

Support Parameterized Implicit Geometries

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Acknowledgement

I thank Martin van Wyss and William McIntosh of the City of Greater Geelong, Australia for their time and patience in helping me understand their advanced implementation of parameterized instances and letting me use it as an example of a successful integration of independently managed city infrastructure. They also kindly provided the demonstration video in this presentation.

My description of the parameterization scheme uses part of the Geelong model as an example but is not a precise description of how their model works - it's simplified and has a particular emphasis to illustrate how we could support this kind of infrastructure integration in version 3.0. Any errors are my fault.

The Proposal

Implicit Geometries allow re-use of geometry by instances transformed by a 4 x 4 transformation matrix. Addition of a set of key-value pairs to define parameters to further customize individual instances would enable database-driven “inventory” applications such as site and city infrastructure management.

This can be implemented via a simple ADE but the concept is both general and useful as demonstrated by a 3D building, vegetation, and sign management application that ties together planning, cadaster, urban horticulture, and road sign maintenance for the City of Greater Geelong, Australia.

Parameterized Instances

- The core idea is the use of parameterized representations of classes of objects appearing in a site or city model. The parameters capture the important aspects of variation between individuals of each class. Using parameterized instances can be very efficient in the storage, rendering, and analysis of complex 3D models. It also facilitates integration of asset data captured and maintained by different groups.
- The main design work is determining the parameterization scheme.
- The parameterization of trees by the City of Greater Geelong is a good example.

Parameterized Trees

Pick a small number of parameters that control the geometry and appearance of trees. Different parameters may be appropriate for different environments.

The City of Greater Geelong chose species, diameter at breast height, height, and condition.

Species



Diameter at Breast Height



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Height



Condition

Healthy



Stressed



Unhealthy



Dead



Signs - Same Approach but More Complex



Conclusion

- Supporting parameterized instances of objects administered by a city government enables a simple and direct connection between asset databases from different departments in a single 3D database that preserves all geometric relationships.
- Separate departments can maintain their work processes and have a new ability to see and analyze everything in context.
- The resulting integrated database can be used with no further development effort for cadastral, horticultural, road maintenance, disaster planning, design, and permitting and review of new building proposals.