Remote sensing
meets
Psychology

WAVARS

The Human Factor in Remote Sensing: First Results
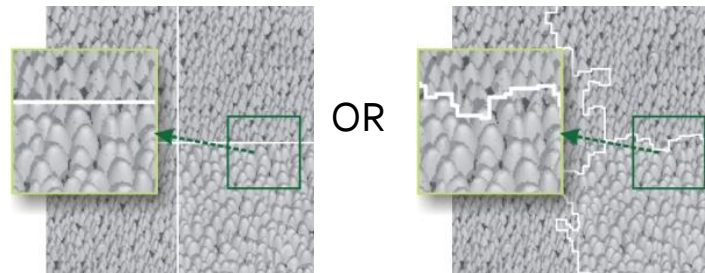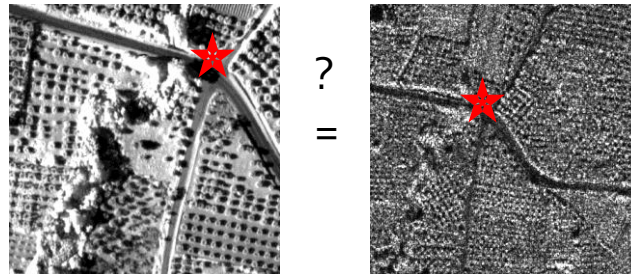
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WAVARS

- Subject and rationale
- Objectives
- Methodology
- Preliminary results and outcome
- Future planning

WAVARS

Subject and Rationale

- Remote sensing image analysis
- Importance of human perception and interpretation

Subject and Rationale

- **Psychological research**
  - **Sustained attention**
    - Signal detection theory
    - Medical examples
    - Vigilance
  - **Personality traits**
    - Extravert <-> Introvert
    - Organized <-> Careless
    - Inventive <-> Conservative
    - Agreeable <-> Competitive
    - Nervous <-> Confident
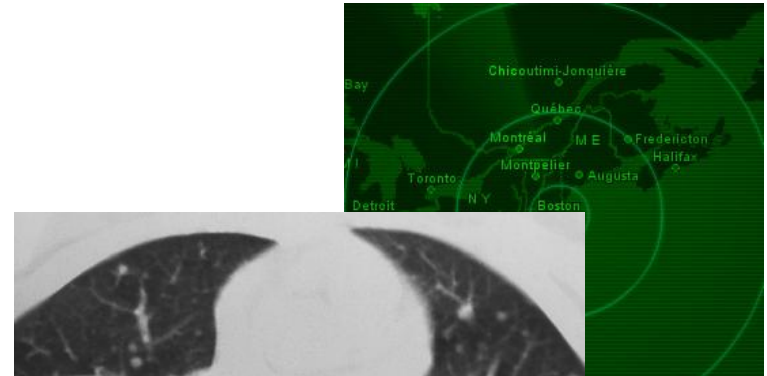
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Objectives

- **Quantification** of operator performance (accuracy, speed, vigilance) in a variety, though limited number, of remote sensing practices using air- and space borne remote sensing imagery;

- Characterization of operator performance and its **determinants** :
  - Problem-specific factors, e.g. color schemes, and spatial resolution;
  - Human factors, e.g. role of certain personality traits and visual memory;

- Identification of possible interventions **enhancing** operator performance and formulation of well-founded feedback guidelines regarding the problem definition and the operator efficiency for use in practical settings;

- Development of an assessment **instrument** recognizing suitable candidates for jobs that require image analysis and interpretation.

WAVARS

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Remote sensing meets Psychology
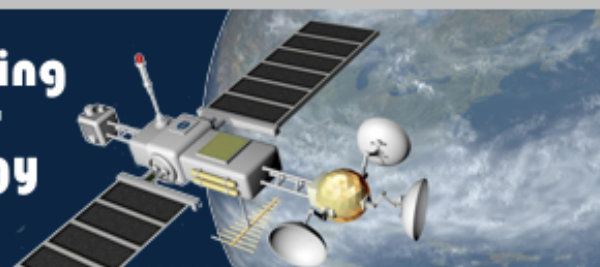
Welcome!!

Welcome on the website of our project. The aim of this research is to develop an online tool for digitalisation. If you wish more information about the project itself, you can click here.

You don't need any experience to participate in the test! The digitalisation-process will be explained and you get some example exercises, so you can learn it in no time.

The first part of the website will take fifteen minutes. You get maximum one hour to perform the digitalisations.

On the average, it takes one hour to go through the entire website.

Once you have finished, you will get feedback in the form of a personal profile and a comparison with other participants.

All data you submit on this website will be stored in a secure database and will be kept anonymously and confidentially.

We would like to thank you in advance for your cooperation!

Language

chose your language : English

Next

This website is an anitiative from the Ghent University, and is sponsored by Belgian Science Policy

Done

Remote sensing meets Psychology

Registration form

E-mail addresses will only be used to compare results of users who did the test several times or to inform users of the results of the project. You are not obliged to fill in this field to take part in the investigation.

