FIG WORKING WEEK 2017

Helsinki Finland

29 May - 2 June 2017

A Quantitative Comparison of Completely Visible Cadastral Parcels Using Satellite Images: A Step Towards Automation

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Slides partly by Y. Wassie and M.Koeva

Surveying the world of tomorrow -
From digitalisation to augmented reality

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Outline

- Overview
- Visual boundary analysis
- Case Studies areas
- Feature extraction methods - capabilities
- Future research direction

Real world -Technology

To assist in solving problems

↓

Image-based identification

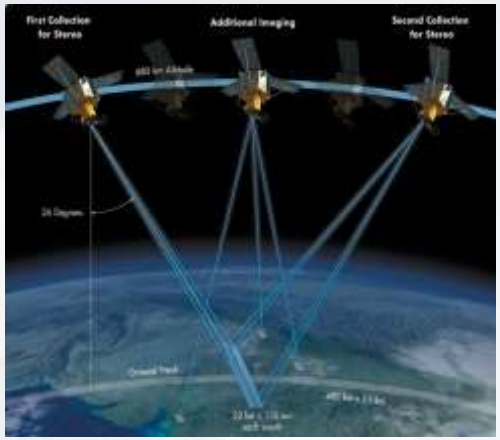
↓

Information on land parcels

Image source: Google Earth

Remote Sensing for Parcel Boundaries

Technological development in photogrammetry, RS, computer vision, machine learning, robotics etc.



NEW opportunities for the domain of fit-for-purpose LA especially where there are still large unmapped areas !

Remote Sensing

HRSI can be used for low-cost and up-to-date solutions by creation and upgrading of cadastral maps

Luo, Bennett et al. 2016, Wassie, Koeva et al. 2016

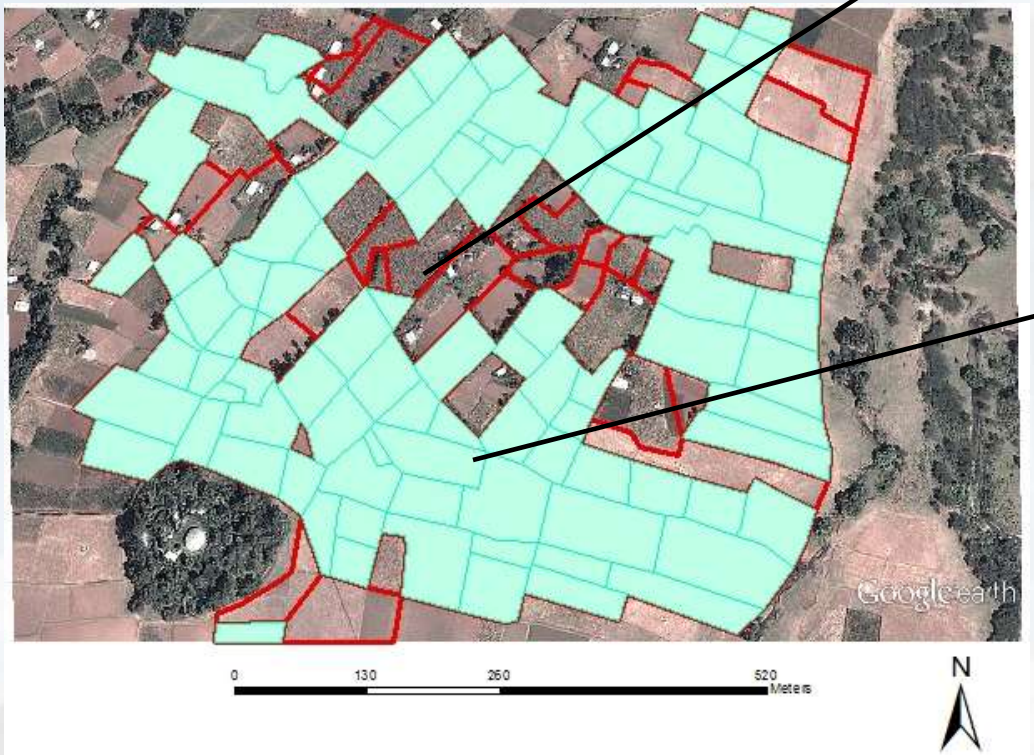
Objective

- To explore and evaluate techniques for automatic/ semi-automatic detection and extraction of visible cadastral boundaries

