User Assessment of 3D Chromo-Stereoscopy for Hydrographic Applications

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The outline of the presentation

- Introduction: the use of colour in Hydrography
- Chromo-stereoscopy (CS)
- CS in Hydrography
- The process of this research
  - Create hydrographic scenario
  - user group assessment
- Results

Colours in Hydrography

- On a chart
  - Red: hazards
- Colour convention of channel marking buoys
  - Red
  - Green
- Bathymetry colour stratification along Z axis from red to blue
- As a basis of a 3D technique known as Chromo-stereoscopy

The concept of CS

- 3D technique that uses the differential diffraction of colour light
- Only one image
- Normally, red parts of the image appear closest and blue parts most distant
- Use 3D ChromaDepth glasses
- CS is a low-end, inexpensive viewing technique
- Constrains the order of colours
- Different from anaglyph
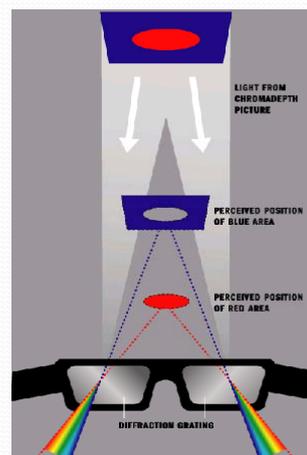
Anaglyph

- 3D technique uses combination of colour and the parallax effect
- Colour for filtering
- Two images in two complementary colours
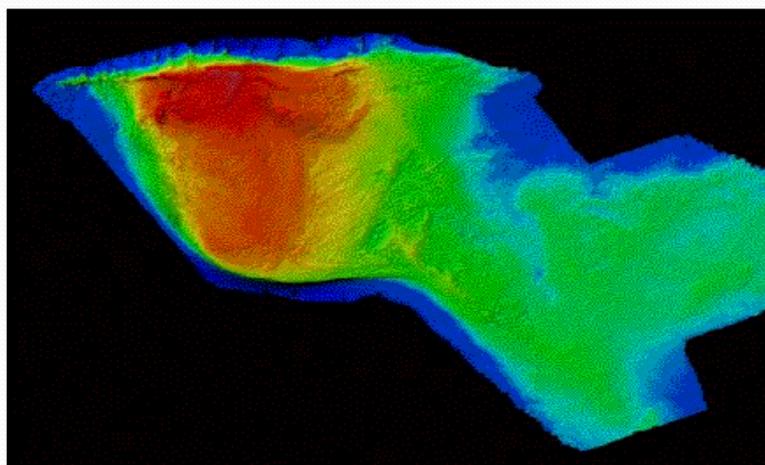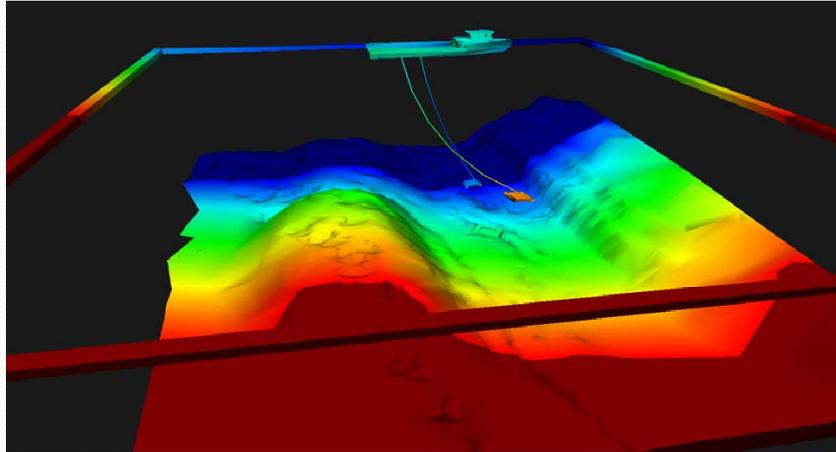- Anaglyph glasses: lenses of two complementary colours
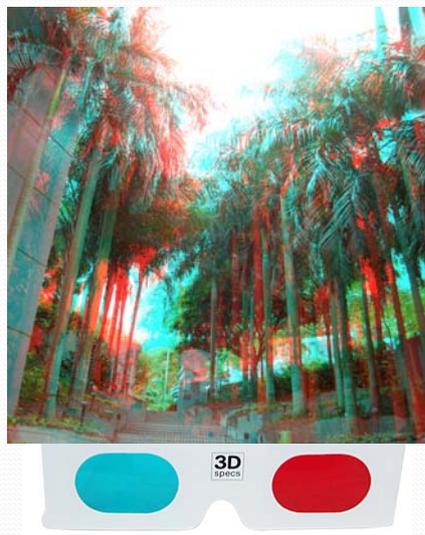
CS in Hydrography (1)

