



To Whom It May Concern,

The professional profile of Professor Francisco José Serón Arbeloa, a Doctor in Physical Sciences, currently a Full Professor in the area of Languages and Computer Systems at the Department of Computer Science and Systems Engineering of the School of Engineering and Architecture at the University of Zaragoza, who has developed R&D&I activities in areas including Intelligent and Cognitive Agent Modeling, Digital Holography, Mixed Realities, Computer Graphics, 3D Modeling of terrestrial structures, Simulation of natural phenomena, and Seismic Modeling (as detailed at <http://webdiis.unizar.es/~seron/>), I hereby offer my expert assessment responding to the request from Dr. Carlos Jiménez de Parga, in which he seeks an expert opinion in Computer Graphics regarding the visual quality of the virtual clouds presented at

<https://www.isometrica.net/thesis/>

I hereby inform you as follows:

The pursuit of visually compelling and physically plausible real-time simulations of volumetric clouds remains a significant challenge in computer graphics. Recent advancements have explored the application of Deep Learning techniques, particularly Recurrent Neural Networks (RNNs), to model the intricate dynamics of fluid flow that govern cloud formation and evolution. These approaches often represent clouds using a collection of pseudo-spheres, offering a computationally efficient alternative to high-resolution volumetric grids.

However, the visual quality of the resulting imagery is paramount for their practical application in areas like virtual reality, gaming, and weather visualization. The evaluating the visual quality of the generated imagery often involves subjective assessments by human observers.

The perceived visual quality of any image, regardless of its content or generation method, is fundamentally a subjective process. What one person finds aesthetically pleasing, realistic, or impactful, another might perceive differently. This subjectivity arises from a complex interplay of factors that reside within the individual viewer.

One key aspect is personal experience and background. Our past encounters with the visual world shape our expectations and preferences. Someone who has spent a lot of time observing real clouds, for instance, might be more critical of a simulated cloud that deviates from their learned understanding of cloud structure and behavior. Similarly, cultural background, artistic exposure, and even personal memories associated with certain visual styles can influence our judgment.

Furthermore, the context and purpose of the image can influence its perceived quality. A slightly noisy or less detailed image might be perfectly acceptable, even desirable, in a fast-paced video game where performance is critical. However, the same level of visual

fidelity would likely be deemed unacceptable in a scientific visualization or a high-resolution cinematic rendering where accuracy and detail are paramount. The intended audience and the message the image aim to convey also contribute to this contextual subjectivity.

Even our current emotional state and attention can affect how we perceive visual quality. A viewer who is tired or distracted might not notice subtle imperfections that would be glaringly obvious to someone who is alert and focused. Our mood can also bias our perception, making us more or less receptive to certain visual characteristics.

Therefore, when evaluating the visual quality of images generated by techniques like Deep Learning for fluid simulation, it's crucial to acknowledge this inherent subjectivity. While objective metrics can assess certain aspects like resolution, frame rate, or adherence to physical laws, the ultimate judgment of "good" visual quality often lies in the eye of the beholder. This necessitates considering diverse perspectives and, in many applications, relying on user feedback and subjective evaluations alongside quantitative measures.

Conclusion

Drawing upon my expertise in Computer Graphics and the simulation of natural phenomena, and considering my personal observations of real-world clouds, I find the visual quality of the virtual clouds presented in the referenced work to be sufficiently compelling for the stated applications.

Therefore, I conclude that the visual quality of the virtual clouds presented at the aforementioned link meets a satisfactory standard for their intended use, as evaluated from the perspective of an expert in Computer Graphics.

Signed by

Dr. Francisco José Serón Arbeloa

<https://webdiis.unizar.es/~seron/>