J Inform Tech Softw Eng 2016, 6:4(Suppl)
http://dx.doi.org/10.4172/2165-7866.C1.006

Advanced animation technology for digital health

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The introduction of animation techniques in film production such as motion capture, virtual reality, modeling and simulation, has revolutionized the entire film industry. We (National Centre for Computer Animation, NCCA) as the No.1 UK research and education base for computer animation, are endeavoring to bring these state-of-the-art animation techniques into health industry, benefit more people by improving the efficiency and efficacy of healthcare services. Since 1989, the NCCA (winner of the UK – Queen's Anniversary Prize in 2012), has been at the forefront of computer animation education and research in the UK, and our graduates have made a global impact upon the film industry such as the achievement on the films of Gravity, Inception and Avatar. We have prioritized multidisciplinary applications of our computer animation technology from film production into other fields, especially the Digital health area. In the past five years, we have successfully developed a few medical projects cooperated with doctors and local hospitals. For example, "Augury project": a sophisticated colorectal surgery simulator collaborated with the consultant surgeons from Bournemouth & Poole NHS; "Neuravatar": an intelligent virtual avatar to guide GPs to make neurological diagnosis in their clinical practice, guided by Dr. Rupert Page (Consultant Neurologist & Clinical Lead, Dorset Epilepsy Service), funded by AHSN; "Digital Psychiatrist": a facial and emotional recognition system to perform Mental State Examination based on videos and images of patients, collaborated with Dr. Wai Chen (Professor of Child Psychiatry at The University of Western Australia).

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An object-based visual selection framework

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Real scenes are composed of multiple points possessing distinct characteristics. Selectively, only part of the scene undergoes scrutiny at a time, and the mechanism responsible for this task is named selective visual attention. Spatial location with the highest contrast might highlight from scene reaching level of awareness (bottom-up attention). On the other hand, attention may also be voluntarily directed to a particular object in the scene (object-based attention), which requires the recognition of a specific target (top-down modulation). In this paper, a new visual selection model is proposed, which combines both early visual features and object-based visual selection modulations. The possibility of the modulation regarding specific features enables the model to be applied to different domains. The proposed model integrates three main mechanisms. The first handles the segmentation of the scene allowing the identification of objects. In the second one, the average of saliency of each object is computed, which provides the modulation of the visual attention for one or more features. Finally, the third builds the object-saliency map, which highlights the salient objects in the scene. We show that top-down modulation has a stronger effect than bottom-up saliency when a memorized object is selected, and this evidence is clearer in the absence of any bottom-up clue. Experiments with synthetic and real images are conducted, and the obtained results demonstrate the effectiveness of the proposed approach for visual selection.

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