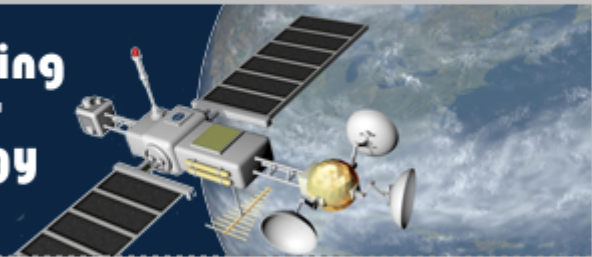☐ I would like to to stay informed of the results of the project.

email _____

Next

This website is an anitiative from the Ghent University, and is sponsored by Belgian Science Policy

Remote sensing meets Psychology

Profile (1/2)

Profile

General

Country	— choose —
Gender	Female
Age	25
Level of education	Master
Colour-blind	☐
Spectacles / Lenses	☑

Experience and skills

Experience with GIS and digitizing	use it occasionally

Next

Done

Remote sensing meets Psychology
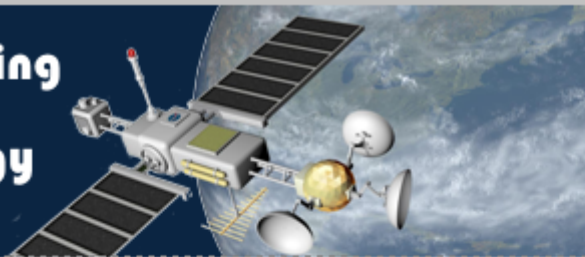
Profile (2/2)

Years of experience   0

Hours / month (approximately)   0

I have to digitize images in the exercise of my profession   ☐

Occupation

Diploma / Subject

Circumstances

Try to give an accurate description of the circumstances in which you are doing this test

Quiet environment   ○ ○ ○ ○ ○   Busy environment

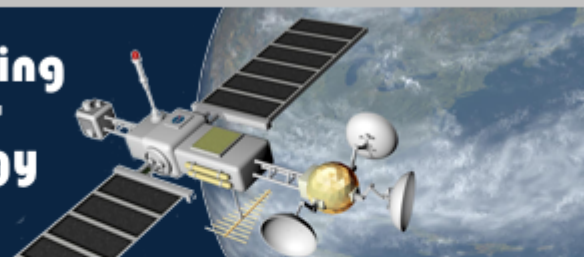Tired   ○ ○ ○ ○ ○   Wide awake

Poor monitor   ○ ○ ○ ○ ○   Good monitor

No coffee yet   ○ ○ ○ ○ ○   Five cups of coffee

Start of the (working)day ○ ○ ○ ○ ○   End of the (working)day

Next

Questionnaire (1/2)

(1 = not good en 5 = very good)

	1	2	3	4	5
Make friends easily.	○	○	○	○	○
Feel comfortable around people.	○	○	○	○	○
Start conversations.	○	○	○	○	○
Know how to captivate people.	○	○	○	○	○
Don't mind being the center of attention.	○	○	○	○	○
Don't talk a lot.	○	○	○	○	○
Keep in the background.	○	○	○	○	○
Have little to say.	○	○	○	○	○
Don't like to draw attention to myself.	○	○	○	○	○
Am quiet around strangers.	○	○	○	○	○
I'm relaxed most of the time.	○	○	○	○	○
Seldom feel blue.	○	○	○	○	○
Get stressed out easily.	○	○	○	○	○
Worry about things.	○	○	○	◉	○
Am easily disturbed.	○	○	○	○	○
Get upset easily.	○	○	○	○	○
Change my mood a lot.	○	○	○	○	○
Have frequent mood swings.	○	○	○	○	○
Get irritated easily.	○	○	○	○	○
Often feel blue.	○	○	○	○	○

Done

Remote sensing meets Psychology
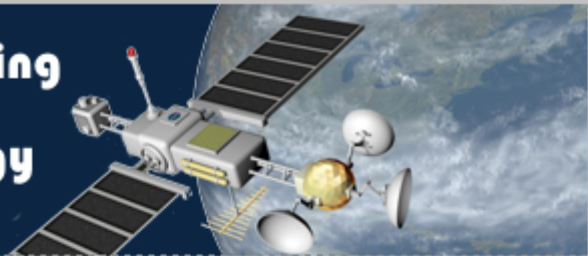
Introduction interactive test

In this test, you will get to see some images with colored blocks

First you see an image with 4,5,6 or 7 blocks in different colors.

After a short break, you will see the same image again with the same amount of blocks in the same locations, but the color of one of the blocks may have changed.

The question you have to answer is if you have seen the same image two times.

Yes: You saw the same image

No: There was a difference (color of one of the blocks changed)
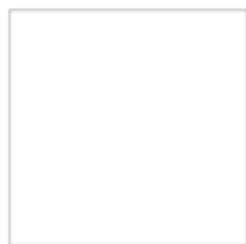
| Image 1 | pauze | Image 2 | Image 1 = Image 2 |

Next

Example 1

Points

Help

Info

Search all the lampposts in the image and point out their ground point.

