



Artificial Terrain Generation

Presentation by Liam Brydon



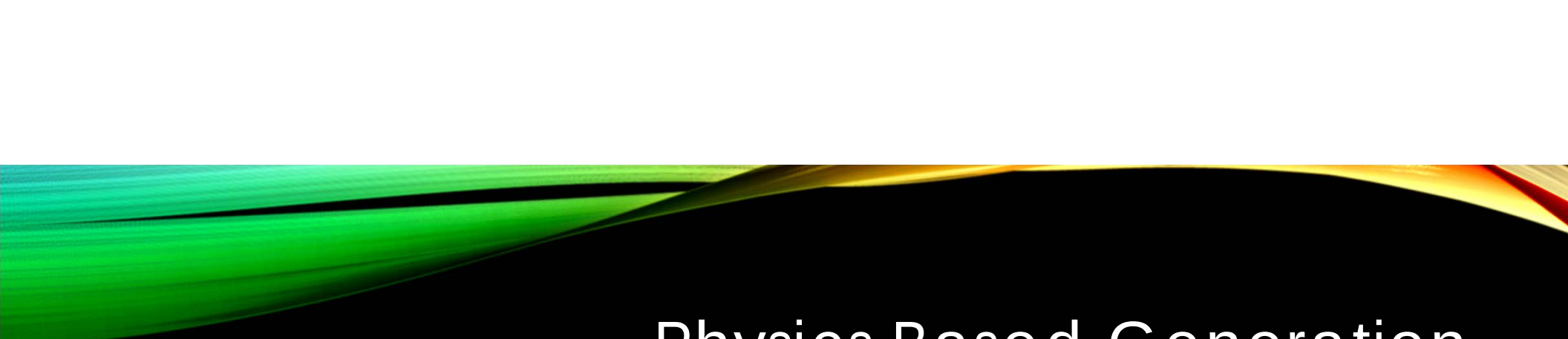
Introduction

- Creation of real or imaginary landscapes
- Computer graphics/ computational geometry
- Used in movies, video games, and more
- “Terrain Generation Using Procedural Models Based on Hydrology” *Génevaux et al.* [1]



Procedural Generation

- High variability
- Simple implementation
- Terrain is not always geologically accurate
- Large scale terrain often appears 'fresh'



Physics Based Generation

- Create terrain exposed to morphological agents
- Low controllability
- Computationally expensive
- Difficult to generate large and detailed terrain



Sketch Based Generation

- High controllability
- May or may not be geologically accurate
- Time consuming to create even small scenes



Background

- Many methods already exist such as procedural generation, physics based generation, and sketch based generation
- These methods have pros and cons
- No method for controllable, efficient and geologically consistent terrain