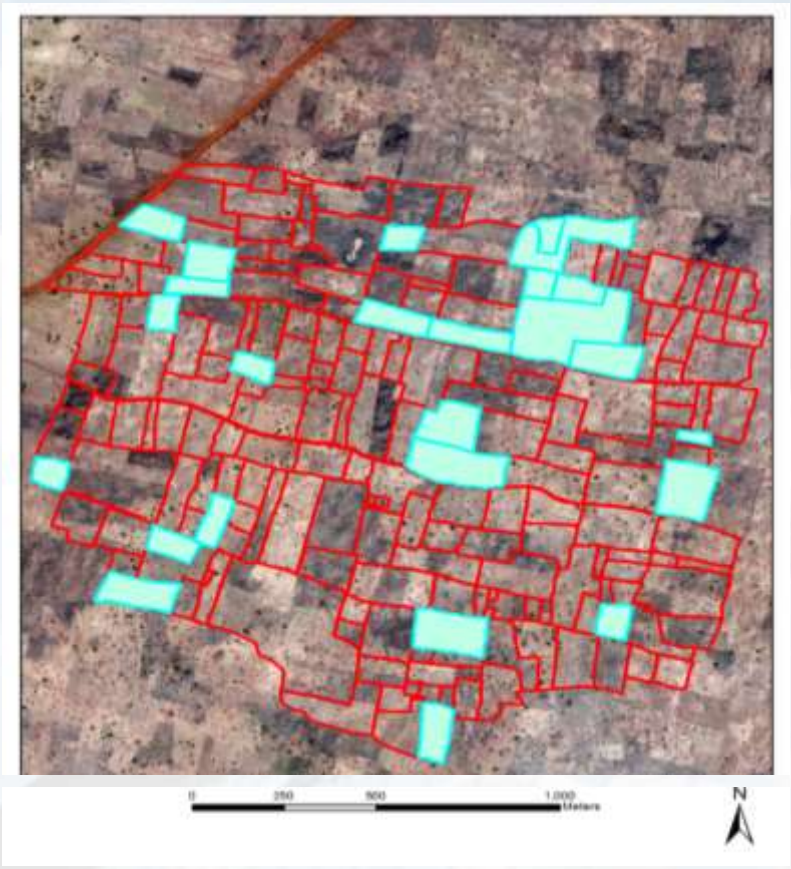
- Quantifying visible boundary correspondence with cadastral parcels

