

Interactive Computer Visualisations of Time and Place

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Abstract

This paper describes research into the development of a composition portfolio themed on interactive computer-based visualisations of time and place. The application of various computer graphics techniques are discussed including pixel shaders, particle systems, plasma and Perlin Noise.

Categories and Subject Descriptors: I.3.3 [Computer Graphics]: Display algorithms; J.5 [Arts and Humanities]: Arts, fine and performing

1 Introduction

This research is developing a composition portfolio exploring the past of place using aural and visual creative computational techniques. The impact of these techniques on user perception is being evaluated through systematic usability testing as part of an iterative methodology. This paper discusses various visual techniques under development and evaluation.

2 Techniques

2.1 Pixel Shaders

Custom pixel shaders are being evaluated for their impact on user perception of the evocation of the past of place. Multi-facted effects include sepia tint, scratches, spots/noise and a visualisation reminiscent of a flickering, old projector [Kod09]. One work exploiting this technique is an aged and slightly unstable "TimeRadio", based on Charles Babbage's observation that "*The air itself is one vast library, on whose pages are for ever written all that man has ever said or woman whispered*" [Bab38]

User interaction with these techniques includes dynamic variability (the modification of pixel shader parameters in real time), producing user-interactive emergent effects applied to layered moving images of past and present (Fig.1).

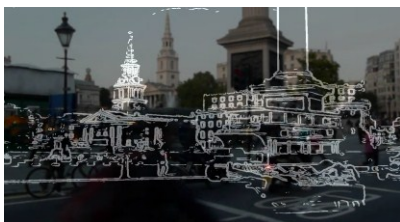


Figure 1: user-interactive edge finder pixel shader

Other pixel shader prototyping includes dynamically applying 3D anaglyphic effects to existing 2D images, and their use during transitions between images layered within the Z-axis: for example, a custom pixel shader applied to the alpha channel, producing visual effects designed to reinforce the impression of an older image both latent and emergent beneath the present (Fig.2).



Figure 2: alpha channel pixel shader, Z-axis image transition

2.2 Particle Systems

Particle systems are being explored with images of London past and present. In Fig.3 a function generates randomly-sized images at arbitrary screen co-ordinates, producing an effect reminiscent of Magritte's Golconda.



Figure 3: particle emitter using London image

In other implementations, on-screen particle motion is managed by iterative code triggered by events, including the mouse event handler, custom timer and events raised

by calculating that (random) lifespan attributes have caused a particular particle to expire.

2.3 3D in a 2D environment

Other visual techniques use the Z-axis as a means of simulating a 3D perspective. Using plane projection, 3D-like objects, such as rotating text and cubes, are being exploited. Multiple on-screen objects are defined with individual perspective transforms.



Figure 4: plane projection rotating text

Fig.4 illustrates a prototype landing page with rotational text comprising two text elements each with its own plane projection. Fig.5 illustrates the same method applied to a rotating cube with a secondary object inside rotating at twice the rate of the object in which it is located.

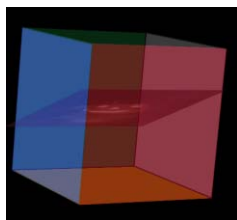


Figure 5: multiple objects with alternative perspective transforms and rotational characteristics

2.4 Plasma

Colour palettes used with plasma techniques are being constrained to a subset of the red/blue RGB colour space as part of related works exploring the symbolic representation of memories and emotions related to time and place. In Fig.6 the use of these techniques is combined with image content interactions triggered by event markers in related audio content.

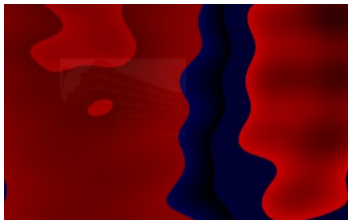


Figure 6: plasma effect

2.5 Perlin Noise

Fig.7 illustrates work currently in progress to utilise Perlin Noise [Per97] to create an on-screen visualisation of a "brain", with layers of imagery (encapsulating memory) floating to the surface and then receding.

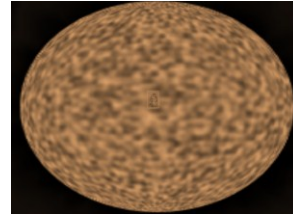


Figure 7: experimental "brain-like" Perlin Noise

2.6 Combinatorial Techniques

More complex visualisation effects are being developed through combinatorial techniques (Fig.8).

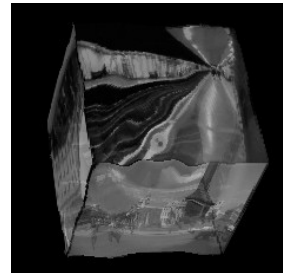


Figure 8: plane projection and pixel shading combined

Other novel graphics effects have been developed by using alternative, switchable pixel shaders and applying them to entire content rather than specific objects.

3 Conclusions

This paper has described a range of computer graphics techniques being developed and evaluated as part of the development of an original portfolio of aural and visual compositions. Applying its underlying iterative methodology, research continues both on refining individual techniques and on their combinatorial exploitation within extended works that bring together a variety of visualisation and auralisation methods.

4 Acknowledgements

Many thanks to Professor Andrew Hugill and Professor Simon Emmerson at the IOCT. Images from the book "Lost London 1870-1945" are provided courtesy of English Heritage London Region and the City of London, London Metropolitan Archives. Moving images of Piccadilly Circus and Trafalgar Square from the 1920's are provided courtesy of Getty Images.

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