Start

0.00000, 0.00000

Next

Polygons (parcels)

Help

133.00000, 171.00000

2	37
Minutes	Seconds

Next

Done

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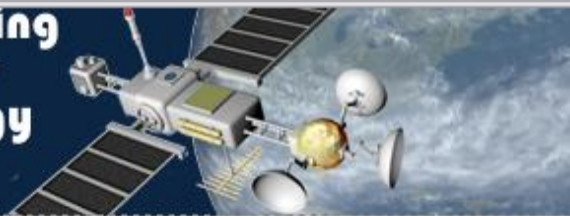
Image 42

Polygons (water)

Help

206.00000, 10.00000

4	51
Minutes	Seconds

Next

Done

Image 43

Lines (roads)

Help

343.00000, 141.00000

4	45
Minutes	Seconds

Next

Done

Psychology

Image 50

Points (trees)

Help

242.00000, 105.00000

4
nutes

52
Seconds

Next

Done

Help

88.00000, 65.00000

Next

4
Minutes

7
Seconds

Done
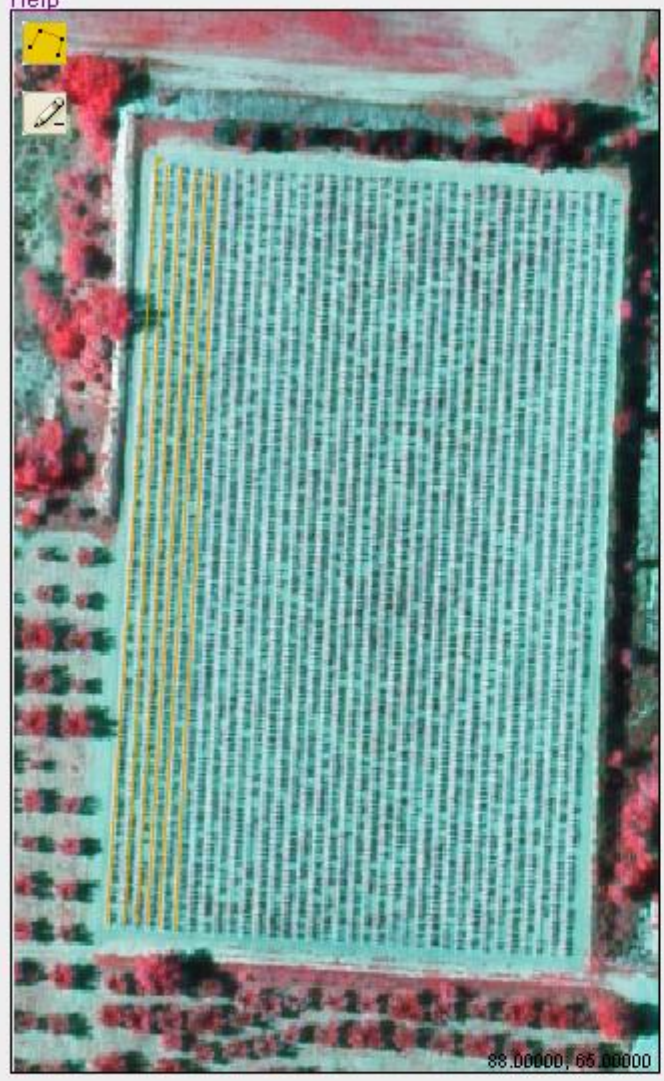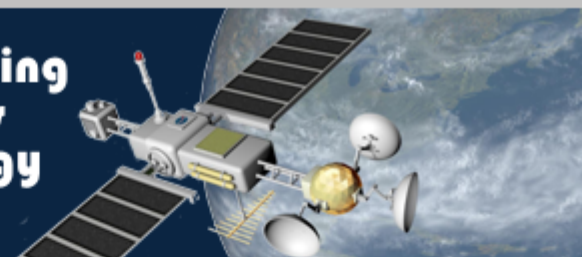
Reaction

(1 = not good en 5 = very good)

	1	2	3	4	5
Doing well on this test is important to me.	○	○	○	○	○
I wanted to do well on this test.	○	○	○	○	○
I tried my best on this test.	○	○	○	○	○
I tried to do the very best I could to on this test.	○	○	○	○	○
While taking this test, I concentrated and tried to do well.	○	○	○	○	○
I want to be among the top scorers on this test.	○	○	○	○	○
I pushed myself to work hard on this test.	○	○	○	○	○
I was extremely motivated to do well on this test.	○	○	○	○	○
I just didn't care how I did on this test.	○	○	○	○	○
I didn't put much effort into this test.	○	○	○	○	○
I probably didn't do as well as most of the other people who took these tests.	○	○	○	○	○
I am not good at taking tests.	○	○	○	○	○
During the testing, I often thought about how poorly I was doing.	○	○	○	○	○
I usually get very anxious about taking tests.	○	○	○	○	○
I usually do pretty well on tests.	○	○	○	○	○
I expect to be among the people who score really well on this test.	○	○	○	○	○
My test scores don't usually reflect my true abilities.	○	○	○	○	○
I very much dislike taking tests of this type.	○	○	○	○	○
During the test, I found myself thinking of the consequences of failing.	○	○	○	○	○
During the testing, I got so nervous I couldn't do as well as I should have.	○	○	○	○	○
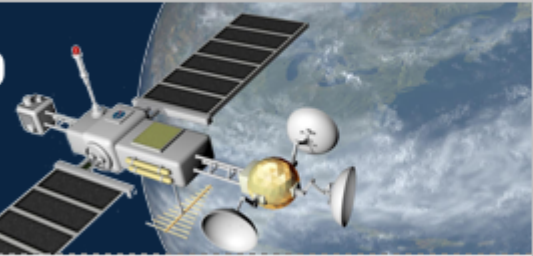
Results

For every test you completed, your results are compared to a control group. The control group consists of 120 participants who completed the test in a controlled environment.

