Foveating Dynamic Scenes based on Expert’s Eye Movements to Convey Perceptual Skills

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Research Questions

1. Analyzing the role of perceptual skills on different expertise levels (eye tracking and verbal protocols)
   - classifying locomotion patterns of reef fish: Jarodzka, Scheiter, Gerjets, & Van Gog (2010)
   - air traffic control: Van Meeuwen, Jarodzka, Brand-Grande, Van Merriënboer, De Beek, & Kirschner → Poster at this conference!

2. Developing a method to teach perceptual skills (instructional design)
   - classifying locomotion patterns of reef fish: Jarodzka, Van Gog, Berr, Scheiter, & Gerjets (submitted)
   - diagnosing epileptic seizures in infants: Jarodzka, Balslev, Holmqvist, Nyström, Scheiter, Gerjets, & Elia (submitted)

Task Analysis: Procedure, Knowledge, & Skills

Based on perceptual input, i.e., perceptual skills
- specifying body parts that might be affected by the disease
- search and identification of relevant elements
- specifying the motion pattern of these body parts
- inspection and interpretation of relevant elements
- diagnosis of the disease
- assignment of observations to the according diagnosis

Based on conceptual knowledge

Empirical Findings on Role of Perceptual Skills and Expertise

- Improving perceptual skills required for naturalistic, dynamic scenes
  - efficient visual search within (equally) salient relevant and irrelevant elements and detection of relevant elements
  - correct interpretation of these elements

- Expert specific strategies
  - Knowledge- and experience-based shortcuts increase with expertise & enable a fast and correct reaction
  - & found in verbal and in eye tracking data
  - strategies become more diverse with increasing expertise
Conveying Perceptual Skills

No methods to convey perceptual skills, the development of this inspired by methods to teach cognitive skills.

A prototypical instructional method for initial skill acquisition is example-based learning. Like

Worked examples
Cognitive modeling

Novel Instructional Approach: Eye Movement Modeling Examples
(Qu, J., Scholer, G., Jarodzka, H. & Paas, F. 2010)


Design & Sample Size

N = 60 medical students in their final year

<table>
<thead>
<tr>
<th>Eye movement modeling examples during learning</th>
<th>Control</th>
<th>Circle display</th>
<th>Foveated display</th>
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<tbody>
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<td>n = 20</td>
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Marcus Nyström
Humanities Lab, Lund
SMI High Speed 240 Hz

Procedure

Learning
EMME (no vs. dot vs. foveation)

Testing
New videos without guidance

• Does EMME guide the students’ attention?
• Does EMME lead to a more efficient visual search?
• Does EMME lead to a better interpretation performance?
1. Successful attention guidance: closer to expert’s gaze
   foveated display < other two groups

2. More efficient visual search: faster and longer on relevant features
   foveated display > other two groups

3. Better interpretation performance: higher MCQ scores
   foveated display > other two groups

For questions on this talk, please contact me:

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