Validation of the City Metaphor in Software Visualization

Gergő Balogh

The rapid evolution of computers made it possible to handle a large amount of information. New algorithms were invented to process data and new ways emerged to store their results.

However, the final recipients of these are still the users themselves, so we have to present the information in such a way that the human brain could understand it. One of the many possibilities is to convert the data into a graphical representation. This conversion is called visualization. Various kinds of method exist, beginning with simple charts through compound curves and splines to complex three-dimensional scene rendering. However, there is one point in common; all of these methods use some underlying model, a sort of language to express its content.

The increased performance of graphical units and processors made it possible and the data-processing technologies made it necessary to renew and to reinvent these visualization methods. In this research, we focus on the so called city-metaphor which displays information as buildings, districts, and streets.

Our main goal is to find a way to map the data to the entities in the fictional city. To allow the users to navigate freely in the artificial environment and to perceive the meaning of the objects, we have to find the difference between a realistic and an unrealistic city. To do this, we have to measure how much it is truth to reality or the city-likeness of our virtual creations. In this paper, we present four computable metrics which express various features of a city. These are compactness for measuring space consumption, eccentricity for describing the shape of the city, connectivity for showing the low level coherence between the buildings, and homogeneity for expressing the smoothness of the landscape. These metrics will be defined in a formal and an informal way, illustrated with examples. The connection among the high level city-likeness and these low level metrics will be analysed. Our preliminary assumptions about these metrics will be compared to the intuitions of users collected by an online survey. Finally, we will summarise our results and propose a way to compute the city-likeness metric.

References

[1] Wettel, Richard and Lanza, Michele. CodeCity: 3D visualization of large-scale software, *Companion of the 30th international conference on Software engineering*, 2008

[2] Balogh, Gergő and Beszedes, Arpad. CodeMetropolis-code visualisation in MineCraft, *Source Code Analysis and Manipulation (SCAM), 2013 IEEE 13th ICSM*, 2013