UTILIZATION OF VIRTUAL REALITY FOR TEACHING 3D TASKS IN GEOGRAPHY

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INTRODUCTION

- Part of the project: „**Influence of cartographic visualization methods on the success of solving practical and educational spatial tasks**".

- Project duration: 2016 – 2018.

- Investor: **Grant Agency of Masaryk University.**

- Participating Faculties: **Faculty of Science, Education, Arts, Informatics.**

- Acronym: **Carto4edu.**

AIMS OF THE ENTIRE PROJECT – MAIN RESEARCH QUESTIONS

- How different methods of visualization and user interfaces (UI) affects the way of solving spatial tasks by individual person or by group of people?

- How these methods affect the efficiency of processing and interpretation of spatial information and learning?

MOTIVATION

- We have entered 3D era (Boughzala, 2012).
- „Decision making with the immersive visual analytics – is it necessary?" (AAG 2016, Alex Klippel, 3D VR and AR for GI).
- 3D technologies in geography related areas like:
  - education,
  - crisis management,
  - traffic,
  - aviation etc.

BUT
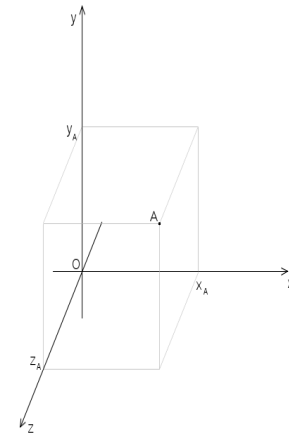
- Where is the added value?
- The use of 3D is still ambigous (Livatino et al., 2015; Seipel, 2012; Beurden et al., 2010; Pascher & Philip, 2001 and others).

THE MAIN EXPERIMENT - MOTIVATIONS

- Where is the added value of Virtual Reality usability?
- Example tasks - long term bad results of students at entrance examinations at the Department of Geography, Faculty of Science, Masaryk University.
- It turns out that high school students have great difficulties to work with contours.

Hiking trail from point A to B leads:

a) on the ridge up to hill

b) on the ridge down to hill

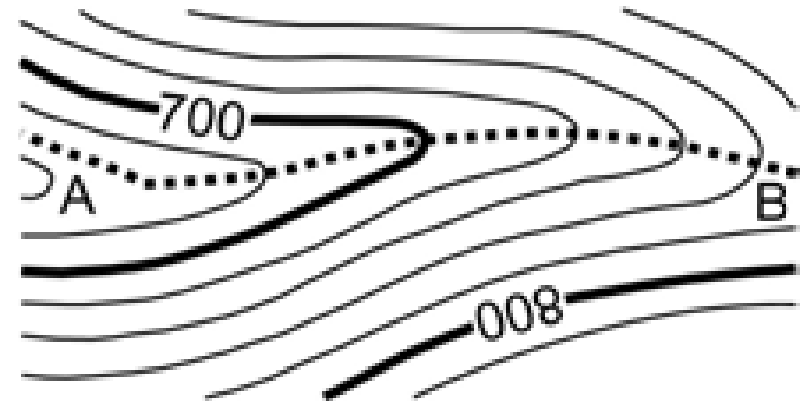*c) in a valley down to hill*

d) in a valley up to hill

*Figure 1 Example of entrance examinations task.*

THE MAIN MOTIVATIONS II

- The results of this described project will not be only objective but also **quantifiable**.
- Objective of this project will determine whether and how much learning in virtual reality helps understanding the problem.
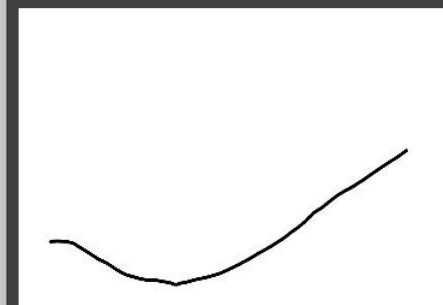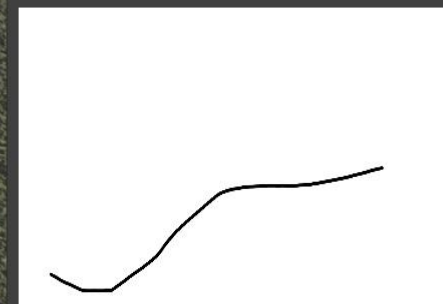
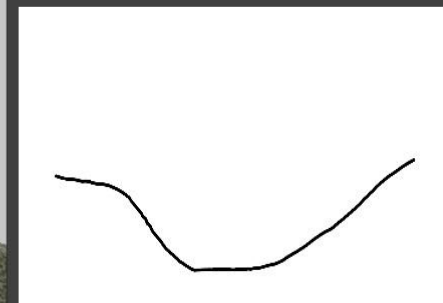# EXPERIMENT WITH 3D SHUTTER GLASSES

