References

[1] Carole, B., Vincent, C., Vincent, H., and Paul, M. (2006), *Applications of Self-Organizing Multi-Agent Systems: An Initial Framework for Comparison*, Informatica, Vol 30, No. 1, pp. 73-82

[2] CIRAD (2007), *AMAP - botAnique et bioInforMatique de l'Architecture des Plantes (Botany and computational plant architecture)* [Online], Available: http://amap.cirad .fr/en/index .php

[3] DFC Intelligence (2010), *Worldwide Market Forecasts for the Video Game and Interactive Entertainment Industry* [Online], Available: http://www.dfcint. com/wp/?p= 277

[4] Erick, B. P., and Esteban, W. G. C. (2007), *Multi Agent System for Intelligent Game Cinematography*, SB Games 2007 – VI Brazilian Symposium on Computer Games and Digital Entertainment, São Leopoldo, Brazil

[5] Greuter, S., Parker, J., Stewart, N., and Leach, G. (2003), *Real-time procedural generation of `pseudo infinite' cities*, In Proceedings of GRAPHITE 2003, ACM Press, pp. 87-95, Melbourne, Australia

[6] Greuter, S., Stewart, N., Parker, J., and Leach, G. (2003), *Undiscovered Worlds – Towards a Framework for Real-Time Procedural World Generation*, In MelbourneDAC 2003 Proceedings, Melbourne, Australia

[7] Haddadi, R., and Jönsson, A. (2009), *Simulation-Based Generation of 3D Urban Environments using a Multi Agent System* [Online], Available: http://www.cs.lth.se/EDA920/ 2009/2009-16_Rapport.pdf

[8] Honjo, T., and Lim, En-Mi (2002), *Visualization of Forest Landscapes by VRML*, AFITA 2002: Asian agricultural information technology & management. Proceedings of the Third Asian Conference for Information Technology in Agriculture, pp. 26-28, Beijing, China

[9] Kelly, G., and McCabe, H. (2007), *Citygen: An Interactive System for Procedural City Generation*, In Proceedings of GDTW 2007: The Fifth Annual International Conference in Computer Game Design and Technology, pp. 8-16, Liverpool, UK

[10] Kelly, G., and Mccabe, H. (2006), *A survey of procedural techniques for city generation*, ITB Journal, Issue 14

[11] Kluegl, F., Oechslein, C., Puppe, F., and Dornhaus, A. (2002), *Multi-agent modelling in comparison to standard modelling*, In Proceedings of the AIS2002 (AI, Simulation and Planning in High Autonomy Systems), Lisbon, Portugal, SCS Publishing, pp. 105-110, San Diego, USA

[12] Lechner, T., Watson, B.A., Wilensky, U., and Felsen, M. (2003), *Procedural City Modeling*, 1st Midwestern Graphics Conference, St. Louis, MO

[13] Luke, S., Cioffi-Revilla, C., Panait, L., and Sullivan, K. (2004), *MASON: A* New Multi-Agent Simulation Toolkit, 2004 SwarmFest Workshop, Michigan, USA

[14] Müller, P., Wonka, P., Haegler, S., Ulmer, A., and Gool, L. V. (2006), *Procedural modeling of buildings*, In SIGGRAPH '06: ACM SIGGRAPH 2006 Papers, ACM, pp. 614–623, New York, USA

[15] Parish, Y. I. H., and Mueller, P. (2001), *Procedural modeling of cities*, In Proceedings of ACM SIGGRAPH 2001, ACM Press/ ACM SIGGRAPH, pp. 301–308, New York, USA

[16] Parunak, H. V. D. (1997), *Go to the ant: Engineering principles from natural multi-agent systems*, Annals of Operations Research, pp. 75, 69–101

[17] Ruben, M., Smelik, R. M., de Kraker, K. J., Groenewegen, S. A., Tutenel, T., and Bidarra, R. (2009), *A Survey of Procedural Methods for Terrain Modelling*, CASA Workshop on 3D Advanced Media In Gaming And Simulation (3AMIGAS), Amsterdam, Netherlands

[18] Smelik, R.M., Tutenel, T., de Kraker, K.J., and Bidarra, R. (2008), *A Proposal for a Procedural Terrain Modelling Framework*, EGVE Symposium, Eindhoven, Netherlands

