

## **Estimation of image difficulty in x-ray screening**

### **Original title / Originaltitel**

Berechnung der Bildschwierigkeit bei der Röntgenbildanalyse

### **Summary / Zusammenfassung**

The relevance of aviation security has increased dramatically at the beginning of this century. One of the most important tasks is the visual inspection of passenger bags using x-ray machines. In this study, we investigate the role of image based factors on human detection of prohibited items in x-ray images. Schwaninger, Hardmeier, and Hofer (2004, 2005) have identified three image based factors: view difficulty, superposition and bag Complexity. In this project we develop a computational model of human x-ray image interpretation. First, we develop image processing algorithms for automatic estimation of image based factors. We then show that these algorithms are perceptually plausible by correlating their results with human ratings of view difficulty, superposition and bag complexity. Then, we show that the computational algorithms correlate with human performance. Finally, we compare the computational model with a model based on human ratings regarding its predictive value of human x-ray image interpretation performance. A perceptually plausible model of human x-ray image interpretation is very valuable for understanding human cognitive processes and representations and it has important implications for the enhancement of computer-based testing and training systems.

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### **Publications / Publikationen**

Schwaninger, A., Bolfig, A., & Michel, S. (in press). A Statistical Approach for Image Difficulty Estimation in X-Ray Screening Using Image Processing. Proceedings of the 4th Symposium on Applied Perception in Graphics and Visualization, ACM Press, New York, USA. [PDF]

Bolfig, A., Michel, S., & Schwaninger, A. (2006b). A statistical approach for automated image difficulty estimation in x-ray screening using image processing algorithms. Proceedings of the 4th International Aviation Security Technology Symposium, Washington, D.C., USA, November 27 – December 1, 2006, 384-388. [PDF]

Bolfig, A., Michel, S., & Schwaninger, A. (2006a). Assessing image difficulty in x-ray screening using image processing algorithms. Proceedings of the 2nd International Conference on Research in Air Transportation, ICRAAT 2006, Belgrade, Serbia and Montenegro, June 24-28, 2006, 253-258. [PDF]

Schwaninger, A., Michel, S., & Bolfig A. (2005). Towards a model for estimating image difficulty in x-ray screening. IEEE ICCST Proceedings, 39, 185-188. [PDF]

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### **Keywords / Suchbegriffe**

Computational modeling, object recognition, x-ray image interpretation

### **Project Leadership and Contacts / Projektleitung und Kontakte**

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[www.psychologie.unizh.ch/vicoreg/](http://www.psychologie.unizh.ch/vicoreg/)

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