Figure 1 gives a visual impression of how we worked. On the X-axis you can see all possible scores, the Y-axis represents the number of people who obtained this score. The area under the chart was divided in five equal areas which contain 20% of the control group each. The outer left and right areas represent respectively the lowest and highest scores. Next to this, the darkgrey areas contain the scores that are rateher low or high. The black area in the middle represents the average scores.
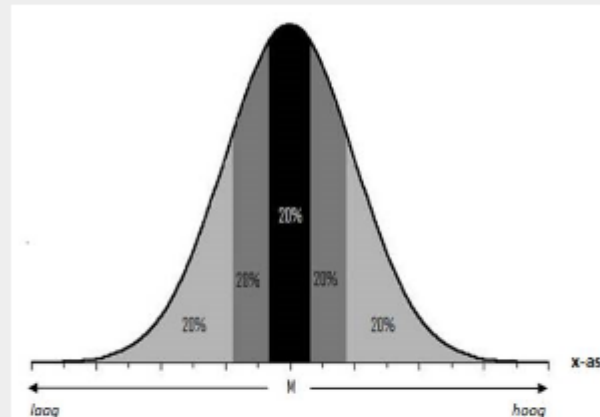
Figure 1: Distribution of the scores of the control group (M=mean)

Now you will get to see for every test you completed how well you scored (in which group). It is also indicated how the factor correlated with the results of the image analysis for the control group.

Personality

Methodology – Try outs

- 24 bachelor students course remote sensing
- 42 students (mainly psychology)
- 54 personnel and students faculty bioscience engineering

WAVARS

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- **Preliminary results and outcome**
- Future planning

Preliminary Results and Outcome - Variability

Table 1 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

Methodology – Data Processing

- Performance - Points

Hit rate & False alarm rate

$$Completeness = \frac{n_{R\&T}}{n_R} \cdot 100\%$$

$$Correctness = \frac{n_{R\&T}}{n_T} \cdot 100\%$$

$$Mean\ Accuracy = \frac{2 \cdot n_{R\&T}}{n_R + n_T} \cdot 100\%$$

Distance

$$Mean\ distance = \sum_{d=1}^{d=n} d \cdot n_d$$

Preliminary Results and Outcome - Variability

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Table 1 MEAN (M), STANDARD DEVIATION (SD), MINIMUM (MIN), MAXIMUM (MAX) AND STANDARD ERROR (SE) OF THE DIFFERENT PERFORMANCE PARAMETERS (N=120).

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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
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12	Roads	2.64	0.18	2.20	3.08	0.016

Preliminary Results and Outcome – Human Factors

Table 2 Mean (M), Standard Deviation (SD) and correlation of human factors with the first performance parameter (N=120).

	Factor	M	SD	Correlation
1	Performance	0.76	0.06	
2	Speed	0.03	0.01	-0.41*
3	Extraversion	3.25	0.67	-0.12
4	Emotional Stability	3.47	0.79	0.16
5	Conscientiousness	3.50	0.64	-0.13
6	Agreeableness	3.19	0.57	-0.22*
7	Openness	3.64	0.73	0.06
8	Motivation	3.34	0.62	0.13
9	Comp. Anxiety	2.66	0.53	-0.32*
10	Sex (female=1; male=2)	1.43	0.50	0.35*
11	Age	24.47	7.38	0.09
12	Experience	0.33	0.72	0.24*
13	Memory Span	2.19	1.18	0.16

