PERSONAL INQUIRY

KRISTOPHER GROPATSAKIS

MADE 1617

TOPIC OF INQUIRY "THE CREATION OF AN ELECTRICITY SOLVER IN HOUDINI"

ANNOTATED BIBLIOGRAPHY

1. Castle, S., *2014. Modeling lightning as a 2-dimensional fractal in an electric field.* [image] Available at: http://www.opensourcephysics.org/document/ServeFile.cfm?ID=11998&DocID=2816&Attachment=1 [Accessed 18 May 2017].

Sam Castle in his student research presentation makes a fantastic attempt in comparing the patterns created by a Dielectric-Limited Aggregation Model of simulated lightning to the Dielectric Breakdown Model. However, what is of value regarding this inquiry is the simplified definition of the Dielectric Breakdown Model Algorithm, as it is one of the research methods initially approached to produce the outcome of the electricity solver. The explanation of the mathematical algorithm by Castle truly presented the characteristics, such as the high computational expense and the demanding implementation requirements of the Dielectric Breakdown Model and enabled the research to inquire for other approaches.

2. Dylan, B., 2016. *Houdini Tutorial // 3D Lightning // Part 01 (Dynamics)* [video, online]. Vimeo. Available from: https://vimeo.com/190948059 [Accessed 18 May 2017].

This tutorial by VFX artist Dylan Brinsbury-Magee forwards the technique applied on the Point Based Approach Method I will be discussing and showing a practice of, in my talk. It demonstrates in a very simplistic fashion how a lightning aesthetic can be achieved with the use of lower level tools. The simplicity in which he demonstrates the method allows any user, whether of the artistic domain or the scientific domain to comprehend how to procedurally animate lightning bolts.

3. Maharathi, B., 2016. *Why do tree branches, cracks in the ground, lightning bolts etc. have similar shapes?* [online] California: Quora Inc. Available from: https://www.quora.com/Why-do-tree-branches-cracks-in-the-ground-lightning-bolts-etc-have-similar-shapes [Accessed 17 May 2017].

PhD Biomedical Engineer Biswajit Maharathi, very simplistically explains how patterns in nature found in natural phenomena are formed. Although, he doesn't deepen into great scientific detail, his observation on lightnings -*that particles follow the shortest path between two points*- enabled the basic ideology behind the *Electricity Solver* to be formed. This not only proved necessary for the outcome of this research, but also defined the character and properties of the Solver.

REFERENCES

Christiano, P., Kelner, J., Mądry, A. and Spielman, D., 2010. *Electrical Flows, Laplacian Systems, and Faster Approximation of Maximum Flow in Undirected Graphs*. 1st ed. [ebook] Los Angeles: Shang-Hua Teng, pp.4, 5. Available at: http://math.mit.edu/~kelner/Publications/Docs/maxFlow.pdf [Accessed 19 May 2017].

Drilian, 2009. *Lightning Bolts* [online]. Available from: http://drilian.com/2009/02/25/lightning-bolts/ [Accessed 5 May 2017].

Dylan, B., 2016. *Houdini Tutorial // 3D Lightning // Part 01 (Dynamics)* [video, online]. Vimeo. Available from:https://vimeo.com/190948059 [Accessed 18 May 2017].

Fractal Branching. (2017). [image] Available at: https://s-media-cache-ak0.pinimg.com/736x/38/02/e8/3802e81a4c6c4096b62b975ea264eef6.jpg [Accessed 25 May 2017].

Ghou, Z.,2017. *Laplacian growth simulation* [online] YouTube. Available at: https://www.youtube.com/watch?v=7m-nvyealB8 [Accessed 19 May 2017].

Hartsfield, T., 2014. *How Tesla Coils Work.* Real Clear Science [online], 29 January 2014. Available from: http://www.realclearscience.com/articles/2014/01/29/how_tesla_coils_work_108474.html [Accessed 20 May 2017].

Hickman, B., 2012. *3D Log Spiral Captured Lightning sculpture (Lichtenberg Figures)* [video, online]. YouTube. Available from: https://www.youtube.com/watch?v=0IxKM7NQXnA [Accessed 25 May 2017].

Imageworks VFX, 2014. The Amazing Spider-Man 2 - Dematerialization Shot Build [video, online]. YouTube. Available from: https://www.youtube.com/watch?v=jFV2KJMU7-w [Accessed 19 May 2017].

Kim, T. and Lin, M., 2007. *Physically Based Animation and Rendering of Lightning* [ebook] Chapel Hill: University of North Carolina. Available at: http://gamma.cs.unc.edu/LIGHTNING/lightning.pdf [Accessed 18 May 2017].

Kim, T. and Lin, M., 2007. *Fast Animation of Lightning Using An Adaptive Mesh*. 1st ed. [ebook] Chapel Hill: University of North Carolina. Available at: http://gamma.cs.unc.edu/FAST_LIGHTNING/lightning_tvcg_2007.pdf [Accessed 18 May 2017].

Quora, 2016. *Why Does Lightning Branch?* [online]. California: Quora. Available from: https://www.quora.com/Why-does-lightning-branch [Accessed 2 May 2017].

Stack Exchange Inc, 2014. *Game Development*: How can I generate a lightning bolt effect? [online]. Available from: https://gamedev.stackexchange.com/questions/71397/how-can-i-generate-a-lightning-bolt-effect [Accessed 12 May 2017].

The Amazing Spider-Man 2, 2014. [film, DVD] Directed by Marc Webb. USA: Sony Pictures Entertainment.

Theodore, K., Avnees S., Ming C. L., Sewall, J., 2007. *Fast Simulation of Laplacian Growth. I*EEE Computer Graphics and Applications*, (02 vol. 27)*, pp.68-76*.

The Prestige, 2006. [film, DVD] Directed by Christopher Nolan. USA, UK: Touchstone Pictures, Warner Bros.

Toro, R., 2014. *How the Tesla Coils Work (Infographic)*, Live Science [online], 9 July 2014. Available from: http://www.livescience.com/46728-how-the-tesla-coil-works-infographic.html [Accessed 15 May 2017].