Image courtesy: Lamplugh, et al., 1996)

CS in Hydrography (2)

Ostnes (2003-2005)

Depth cues

- Occlusion/ overlapping
- Chromatic aberrations
- Perspective
- Shading

Current research
CS in Hydrography (3)

- Built on the stationary and the oblique view of CS
- Assess the consequences of CS in moving images
  - Produce some scenarios
  - Assess the views against user groups
- Assess users' perceptions for the changes in some cartographic aspects
- Assess the results of combining CS with shading

Producing moving images

- Investigating a useful software
  - Easy to learn for novice programmer
  - Support colour manipulation
  - Support move through 3D imagery
- Options
  - IDL
 - C++
  - Matlab

Matlab

- Popular software in Academia
- High level language
  - Compact scripts
  - Many build in functions
  - Highly customised, SO requires good understanding for the build in functions
- Support building graphical user interface
- Support generating and manipulating colours

Practical work

- Create three visualisations to show the CS effect in hydrographic applications
- Create a User Graphical Interface (GUI)
- Create questionnaires to assess the potential of CS
- Run tests with different audiences
  - specialists and non-specialists
- Refine the GUI and the visualisations' contents

GUI

- The GUI support:
  - Running different scenarios
  - Applying two colour schemes
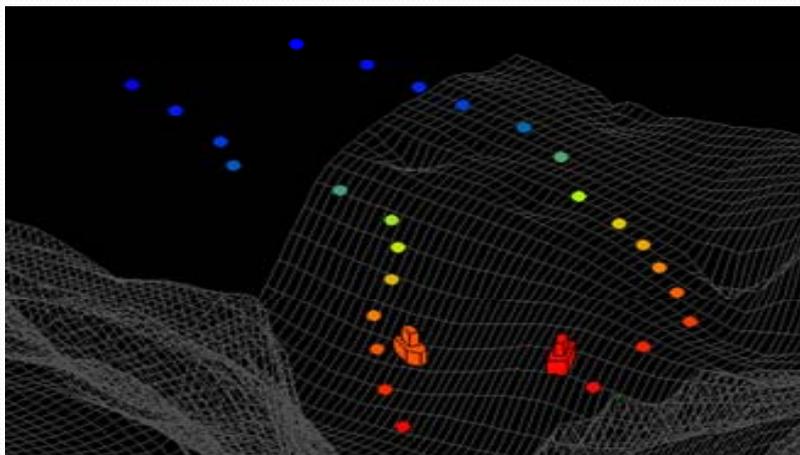 - Add shading effect
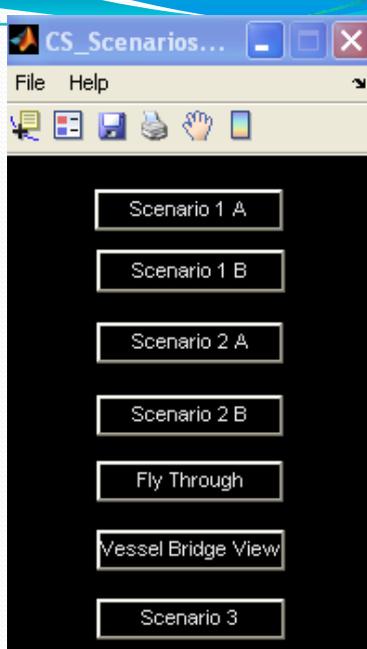
Questionnaires

- Evaluate the usability of CS3D in hydrographic applications
  - Gauge the participants' 3D perception
  - Investigate the consequences of changing colour convention
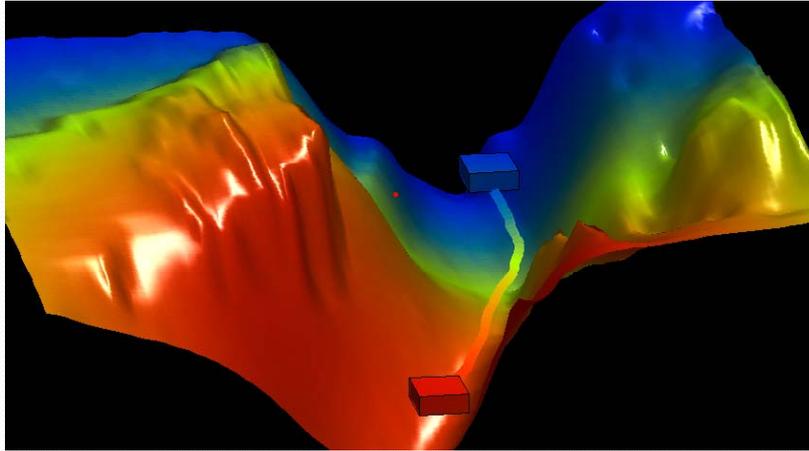 - Investigate the effect of combining CS with shading