* Significant for p=0.05
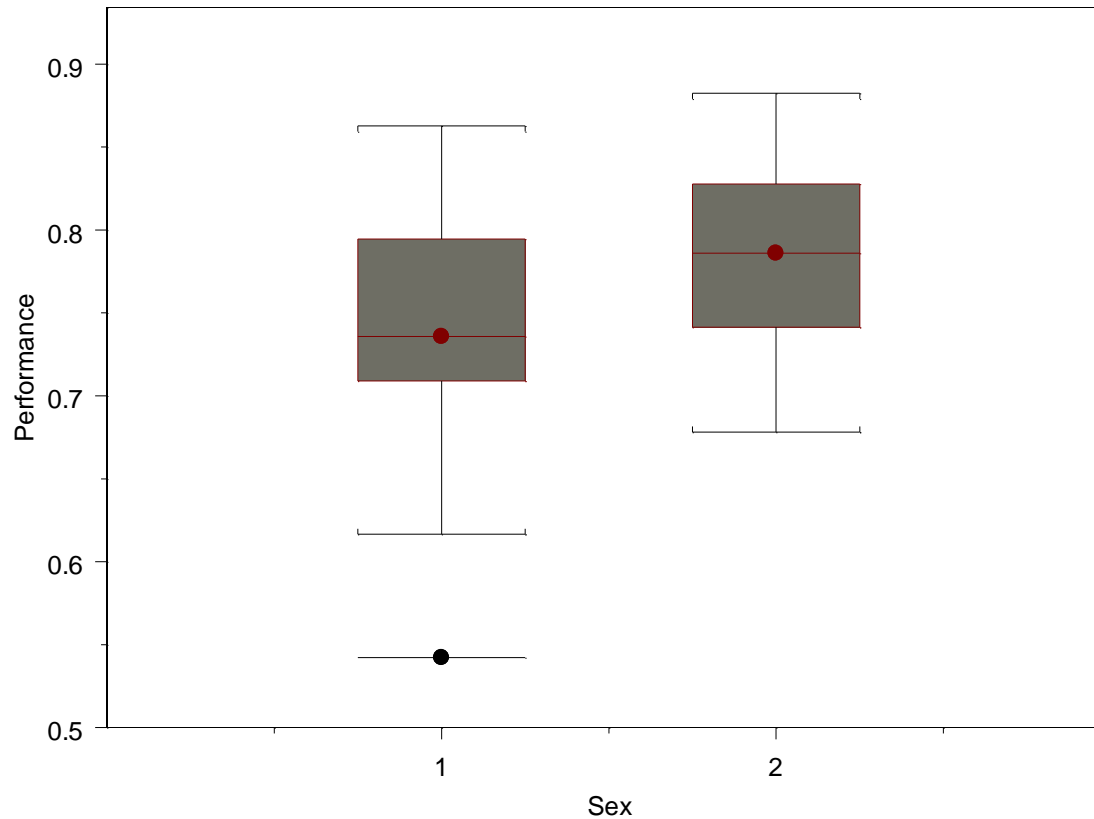
Figure 2 *Box plots of performance grouped by sex (1=female, 2=male)*
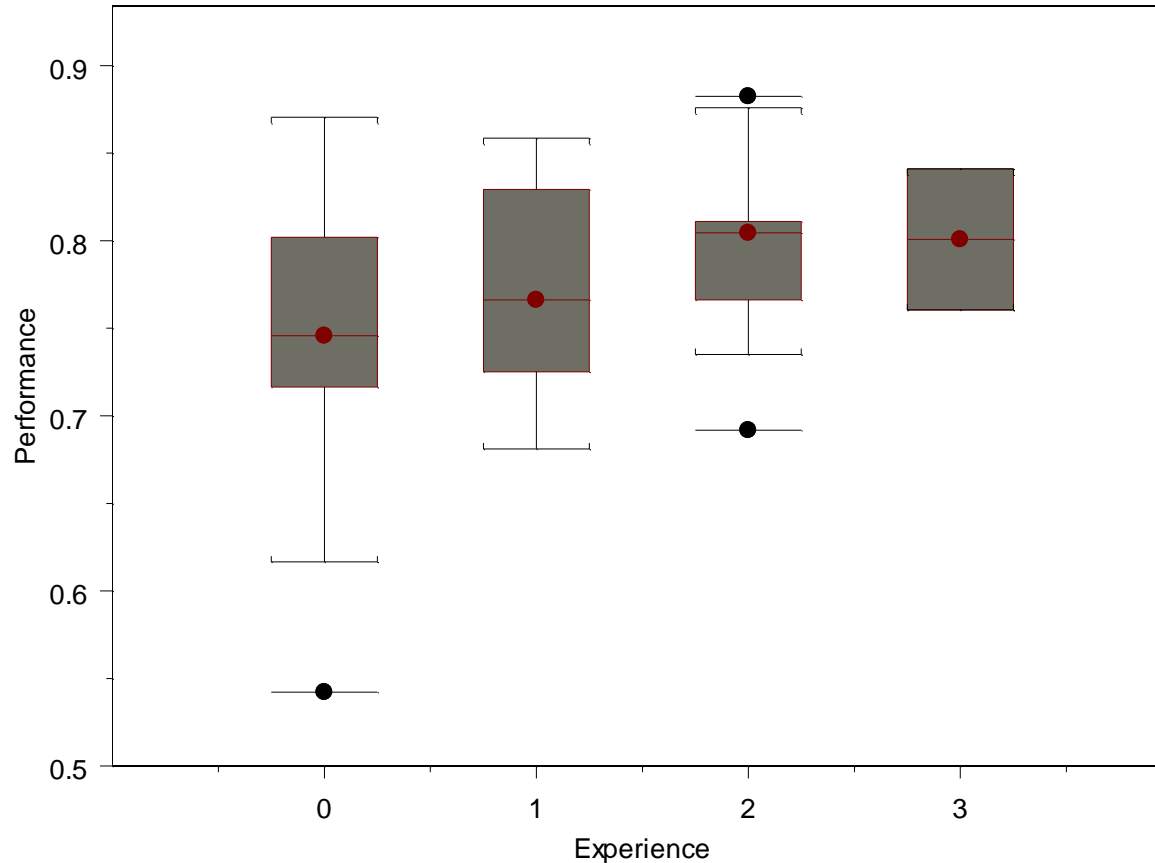
Figure 3 *Box plots of performance grouped by experience (0=no experience, 3=specialised)*