| Mental Rotation Test | | Static stage | | Interactive stage | | Self-report questinaire | Inquiry |
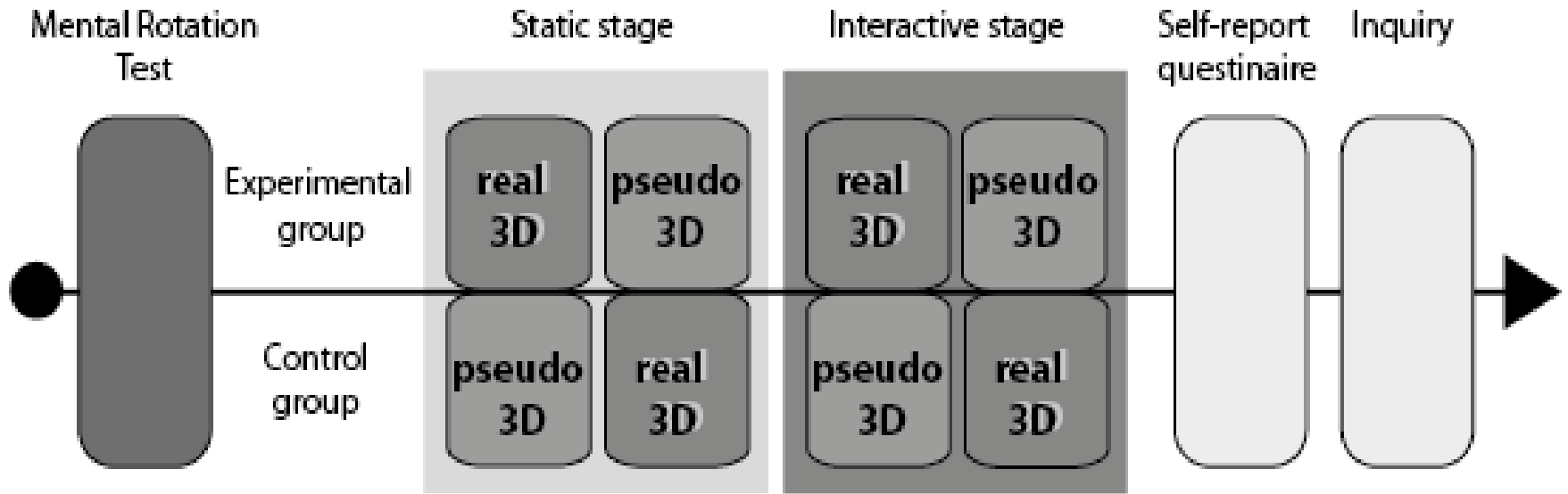
39 volunteers (18 females and 21 males; age 16-18) from two high-schools in Brno (the Czech Republic).