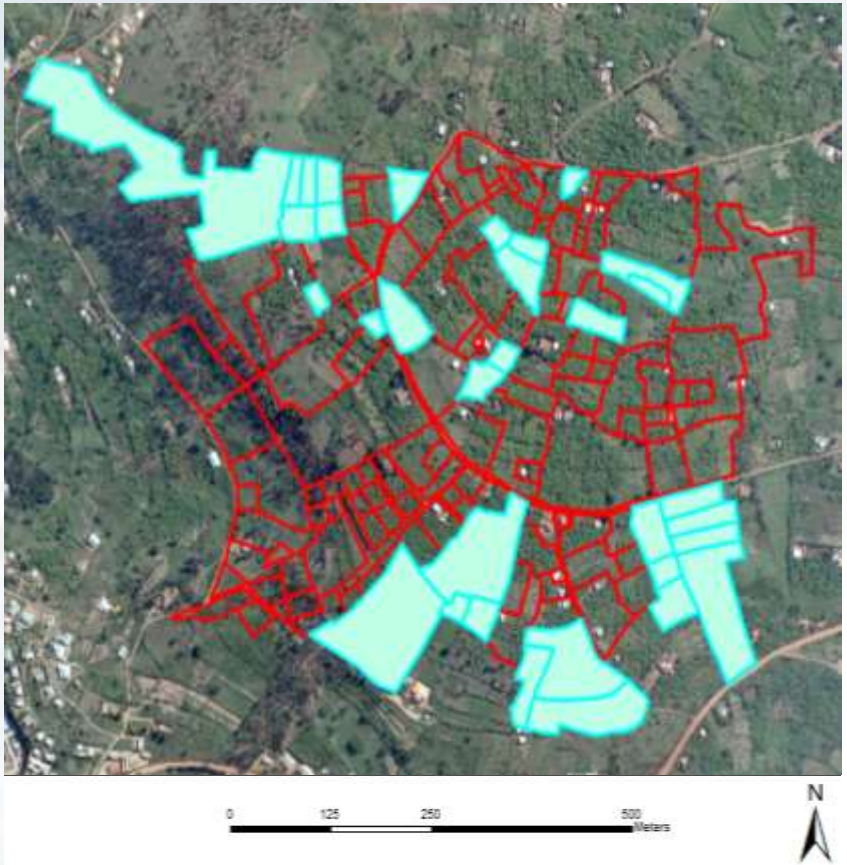
Visual boundary analysis – Ethiopia

Visual boundary analysis - Ethiopia

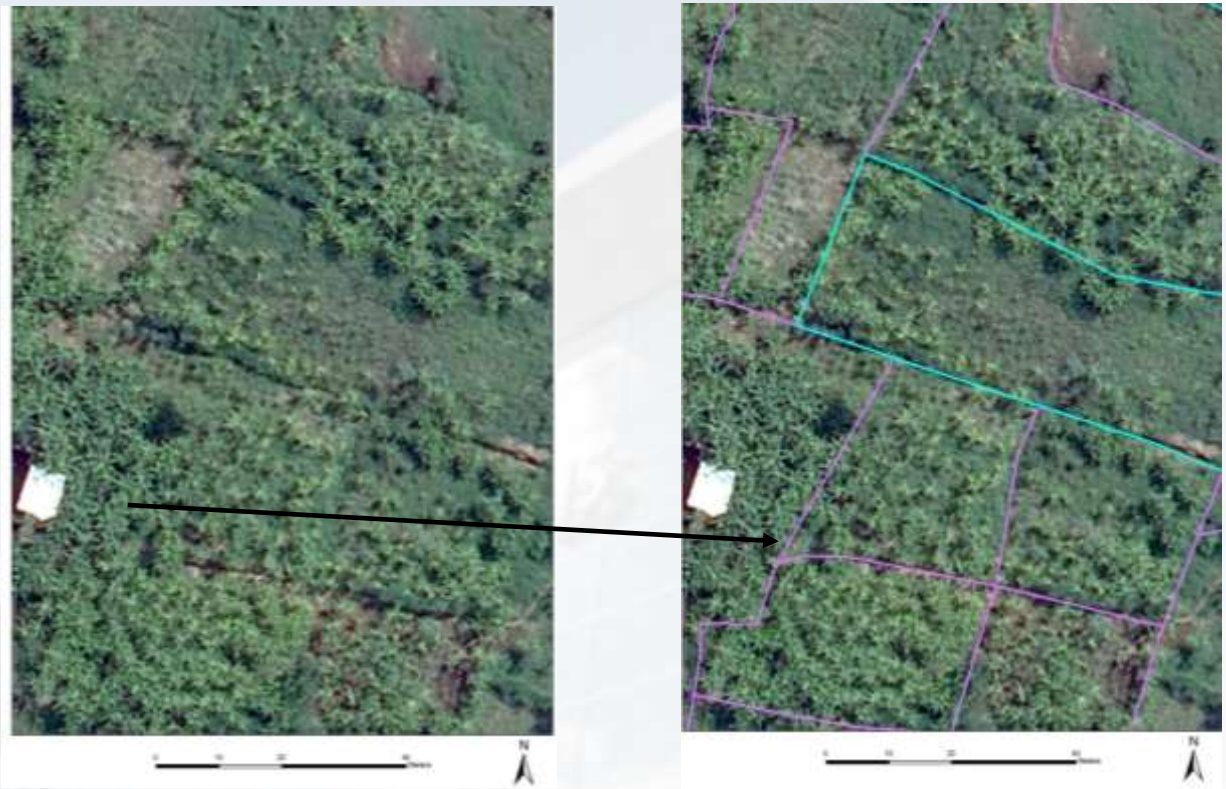


Visual boundary analysis – Ghana, Rwanda



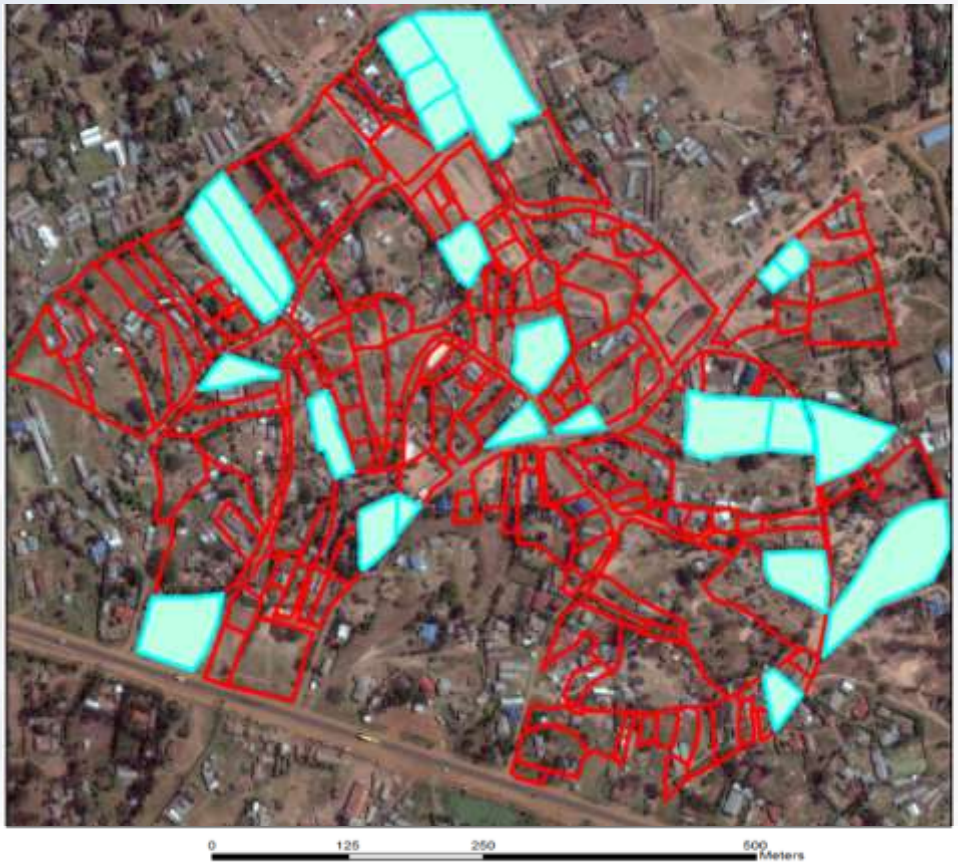


Visual boundary analysis – Rwanda



Visual boundary analysis – Guatemala

Visual boundary analysis – Kenya



Visual boundary analysis - statistics

Place	Total	Fully visible		Landscape
		Number	Percentage	
Ethiopia	128	92	**71%**	Rural
Rwanda	151	33	**22%**	Rural
Guatemala	172	47	**27%**	Urban
Ghana	200	25	**12.5%**	Rural
Mozambique	190	47	**24.7%**	Urban
Nepal	164	0	**0**	Rural-hilly
Kenya	179	23	**12.8%**	Peri-urban/informal

