Workshop

COLOUR IMAGING REPRODUCTION FOR 3D PRINTING

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Summary

Recently the technology of additive manufacturing, including three dimensional (3D) printing, has developed dramatically. One of the biggest advantages of 3D printing systems is their ability to directly interconnect with advanced manufacturing techniques and allow custom made production, with excellent accuracy and savings in both time and cost. Colour 3D printing using inkjet technology has evolved to produce full spectrum colour, solid objects in many different materials. This technique has been utilised extensively for rapid prototyping and is gaining popularity in multidisciplinary applications. With the evolution of various 3D imaging capturing techniques, another milestone has been achieved, allowing accurate acquisition and transformation of target object geometric data into 3D digital models. By combining 3D image capture and 3D printing, there is huge potential to achieve "What You See Is What You Get" processing for any objects.

However, the accurate reproduction of coloured 3D objects is still a huge challenge for colour and imaging science. Conventional colour image reproduction techniques based on CIE Colorimetry have been developed for more than 20 years and perform very well in transforming colour images from one digital media to another under various viewing conditions. However, CIE standard observer and psychophysical data for colour appearance modelling and colour difference evaluation were all obtained for flat colour samples. Therefore, to apply conventional colour image reproduction technique for 3D objects might not be straightforward or accurate. Moreover, more complex viewing conditions are always encountered when a 3D object is viewed and compared to the original. To preserve a colour reproduction for any illumination, a spectral based colour reproduction is even more important for 3D objects than for flat images. Furthermore, a full-colour 3D model contains a significant amount of data. A trade off between the complexity of a model and accuracy of the model prediction has to be taken into consideration as well.

This workshop will bring researchers, engineers and users who work in the field of 3D colour imaging reproduction together. The goal will be to understand more deeply what the most pressing challenges are in this area, and stimulate cross-disciplinary collaborations that might help address these issues. In particular, Dr Carinna Parraman from University of the West England, Dr Tzunghan Lin from National Taiwan University of Science and Technology and I will address key issue of colour management for 3D cameras and 3D printers, and colour measurement for 3D objects, respectively. It will follow by discussion among participants to share insight and simulate new idea in those topics. In addition the potential for a new CIE Technical Committee on this topic will be summarised.

Dr Kaida Xiao received his PhD from Colour and Imaging Institute, University of Derby, working with Professor Ronnier Luo in colour appearance modelling. He then worked in

Samsung Advanced Institute of Technology in Korea, on colour image processing for displays. It was followed by a post at Tru-Colour Ltd., working on display visual colour calibration. After periods at the University of Sheffield, working on colour image reproduction for 3D printing in soft tissue prostheses, he is now a Senior Research Fellow at Department of Psychological Science at the University of Liverpool and a Visiting Professor in the University of Science and Technology Liaoning, China. His research interests are related to 3D colour image reproduction and printing, medical image capture and analysis, colour appearance modelling and image quality enhancement. He has been actively working with CIE since 2006. He is now the Technical Committee Chair for CIE TC 1-92, skin colour database and the Reportership for CIE R8-11, 3D colour image reproduction for 3D printing.