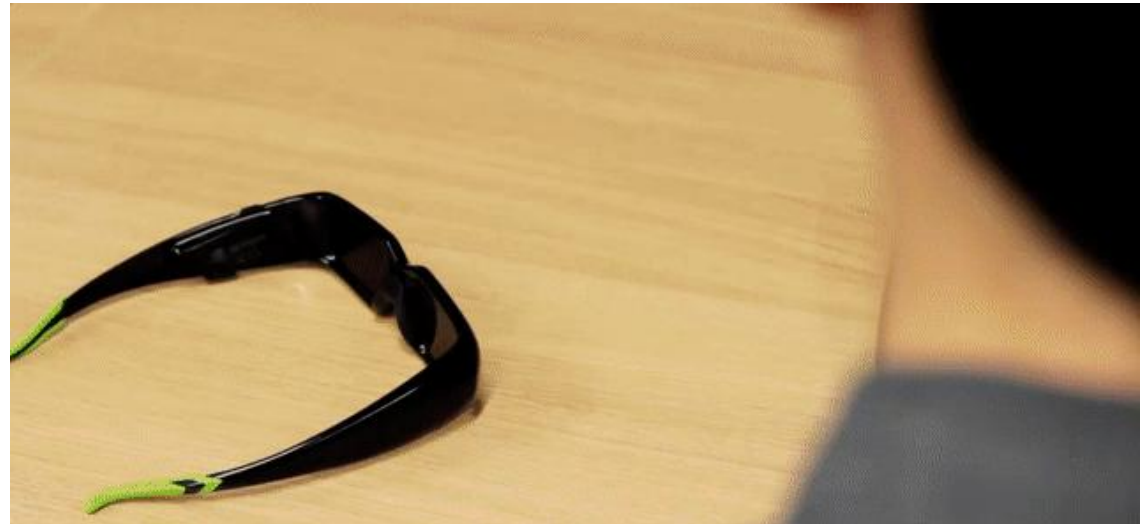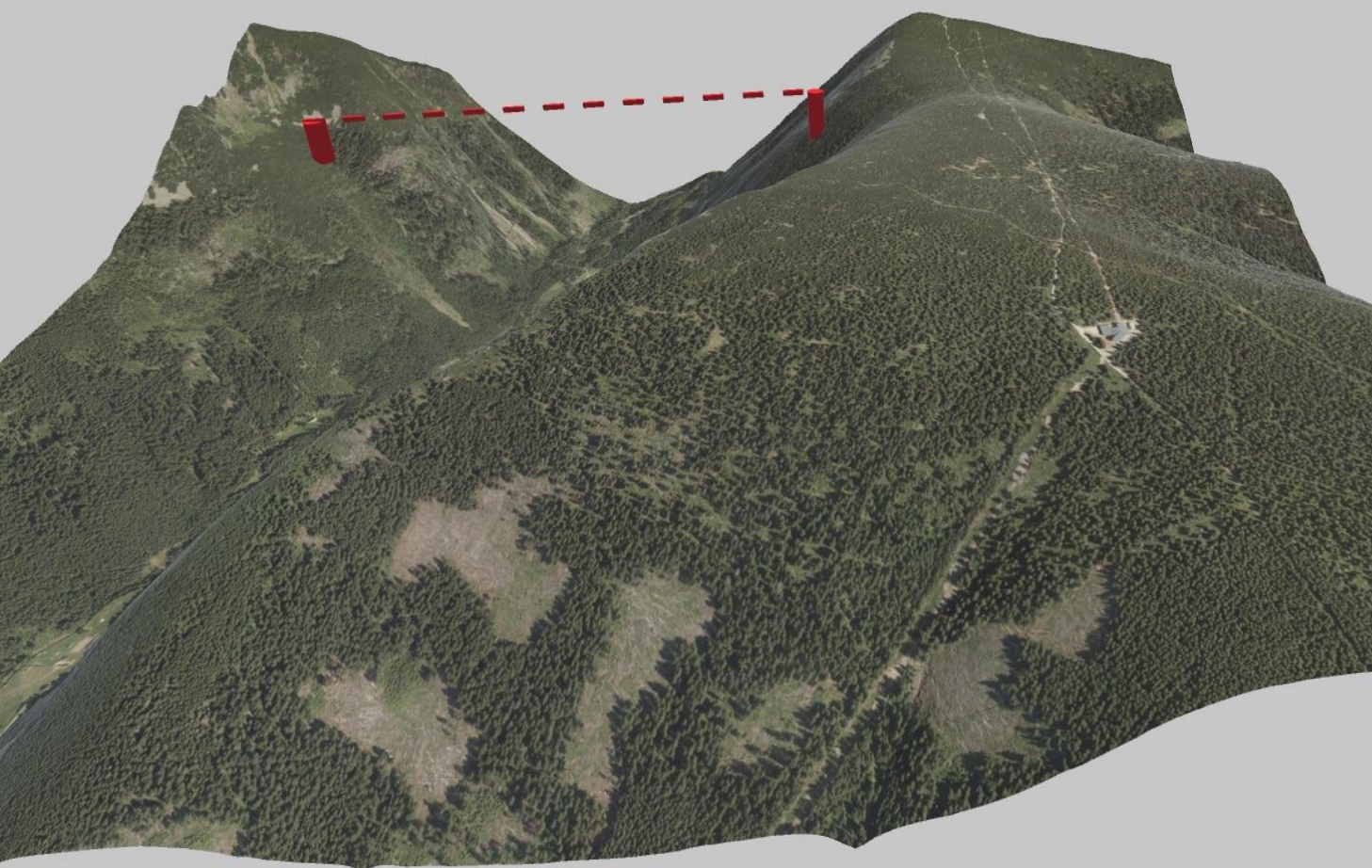
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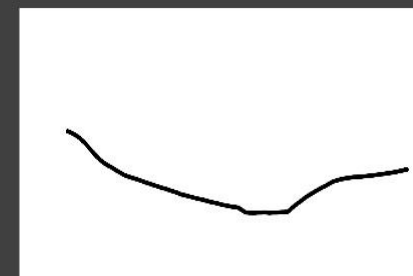
Which of lines on the terrain matches the profile on the right?

