CROSS-SENSOR MOSAICKING – A NEW APPROACH TO FULFILL FUTURE USER DEMANDS

Second joint Workshop of the EARSel SIG on Land Use & Land Cover and the NASA LCLUC Program

Prag, 2016

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Abstract

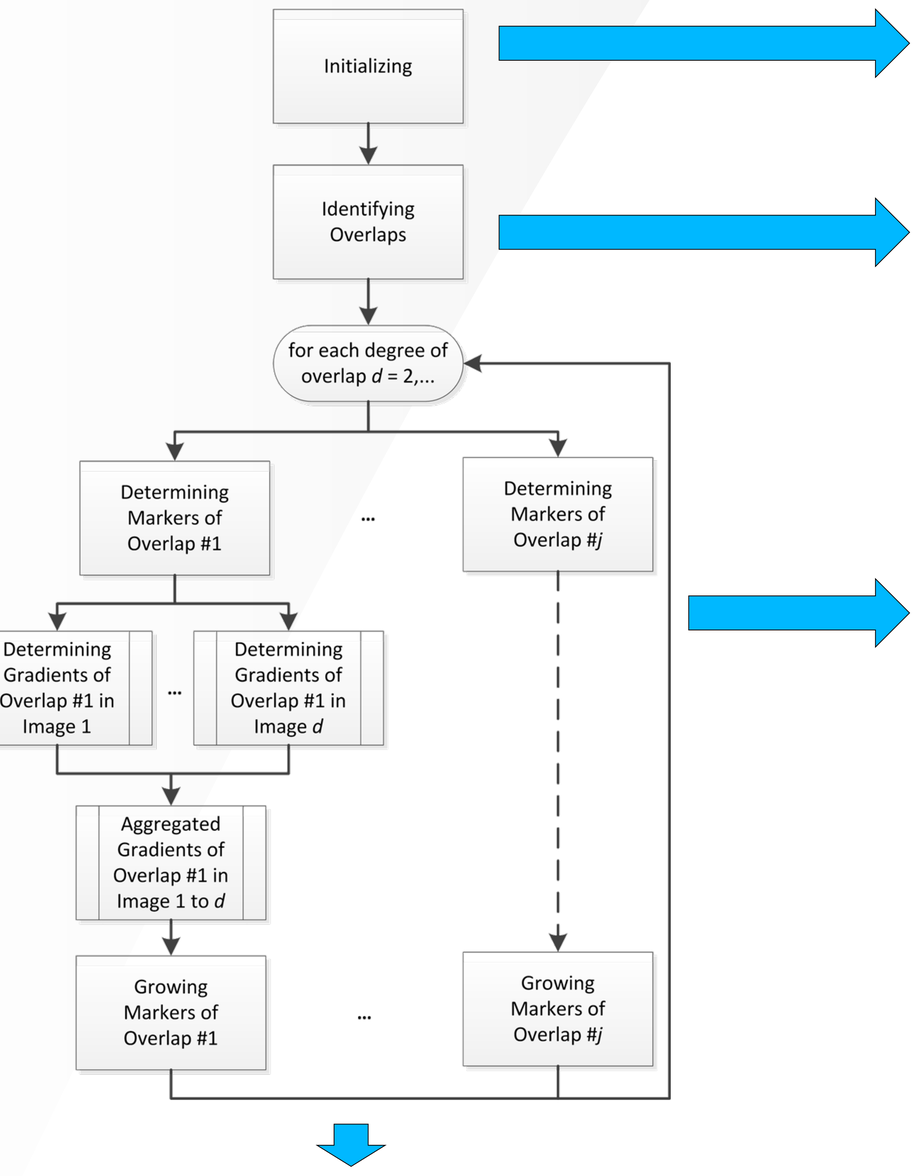
We propose and analyze an algorithm for image mosaicking of high-resolution orthorectified products based on morphological image processing which is especially fully automatic and highly efficient with a quasi-linear (also called log-linear) runtime. Such a runtime is a key factor for the timely provision of European or global mosaics.