[19] Wikia Gaming - Video Game Sales Wiki (2009), *Most Expensive Video Games* [Online], Available: http://vgsales.wikia.com/wiki/Most_expensive_games

[20] Wikia Gaming - Video Game Sales Wiki (2009), *Video Game Costs* [Online], Available: http://vgsales.wikia.com/wiki/Video _game_costs

[21] Wonka, P., Wimmer, M., Sillion, F., and Ribarsky, W. (2003), *Instant Architecture*, SIGGRAPH, San Diego, USA

Appendix A

Approach in Practice

This appendix explains the approach in practice by going through a sample scenario to generate a simple 3D game environment. The procedure to generate 3D game environment is explained step by step with screenshots.

Step 1: User defines the terrain of the3D environment by providing a greyscale height map. Figure A.1 shows a sample height map provided by user by selecting the image file using a file browser. Also provide the number of city areas required as an input in the initial graphical user interface.

Figure A.1 : User Provided Height Map

Step 2: User selects the number of different 3D models required using the graphical user interface of *3D Environment Definition Agent* as shown in Figure A.2.

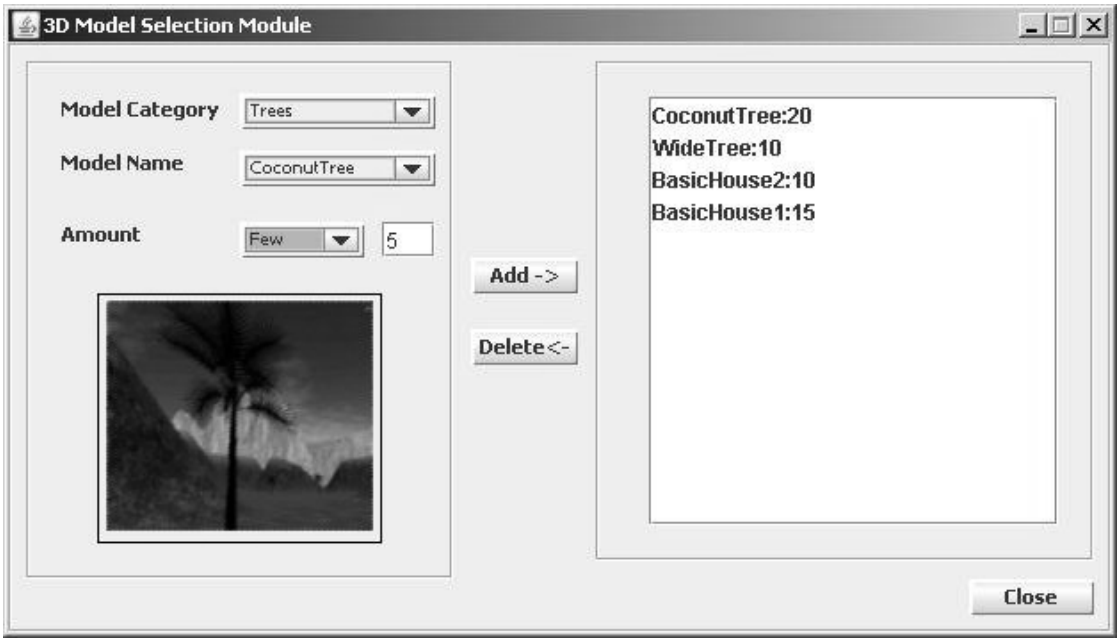

Figure A.2 : Graphical User Interface of 3D Environment Definition Agent interface of 3D Environment Definition Agent

Step 3: If the required 3D models are not already available it is possible to introduce new 3D models using the graphical user interface of *3D Model Definition Agent* as shown in Figure A.3.