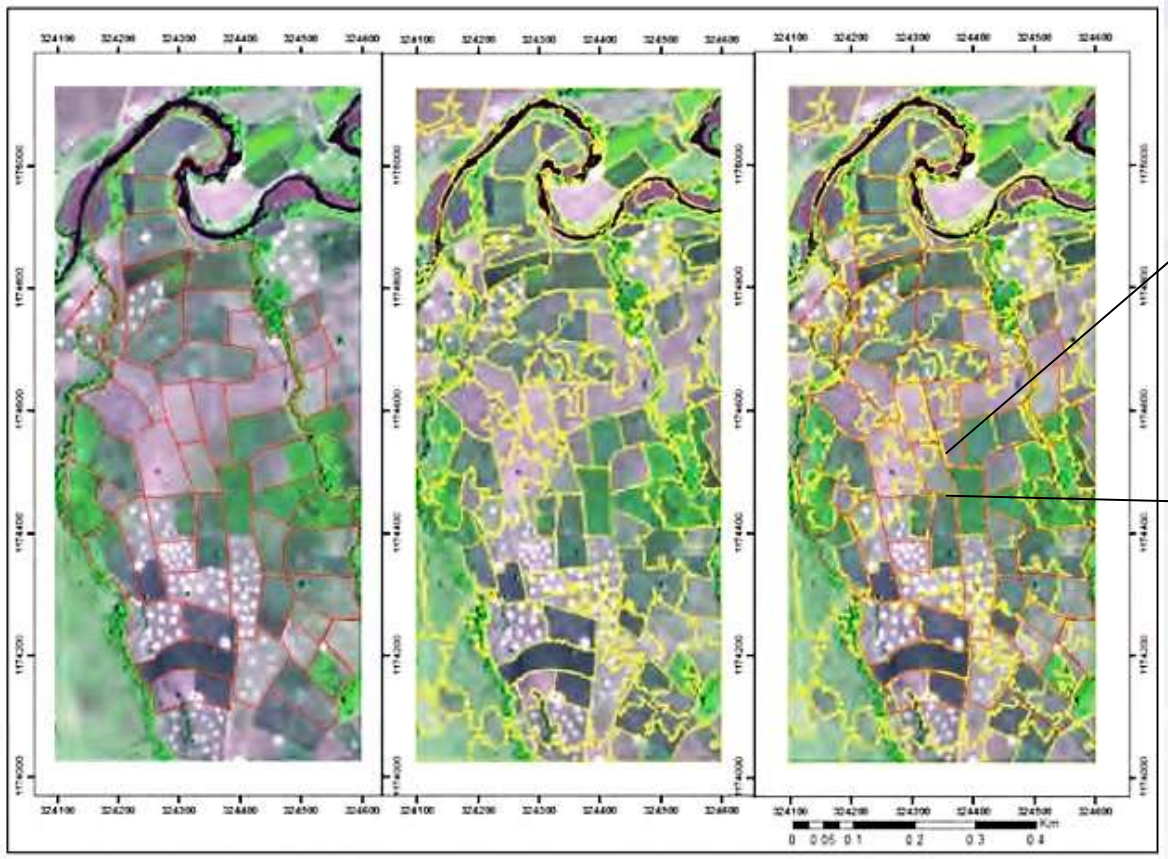
Opportunities and insights

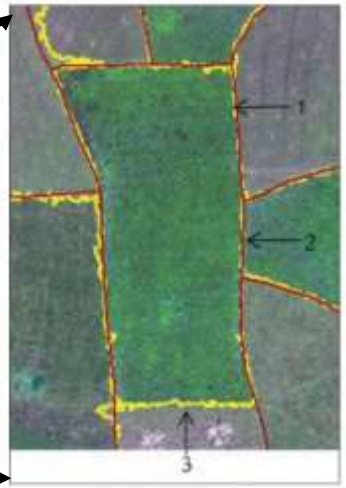
- Small holder farms, e.g. in case of Ethiopia seems to have maximum potential
- Identification in urban areas can be improved by using aerial images
- Images of different seasons – could improve results for Ghana and Rwanda
- Large farms, comprising of multiple parcels were challenging