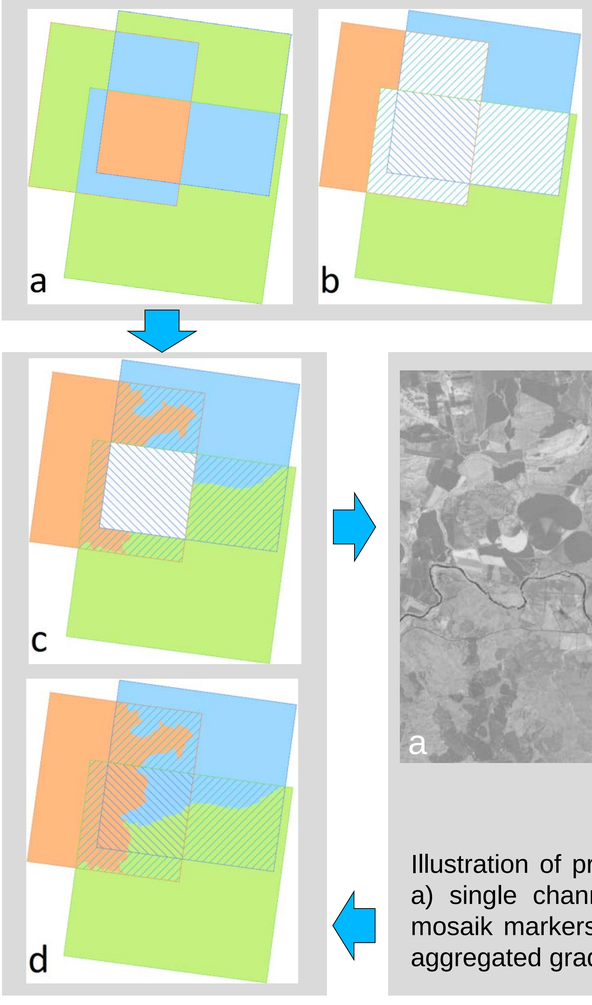
The quality of the image mosaic is probably strongest influenced by the gradient images used for seamline estimation. Future work will consider the determination of gradients based, e.g. on land cover and land use – essentially combined with data of the OpenStreetMap project.

In future developments it's envisaged to tailor the algorithm more strictly to specific applications, examples are the fusion of Landsat 8 and Sentinel 2 data to provide large coverage mosaics with small acquisition date offsets.

Besides of the mosaicking itself we'll focus on the necessary preprocessing steps in order to provide high-quality results as a robust service. Keywords are pan-sharpening and radiometric harmonization.

Right) Three overlapping S2 scenes used for experiment, further experiments were carried out using Landsat 8, SPOT 5, Resourcesat, etc.
Bottom) Map of Footprints of S2 scenes used for demonstration purposes.





Preprocessing: Identification of all overlapping regions, the degree of overlap and the images corresponding to the single overlaps.
In the following the single overlaps are sequentially processed, ordered by the degree of overlap, starting from 1, 2, 3, …, n overlaps.

