View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by Ghent University Academic Bibliography

Operator Variability in Remote Sensing Image Analysis

Soetkin Gardin[1], Sébastien Van Laere[3], Frieke Van Coillie[1], Wouter Duyck[3], Frederik Anseel[2] and Robert De Wulf[1]

[1] Laboratory of Forest Management and Spatial Information Techniques, UGent

[2] Department of Personnel Management, Work and Organizational Psychology, UGent

[3] Department of Experimental Psychology, UGent

Contact: Soetkin.Gardin@UGent.be

Overview

Within the framework of climate change and forest biodiversity loss, the importance of forest management has gained more and more attention worldwide. The conductance of a forest inventory is a very labor-intensive job, therefore field work is often replaced by remote sensing image analysis and interpretation. Although this image processing is highly automated, there is still a considerable human intervention, *e.g.* During georeferencing, operating the computers, building the algorithms, selecting training data etc. The human operator is present in every step of the way, making decisions and choices. The fact that another operator would probably make different choices is often overlooked.

This research aims at:

1. Quantifying operator variability
2. Identifying human and problem-specific factors that influence variability
3. Identifying methods to enhance operator performance

Data collection will be performed over the world wide web, a web application has been developed which contains personality and image analysis tasks.

Factors

Human factors

- Demographics (Age, Gender,...)
- Cognitive Variables (Visual Working Memory Span,...)
- Non-Cognitive Variables (Personality, Motivation,...)

Problem specific factors

- Image Quality (Spatial Resolution, Colour,...)
- Ancillary Information (Precognition, Information Type,...)

Web Application

http://wavars.ugent.be

First Results

Some first results were obtained from a control group (n=120) of students and personnel of the Ghent University.

There were six different digitizing tasks implemented in the web application. For each task, two accuracy measures were calculated and are shown in table 1. The first measure (thematic accuracy) represents the proportion between hit rate and false alarms/misses. The second measure (positional accuracy) represents the mean distance between the digitized and reference elements.

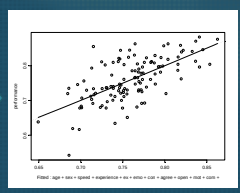
Mean (M), Standard Deviation (SD), Minimum (Min), Maximum (Max) and Standard Error (SE) of the different performance parameters (N=120)

	Factor	M	SD	Min	Max	SE
	Thematic Accuracy					
1	Lamp posts	0.76	0.06	0.54	0.88	0.006
2	Trees	0.92	0.08	0.54	0.98	0.007
3	Water	0.81	0.04	0.64	0.91	0.004
4	Parcels	0.88	0.06	0.36	0.94	0.006
5	Grape vines	0.80	0.12	0.42	1.00	0.012
6	Roads	0.71	0.10	0.41	0.90	0.009
	Positional Accuracy					
7	Grape vines	1.92	0.29	1.26	2.68	0.027
8	Lamp posts	6.29	0.91	4.45	9.75	0.083
9	Trees	4.63	0.50	3.71	6.24	0.046
10	Water	2.49	0.29	1.76	4.23	0.028
11	Parcels	2.62	0.24	2.18	4.03	0.022
12	Roads	2.64	0.18	2.20	3.08	0.016

Linear regression of performance with human factors

	variable	b	SE(b)	t	p	R^2	ΔR^2
step 1	Sex	0.04	0.01	4.07	0.00	0.13	0.13
	Age	0.00	0.00	0.95	0.35		
step 2	Speed	-3.14	0.79	-3.99	0.00	0.28	0.15
	Experience	0.01	0.01	2.00	0.05		
step 3	Extraversion	-0.01	0.01	-1.65	0.10	0.32	0.04
	Emotional stability	0.01	0.01	1.19	0.24		
	Conscientiousness	-0.01	0.01	-1.22	0.23		
	Agreeableness	-0.01	0.01	-1.49	0.14		
	Openness	0.00	0.01	-0.32	0.75		
step 4	Motivation	-0.01	0.01	-1.44	0.15	0.39	0.07
	Comparative anxiety	-0.04	0.01	-3.56	0.00		
	Conscientiousness : Speed						
step 5		3.03	1.22	2.48	0.01	0.43	0.03

(a) Steps



(b) Predicted Performance versus Observed Performance

Conclusions

The results of the control group already showed significant variability amongst operators that could partly be explained by human factors.

Call

In order to get valuable results, it is extremely important to reach a large group of experts, so interested researchers are invited to participate in the experiment.

Two participants will win a Dell Latitude Netbook!

forestsat 2010 Forestsat 2010, Lugo

Research funded by the Belgian Science Policy belspo