages, planned: 3D surface reconstruction with error propagation, de-noising and other features, depending on demand.

Looking ahead

The main objectives of the company in the near future are as follows:

- To develop research-grade science to serve efficient problem-solving. To continue its research and development efforts to meet ever-more demanding client needs and adapt available tools to new sensors such as photon-counting and bathymetric scanners. To develop new algorithms to tackle complex topology arising in terrestrial and close-range scans.
- To strive for enhanced accessibility through graphical user interface design, allowing users who are unfamiliar with command lines to immediately use all the functionalities.
- To propose workshops and training sessions within professional meetings or directly with the client.
- To contribute to brain-storming over data formats, e.g. to include range or point uncertainty in final data products. BayesWavEx already computes range uncertainty and stores it thanks to extra LAS attributes, enabling rigorous error propagation to derived products such as elevation models.
- To start hiring to enhance client-training capabilities, deal with the increase in support requirements and help develop B2B and product sales.

For more information visit www.bayesmap.com.

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