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Interactive Procedural Modeling of Pebble Mosaics

Naoki Kita

School of Knowledge Science,
Japan Advanced Institute of Science and Technology
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In computer graphics, the more hardware performance improves, the more detail is needed in the production of 3D models. However, the modeling process becomes tedious if it is done manually, especially for natural objects because of their complexities. It is therefore important to generate contents procedurally or automatically, so as to produce such models efficiently. Meanwhile, a purely procedural approach lacks extensive user-control of the outcome. Our solution is to combine the power of procedural modeling with the flexibility of manual editing. Large-scale natural object distribution, such as for rocks, is a time consuming task, if the user wants to express a specified design, such as a mosaic, by using such object arrangement. However, previous research about rock modeling and digital mosaics has not focused focuses on user-specified arrangements.

In this paper, we present an interactive method for generating pebble mosaics. This is achieved through designing an underlying tensor field which specifies the flow of pebble arrangement. Our system generates an initial flow field based on reference image gradient. Then, a user can edit the flow field via stroke interface. Considering tensor values of the flow field, the site distribution is generated by Poisson-Disk distribution with ellipsoidal disk. Rock volumes are generated on each disk region. Consequently, our system generates 3D pebble mosaics with user-specified arrangements. Our method can also generate rocks by generating Voronoi-cells from site distribution as well. Moreover, mask image as an additional input allows a user to classify two kinds of stone types. Our results show realistic visual quality.