Bathymetry
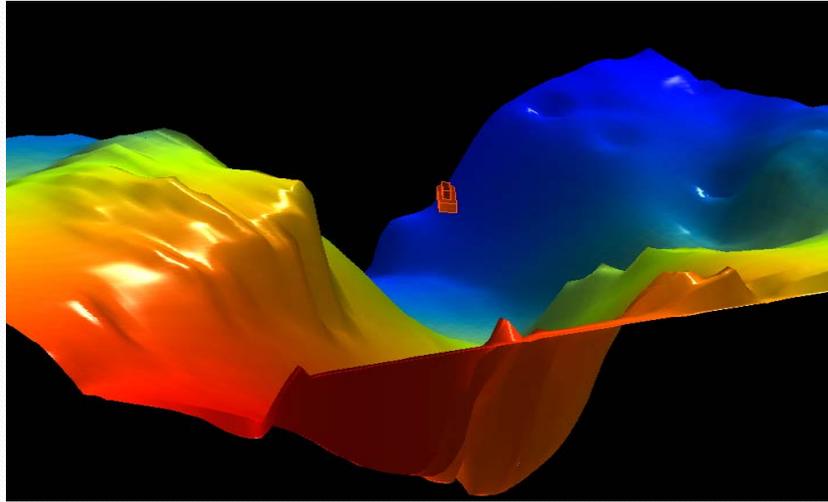
# Navigation scenario with bathymetry

Underwater scenario

Test group response (1)

- The user group includes participants from different disciplines in research, marine sciences and industry
- The scenarios have to be altered depends on test group
- Navigation scenario
  - For navigation specialist
    - No bathymetry
    - Buoys represented in colours and symbols
  - For non-specialist
    - Bathymetry is required

Navigation scenario without bathymetry
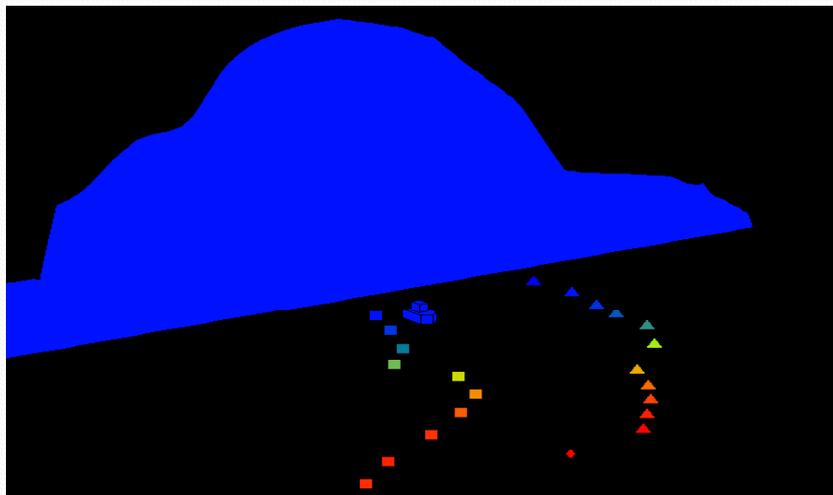
Test group response (2)

- CS is beneficial for under water operations
- Shading &CS
  - Helps to understand the topographic features
  - More realistic images

References

- Lamplugh, M. J., Kearns, T. A. & Craft, A. C. (1996) 'Applications of Multibeam data', Fisheries and oceans Canada. [Online]. Available at: http://www.mar.dfo-mpo.gc.ca/science/review/1996/Lamplugh/Lamplugh_e.html (Accessed: 01.06. 2010).
- Ostnes, R. (2005) 'Use of depth perception for the improved understanding of hydrographic data'. *Unpublished PhD. Plymouth: University of Plymouth. pp. 155.*
- Slocum, T. 1999. Thematic cartography and visualization. Upper Saddle River, New Jersey: Prentice-Hall, Inc.

Than you for your attention

Any Questions?

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