Opportunities and insights

- Full parcels considered – the percentages could be much higher for incomplete parcels
- Further research to access the quality of existing cadastral maps
- A step towards understanding morphological diversities
- Basis for further analysis where image-based methods are used

Opportunities – what looks promising





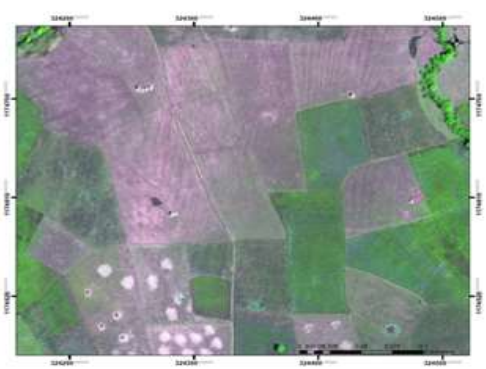
Reference Extracted Reference + extracted

See: Wassie, Y.A., Koeva, M.N. and Bennett, R.M. (2016) Towards automated detection of visual cadastral boundaries : initial investigation of imagery, algorithms and perceptions. In: GIM International, 30 (2016)8 pp. 23-25

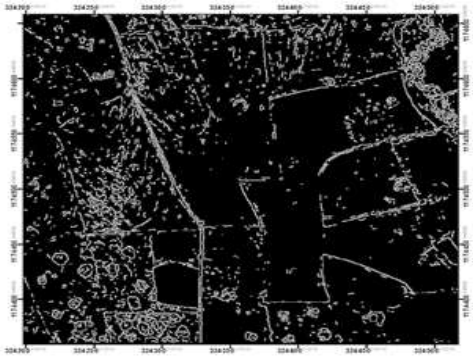
Remote Sensing for Parcel Boundaries

Segmentation is a process of dividing the image into regions or objects of homogeneous pixel values

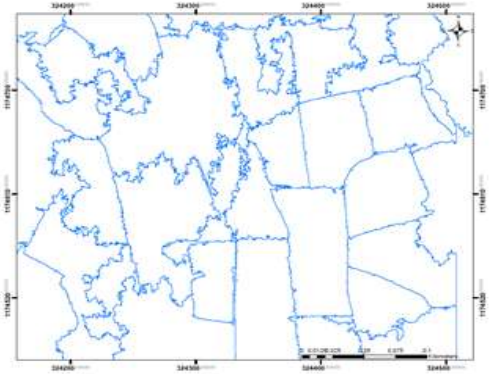
Mean-shift segmentation plug-in in QGIS was selected