Figure 4 *Scatter plot of the relationship between agreeableness and performance*

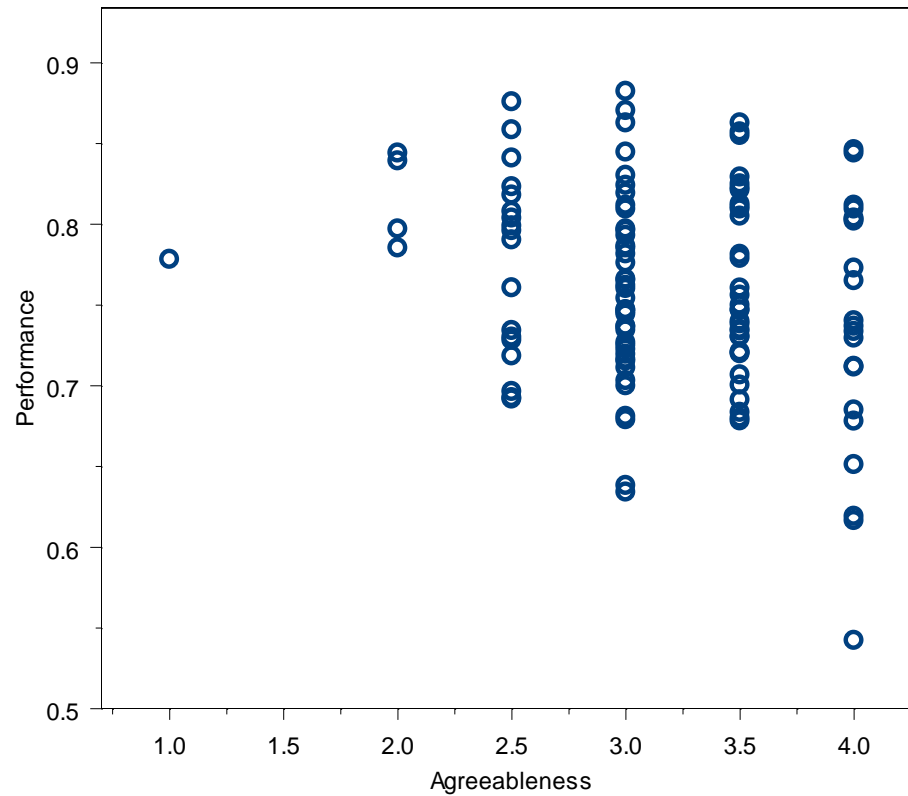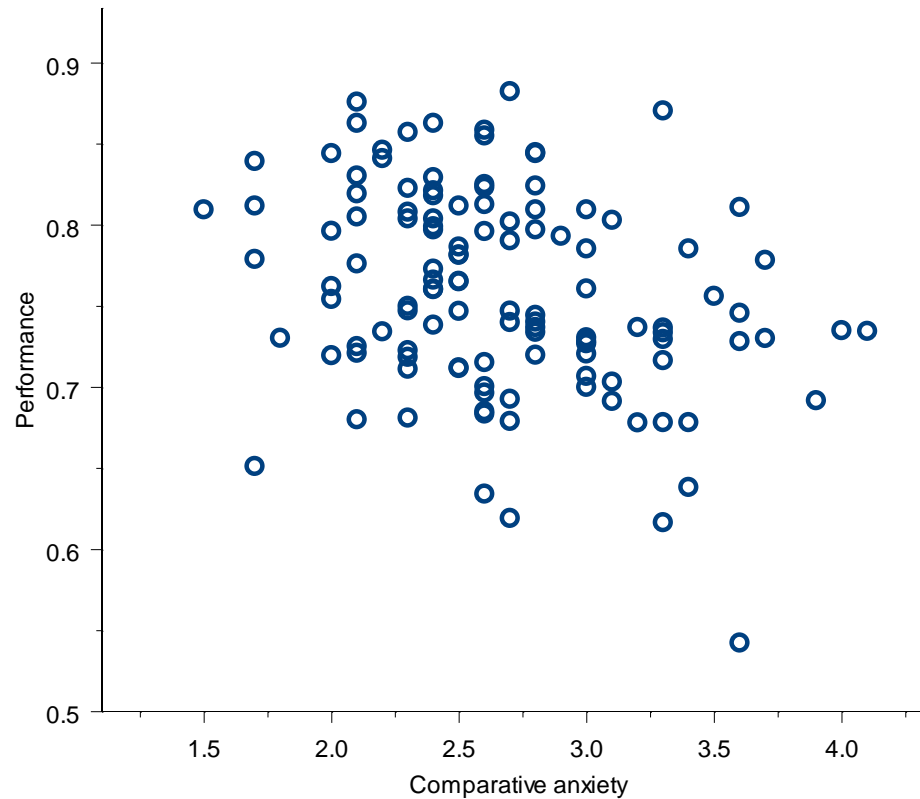