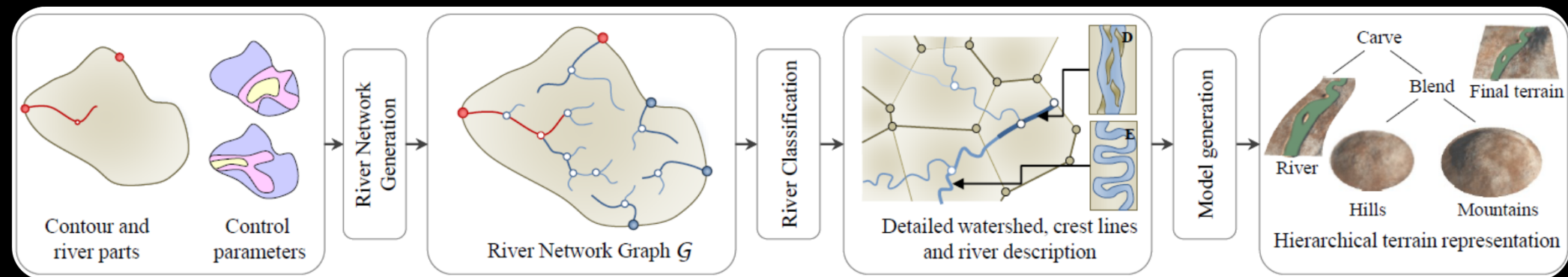


The Paper - Overview

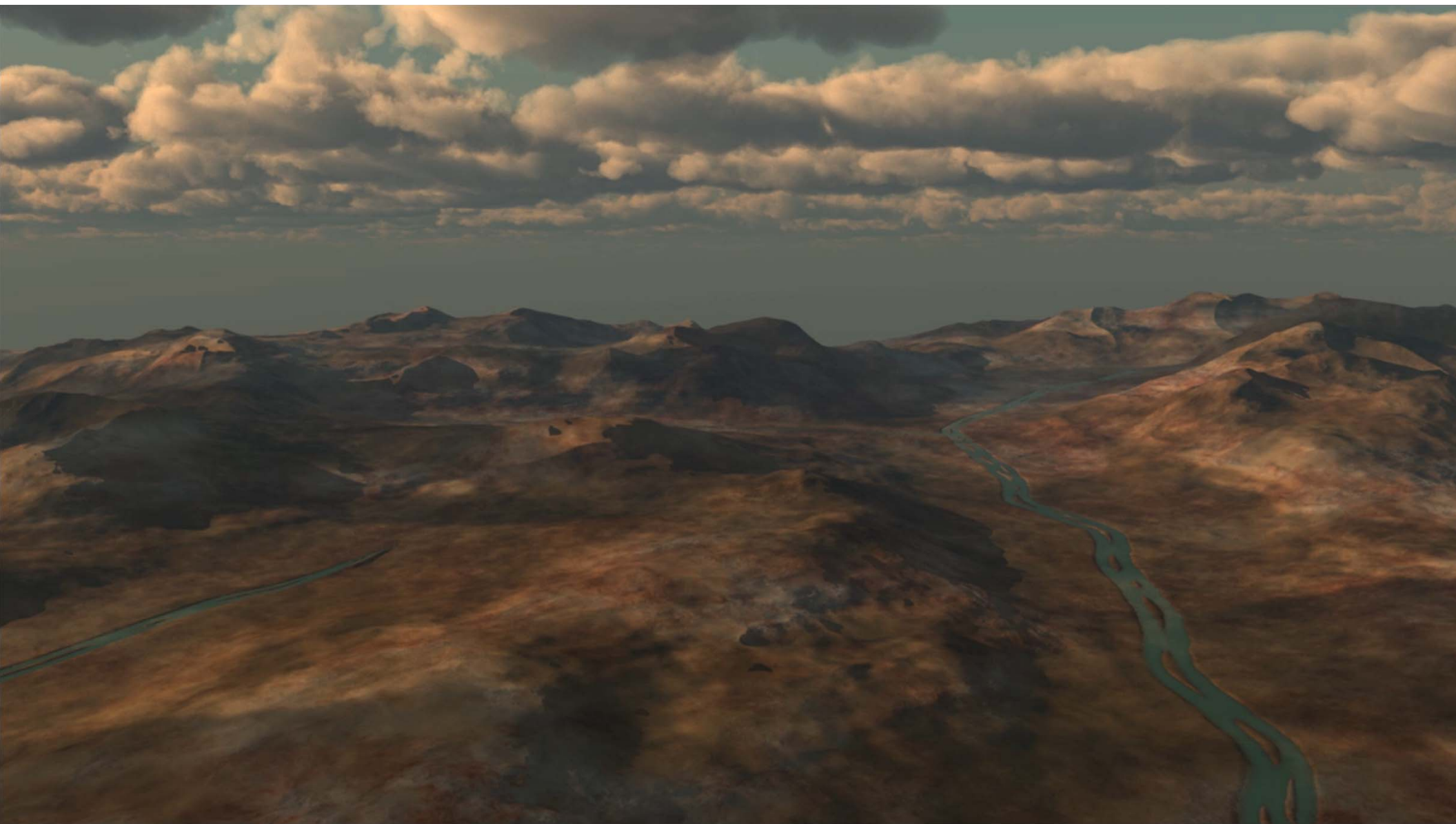
- “A framework that allows quick and intuitive modelling of terrains using concepts inspired by hydrology” [1]
- Uniqueness from the modelling of hydrology concepts
- Defined a being a procedural model

The Paper - Details

- User input
- River network creation
- River classification
- Model Generation



Graphic taken from [1]





Pros & Cons

- Highly efficient both in storage and computation
- Easy for the user to create the required input
- Geologically consistent
- Issues can arise with large mountains
- Rivers can only split going upstream



Further Refinement

- Urban environments
- Generate flora in the terrain generation process
- User control balance



Related Works

- “Synthetic Modeling Method for Large Scale Terrain Based on Hydrology” Zhang *et al.* [2]
- [2] incorporates more hydrology concepts
- “Procedural Riverscapes” Peytavie *et al.* [3]
- [3] uses a similar storage method to [1]
- The main improvement made by [3] is adding animated river surfaces



Summary

- Efficient and geologically consistent terrain generation is possible
- Taking concepts from hydrology in order to avoid simulation is key to this methods success
- Refinements are needed and work has been done since



References

- H. Zhang, D. Qu, Y. Hou, F. Gao, and F. Huang, “Synthetic Modeling Method for Large Scale Terrain Based on Hydrology,” *IEEE Access*, vol. 4, pp. 6238–6249, 2016, doi: 10.1109/ACCESS.2016.2612700.
- J.-D. Génevaux, É. Galin, E. Guérin, A. Peytavie, and B. Beneš, “Terrain generation using procedural models based on hydrology,” *ACM Transactions on Graphics*, vol. 32, no. 4, pp. 1-13, 2013, doi: 10.1145/2461912.2461996.
- A. Peytavie, T. Dupont, E. Guérin, B. Beneš, and É. Galin, “Procedural Riverscapes,” *Computer Graphics Forum*, vol. 38, no. 7, pp. 35-46, 2019, doi:10.1111/cgf.13814.