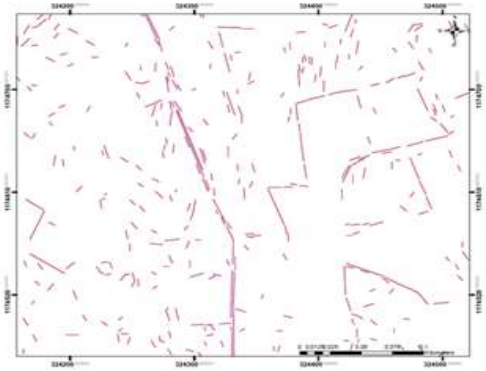
a) Testing image



b) Result by canny edge detector

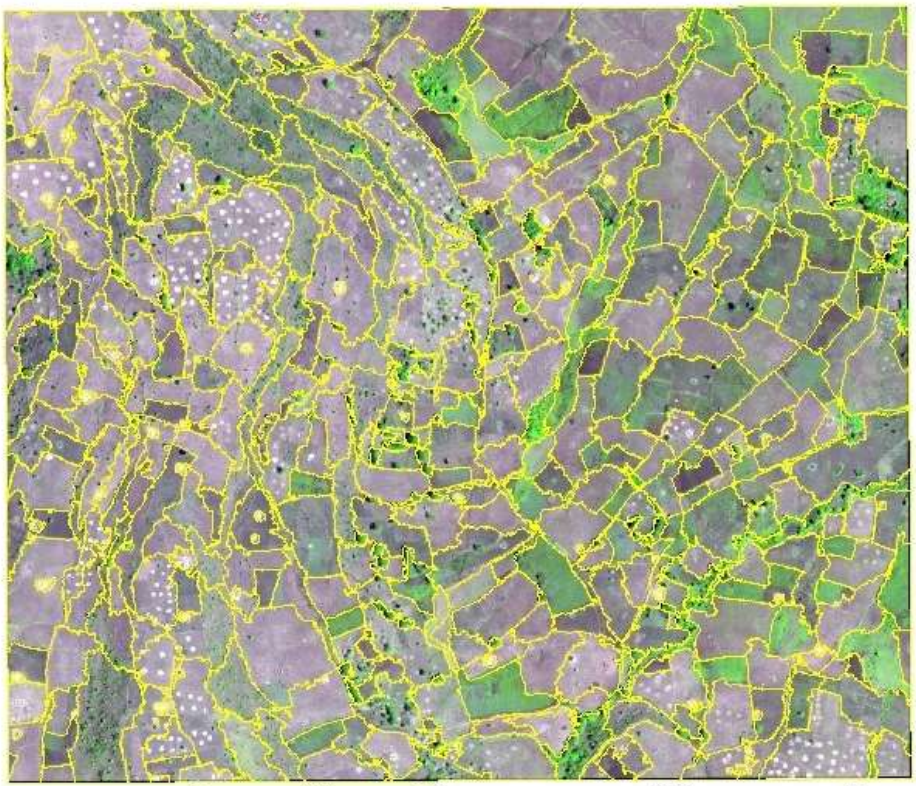


c) Result by Mean-shift segmentation



d) Result by LSD

The extracted boundaries using eCognition® software



ITS 4 LAND
innovations for land tenure

Using New Technologies

A UAV, especially adapted to land administration activities awaits creation – as does software and workflows integrating UAVs with other land administration processes, including adjudication, demarcation, recording, and dissemination. UAVs and usage proliferated over the last 5 years; however, this proposal provides the private consortium partners the opportunity to adapt the tools to the rapidly emerging markets in sub Saharan Africa – and more globally. There exists no tool like the smart sketchmap in the domain on land administration: the concept is simply not conceived and is untested in the domain. The same applies to automatic feature extraction algorithms – existing approaches cover topographic features like roads or buildings in lower resolved images. These two tools could revolutionize land tenure data collection and analysis – radically reducing costs and time spent in the field. The Land Administration Domain Model (LADM) is now an ISO standard (ISO19152, and its software implementation, the Social Tenure Domain Model (http://www.stdm.gltn.net/) is also open-access and open-source. In this regard, there exists the opportunity to tailor a standardized model for alternative land tenure recoding in sub Saharan Africa. This exciting opportunity is yet to be fully exploited by any major players in the domain, despite predilections espoused by larger players including ESRI (also a partner in this project). Geocloud services are particularly unexploited in the land administration domain. The consortium has a head start in this regard: ESRI Rwanda helped to pioneer the first land use portal in sub Saharan Africa in 2014.

Rwanda – New Era, New Norms, Keeping Up, and Up Keep

Ethiopia – Transforming Society, Ensuring Equality

Kenya – Sustaining Livelihoods, Conserving Environments

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MAY 9 – MAY 15

Thank you

Smart Surveyors for Land and Water Management

kadaster

GIN Geo-Informatie Nederland

ITC UNIVERSITY OF TWENTE.