Summary of COSCH Oral Presentations at the International Conference on Image & Signal Processing (ICISP 2014) – Digital Cultural Heritage special session

At the International Conference on Image & Signal Processing (ICISP 2014), Cherbourg, Normandy (France), June 30 – July 2 2014, COSCH supported a special session on Digital Cultural Heritage, chaired by Alamin Mansouri and Frank Boochs, to which four oral and two poster presentations were selected.

The oral presentations dealt with the application of multi- and hyper-spectral imaging techniques to the investigation of artworks and artists' materials mainly covering the COSCH WG1 activities.

The first talk, "Spectral Image Analysis and Visualisation of the Khirbet Queyafa Ostracon", was presented by Sony George and reported the results obtained using the spectral image analysis combined with image processing on the Khirbet Qeiyafa ostracon, a piece of pottery inscribed with ink that belongs to the Iron IIa period. This research was conducted to enhance the readability of the text by carrying out imaging acquisitions in the visible and IR range in order to facilitate the detection of the characters (letters and symbols) and improve their legibility. Analysis of the spectral data using principal component analysis and independent component analysis provided better ink visibility and gave further support to archaeologists and historians. The proposed techniques resulted in an improvement when compared with earlier interpretations.

The second presentation on "Practice-based comparison of imaging methods for visualization of toolmarks on an Egyptian Scarab" was given by Lindsay MacDonald. His presentation dealt with the 3D representations of a small Egyptian scarab with a gold band through the application of a number of diverse methods based on photogrammetry and photometric stereo. They were evaluated for colour fidelity and spatial detail, in the context of a study of tool-marks and manufacturing techniques of jewellery in ancient Egypt. It was found that although a 3D laser scanner provided the best geometric accuracy, the camera-based methods of photogrammetry and photometric stereo allowed for a better representation of the fine details and colours on the object's surface.

In the third talk, Tatiana Vitorino presented a work (entitled "Hyper-Spectral Acquisition on Historically Accurate Reconstructions of Red Organic Lakes") focused on the use of Vis-NIR hyper-spectral imaging spectroscopy to the non-invasive study of red lake pigments. In the presentation, red lake pigments were described as an important group of artists' materials, which identification and study in artworks is a challenging task that requires the existence of a reference database, and the development of effective non-invasive analytical approaches. As such, hyper-spectral imaging spectroscopy was used to characterise and discriminate between historically accurate paint reconstructions of brazilwood and cochineal lakes. The same paints were also analysed with Fibre Optic

Reflectance Spectroscopy, in order to validate the data obtained with the imaging spectroscopic method. The requirements for a successful identification of the paints, which display characteristic features in the visible range, were addressed, and the advantages of using the hyper-spectral imaging technique were shown.

In the last presentation, "Pigment Mapping of The Scream (1893) Based on Hyperspectral Imaging", Hilda Deborah reported some data acquired on the painting "The Scream" (1893) with a hyperspectral scanner. The main focus of this work was the mapping of its constituent pigments. Two different classification methods, i.e. Spectral Angle Mapper (SAM) and Spectral Correlation Mapper (SCM), were compared and SCM was found to be superior to SAM as the latter leads to erroneous detections due to its inability to detect spectra with negative correlation. In addition, besides pigment mapping with the classification approach, the spectral un-mixing approach using linear mixing model was also explored and some preliminary results were presented. However, in the future, the non-linear mixing model needs to be employed.

The session was well attended and several questions from the audience were addressed to the speakers. This testified the strong interest from scientists and researchers with different cultural backgrounds in the application of multi- and hyper-spectral imaging systems, and their data elaboration, to the cultural heritage field. Furthermore, COSCH was well represented and the conference was a successful stage for promoting COSCH activities.