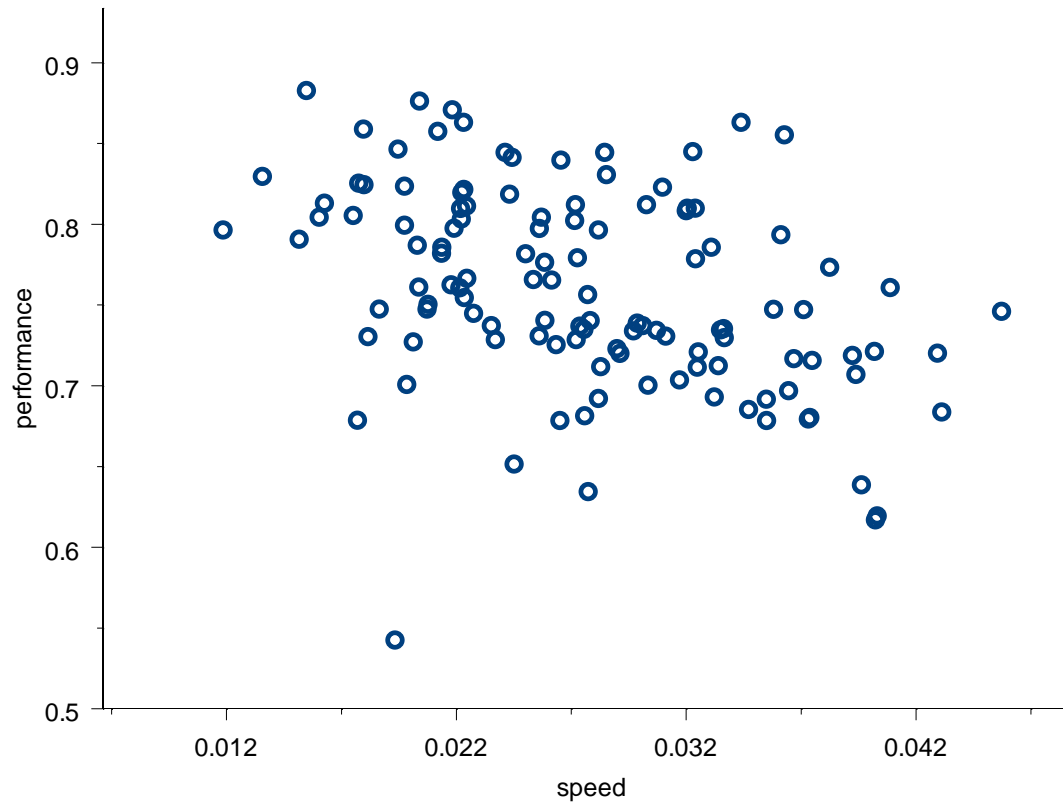Figure 5 *Scatter plot of the relationship between comparative anxiety and performance*

