Mesh2Matter, Rendering New Materialities

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Abstract

Mesh2Matter (Github 2020) explores the use of Machine Learning within a render pipeline, aiming for a materiality influenced by Karen Barad (Barad 2007) and Donna Haraway (Haraway 2016). This project speculatively reads contemporary renderers and goes on to pose new materialities from a framework based on neural nets. In an exploration into rendering matter, it reimagines how we form these configurations, breaking virtual matter from its isolation and weaving new materialities into these virtual spaces.

Rendering A Speculation

Exploring contemporary renderers, we see a myriad of techniques, all faced with simulating a possibly infinite world through finite resources. Each form of renderer cuts corners, but through each cut we see how it augments our world and how it figures its own.

Rendering Figurations

This project predominantly breaks down Ray Tracing (Akenine-Moller et al. 2018), a mainstream form of rendering. Its figuration is the inverse mechanism of light, the camera is the center of its world, projecting out to its surroundings to render an image. This figuration is understandable in terms of increasing performance, but the underlying structure and the cuts its makes are deeply anthropocentric. It places the viewer at the center of the world and leave it unilluminated without the viewer's enlightening gaze.

These processes are fragile and complex illusions, created through blind calculations that focus on fractions—single pixels of a bigger image.

Machine Learning Figurations

This project uses the Pix2Pix (Efros et al. 2018) framework made of two major components, a generator and a discriminator, but this project mainly focuses on the way it sees and translates the image.
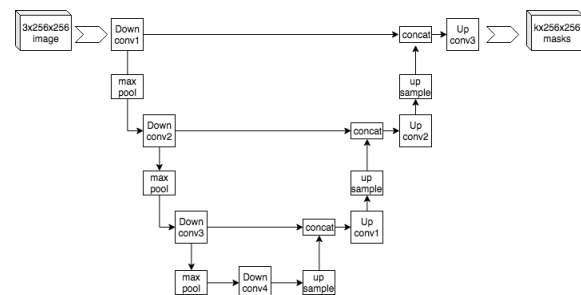

Fig. 1. *Example architecture of U-Net*, 2019, Mehrdad Yazdani, Copyright: Creative Commons.

The texture generation through the U-Net Generator (fig. 1) takes the original image through convolutions (Dumoulin et al 2016) down to the point of almost nothing and back up again. At each convolution the high dimensional space is split and woven back into itself, producing a milieu of causality.

The Difference?

The main difference is that the generation of the image is not through blind calculations, but through a high dimensional web of causality. Each generated texture and form arises because of many movements within the high dimensional net. Speculatively looking at this through Haraway's material-semiotics (Haraway 2016), this translation is similar to the way we conceive the objective world through a complex milieu of signals, contexts and narratives; each interwoven into our own virtual representation of matter and memory.

This speculative figuration shows the output of the Pix2Pix rendering not only photorealistic

complex textures, but an image that is woven from the world. The neural net weaves its own path of what matter is and the relations it consists of, one outside the human perception. This conception sees us on a verge of new forms of matter, convolved (Dumoulin et al. 2016) from the weights, biases and memories of trained models.

Rendering with Mesh2Matter

This project has an enlightening path to its construction, but the final apparatus is made from three major elements:

- A 3D scanning data preparation pipeline.
- A trained 512X512 Pix2Pix model
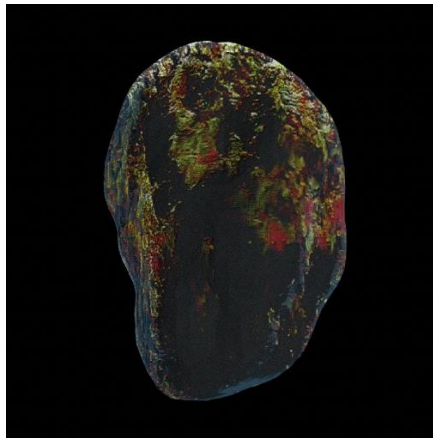- An implementation in a render pipeline.

Fig. 2. *Render with the final Pipeline utilizing the generated texture*, 2020, George Simms, Copyright: Property of the artist.

The renderer creates flowing and merging patterns that have the very distinct textures of rocks and minerals (fig. 2)(Youtube 2020), making them feel as if the forms are passing through time, forming and shedding layers of sediment.

Next Steps for New Materialities

This project set out to render a new form of complex woven materiality, aiming to inverse the apparatus of ray tracing, and to realize a new way of reproducing the world virtually. At this point you could ask: "has this project dismounted the anthropocentric structures of rendering?" Well not yet, but it does start to push towards a new way of reproducing matter, one that is woven from a more complex place outside of our own preconceptions.

References

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Biography

George Simms is a speculative digital artist, working with animation, interaction and code, looking at how we can use our current resources to see from a different vantage point, to imagine what is over another horizon.

He started working digitally during a Bachelors in Sculpture at Camberwell College of Art, completing it in 2015. In 2018 he went on to study a Masters in Computational Arts at Goldsmiths, University of London, completing it in September 2021.

Since graduating, he has been on a group residency at Arebyte gallery with the In-grid Collective, and completed a funded animation project for Gridmarkets.com.