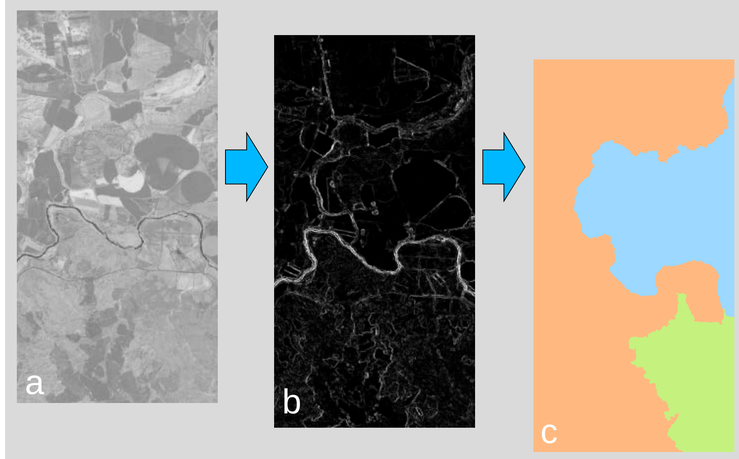
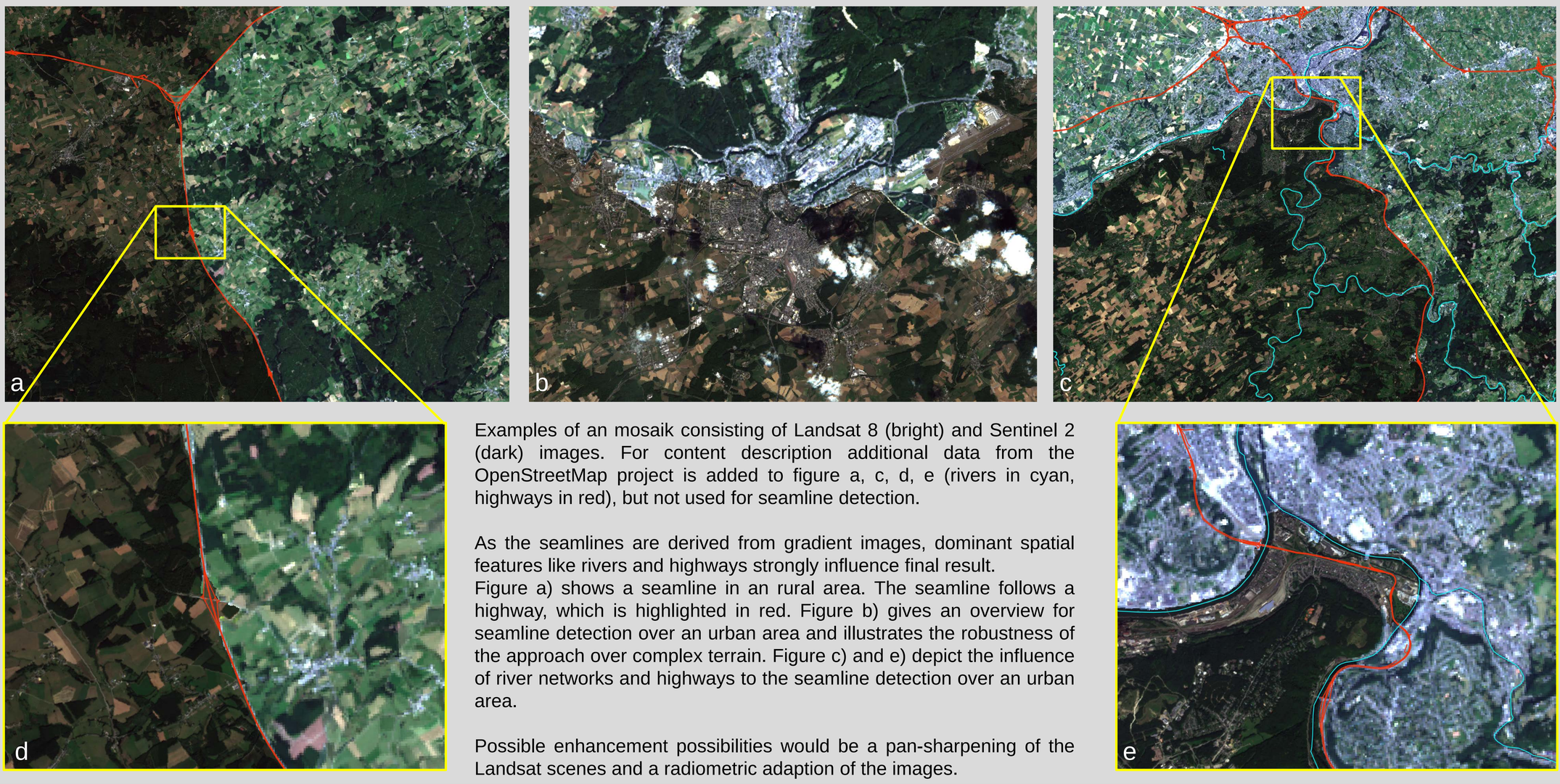


Illustration of process of morphological image mosaicking. a) single channel of image, b) gradient image, c) final mosaik markers obtained from growing initial markers on aggregated gradient image.



Examples of an mosaik consisting of Landsat 8 (bright) and Sentinel 2 (dark) images. For content description additional data from the OpenStreetMap project is added to figure a, c, d, e (rivers in cyan, highways in red), but not used for seamline detection.

As the seamlines are derived from gradient images, dominant spatial features like rivers and highways strongly influence final result.
Figure a) shows a seamline in an rural area. The seamline follows a highway, which is highlighted in red. Figure b) gives an overview for seamline detection over an urban area and illustrates the robustness of the approach over complex terrain. Figure c) and e) depict the influence of river networks and highways to the seamline detection over an urban area.

Possible enhancement possibilities would be a pan-sharpening of the Landsat scenes and a radiometric adaption of the images.

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