Red

Green

Blue

RESULTS OF THIS TEST

Correct answers

	static	interactive
pseudo 3D	m=5.00; sd=1.34	m=5.74; sd=1.33
real 3D	m=5.15; sd=1.66	m=5.77; sd=1.39

Response times

	static	interactive
pseudo 3D	m=16.30; sd=5.86	m=20.85; sd=8.89
real 3D	m=16.72; sd=5.79	m=20.01; sd=8.94

EXPERIMENT WITH VIRTUAL REALITY

- This experiment is in progress.
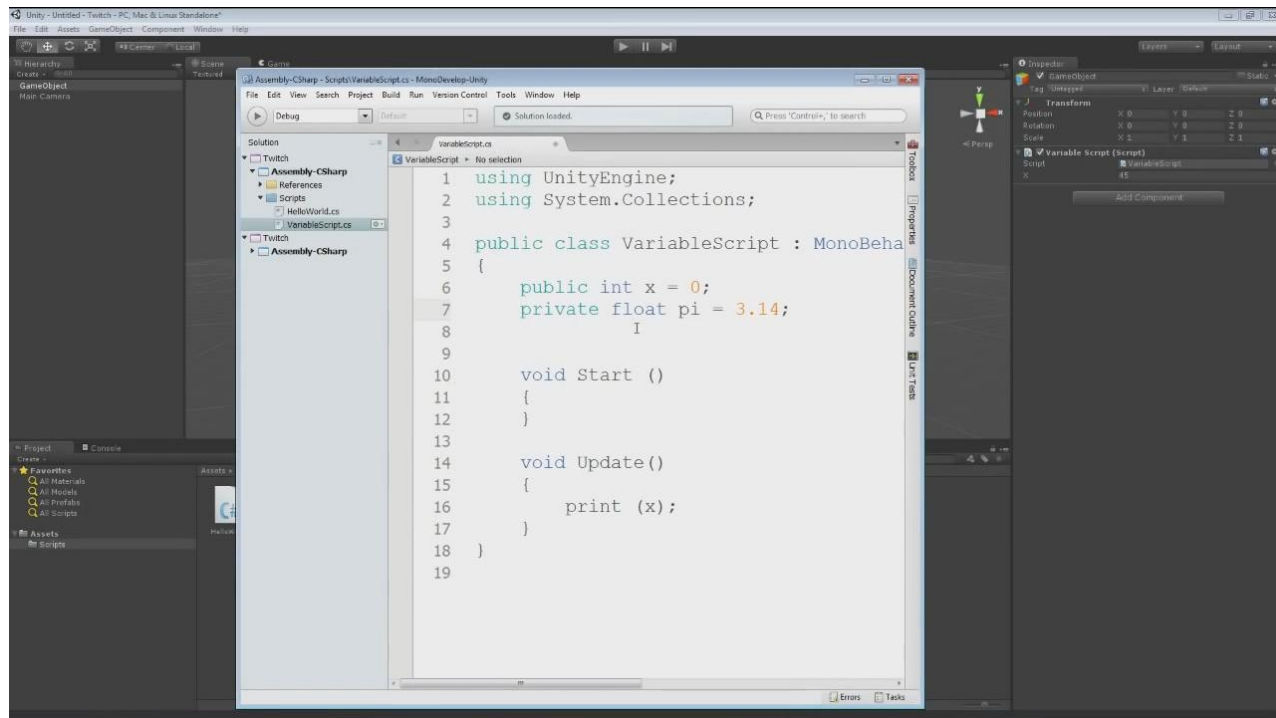- We are working on its design.