Figure 6 *Scatter plot of the relationship between speed and performance*

Preliminary Results and Outcome – Human Factors

Table 3 *Linear regression with the first performance parameter as dependent variable*

|	variable	b	SE(b)	t	p	R²	Δ R²
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		
step 5	Conscientiousness : Speed	3.03	1.22	2.48	0.01	0.43	0.03
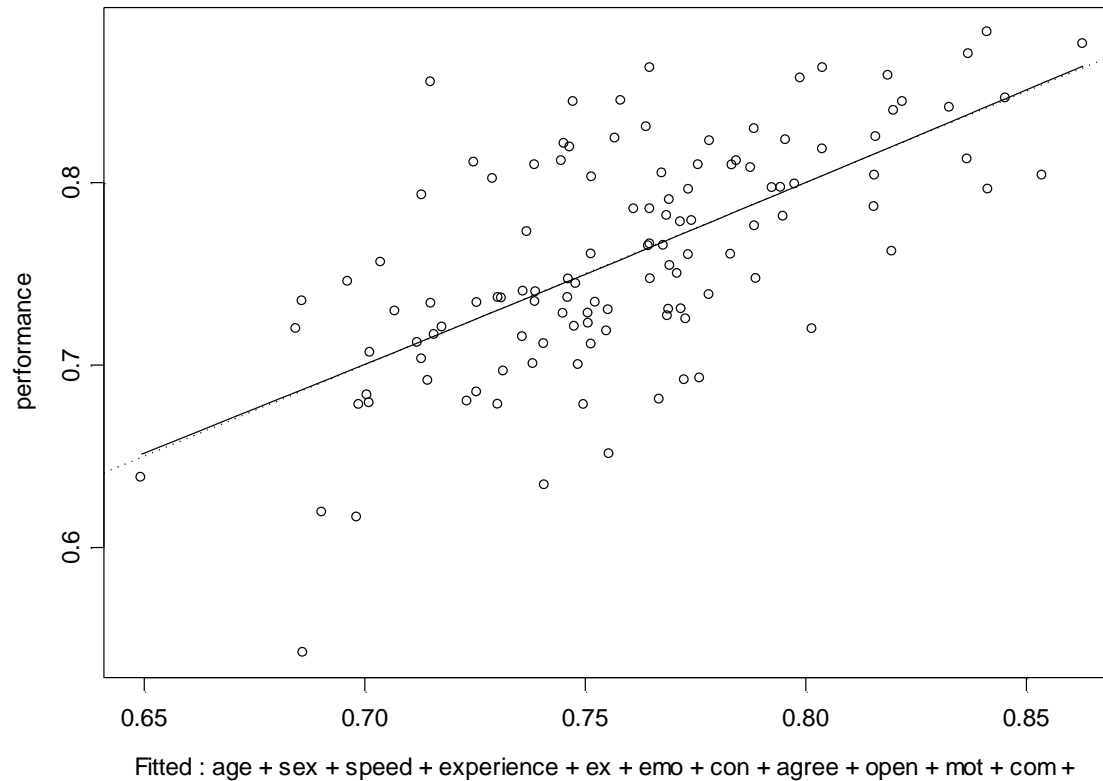
Figure 7 *Scatter plot of the observed versus the predicted performance values*
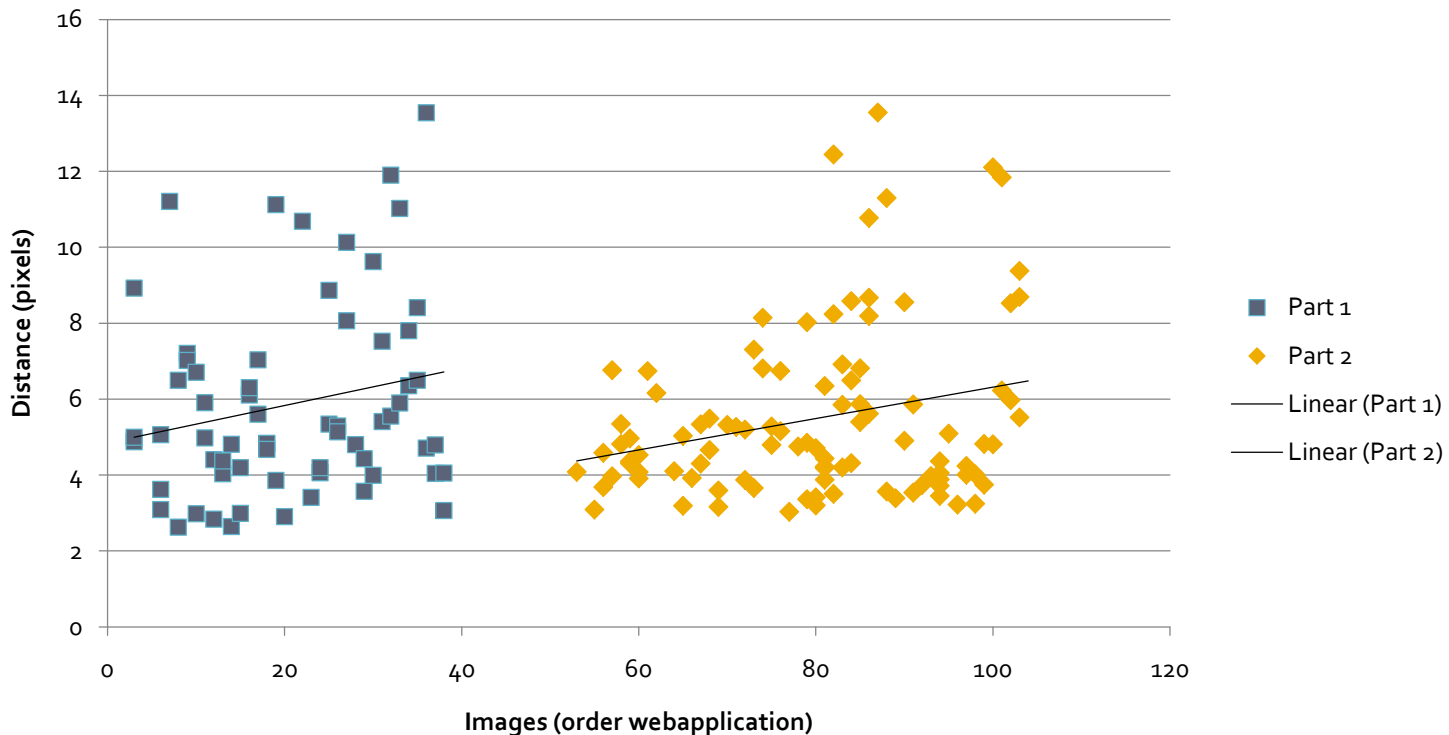
Preliminary Results and Outcome – Time

Figure 8 *Scatter plot of the progress of the Mean distance between the reference and the digitized lamp posts*

WAVARS

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Future Planning

- 05/2010 – 08/2010   promotion
  data collection

- 09/2010 – 03/2011   (data collection)
  data processing
  report results
  develop selection/training tool

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Questions