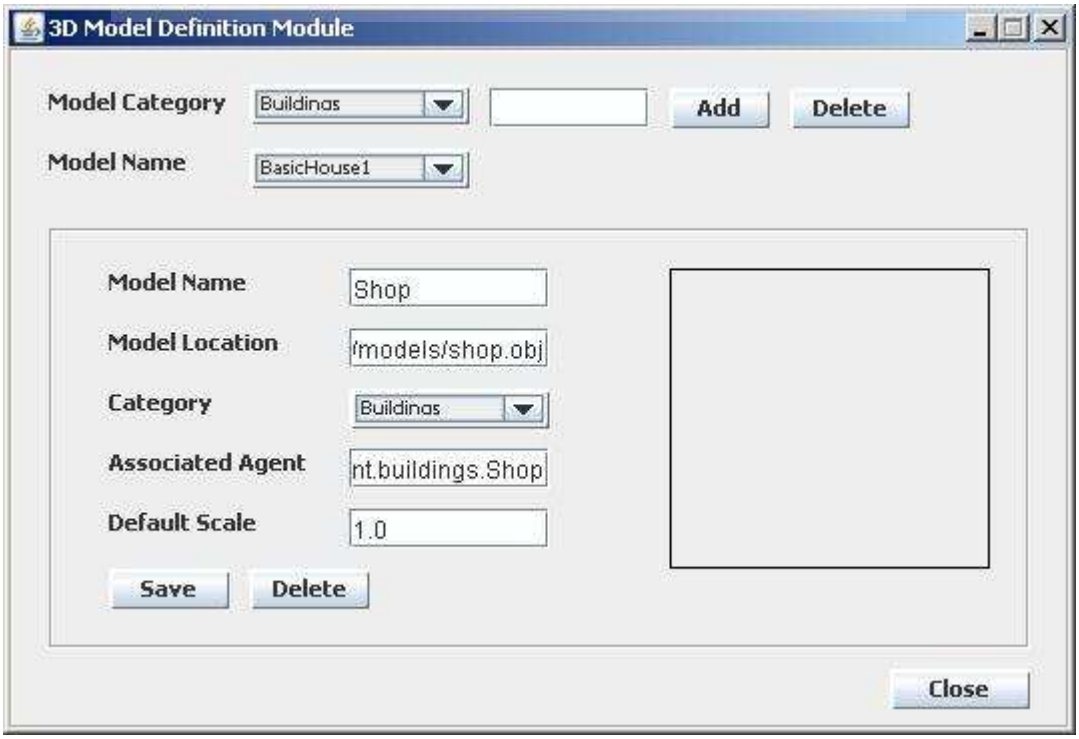

Figure A.3 : Introducing New a 3D Model

Step 4: Figure A.4 shows the 2D view of the system with a simple road network, buildings and trees generated. This view helps to get an overview of the game environment. User can modify the environment in this view if required.

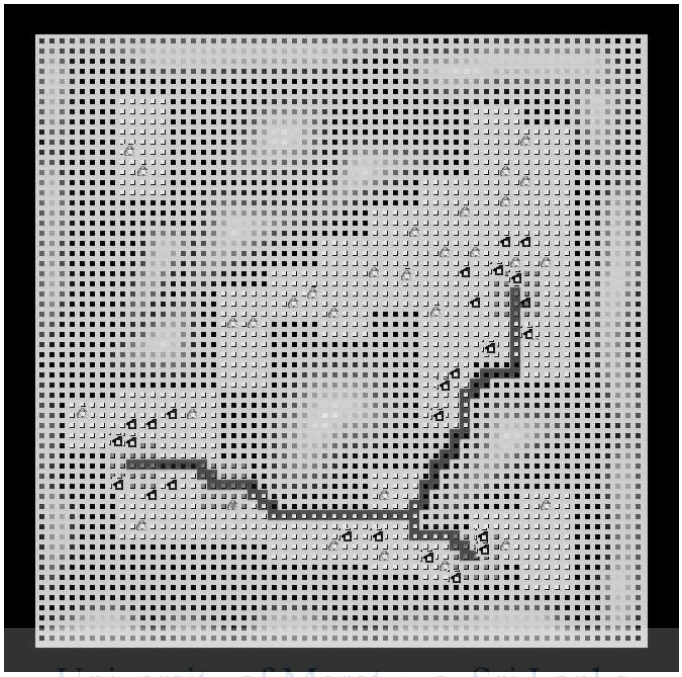

Figure A.4 : 2D View

Step 5: User can view and flythrough the 3D environment, by opening 3D view as shown in Figure A.5 and Figure A.6.

Figure A.5 : 3D View 1

Figure A.6 : 3D View 2

Above steps described a very basic scenario of the system. In addition, it is possible to store the generated 3D environment and extend the behaviours of 3D models.