HARDWARE

- HTC VIVE Virtual Reality System.
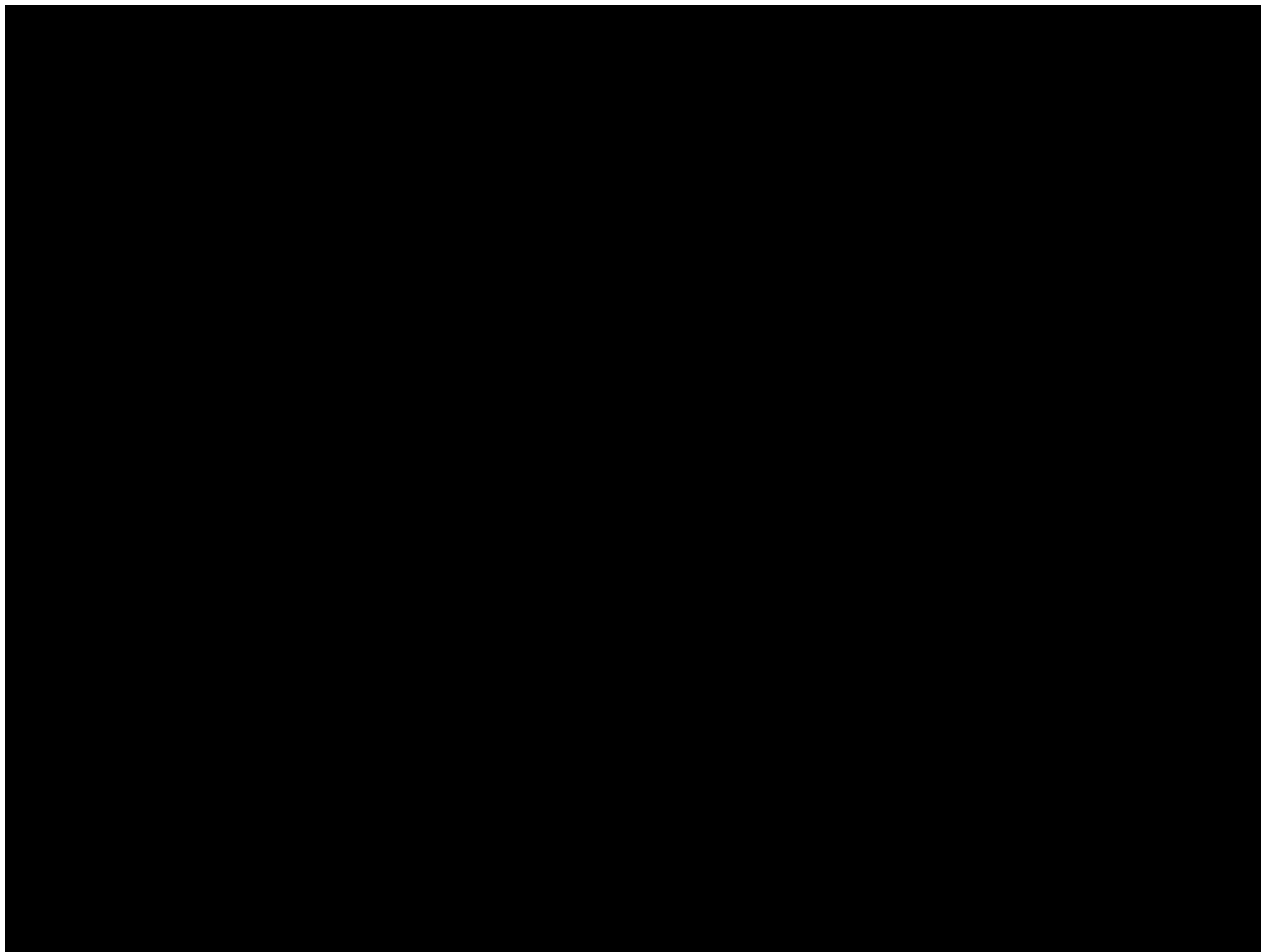- High performance PC.

SOFTWARE

- Unity – cross-platform game engine developed by Unity Technologies.
  - For developing video games and simulations for computers, consoles and mobile devices.
  - Unity GUI or coding (JavaScript, C#).

EDUCATION IN VIRTUAL REALITY

Utilization of virtual reality for teaching 3D tasks in geography.

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NEXT STEPS

- Experiment with students from high schools.
- Fall 2017.
- Are You interested in co-operation? – contact me!

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ACKNOWLEDGEMENTS

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RESOURCES

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- Seipel, S. (2012). Evaluating 2D and 3D geovisualisations for basic spatial assessment. Behaviour & Information Technology, 32(8), pp. 845-858.

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THANK YOU

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