Multi Agent based Approach to Design of 3D Game Environments

4.1 Introduction

Previous chapter discussed about the applicability of multi agent technology to solve the major issues identified. This chapter discusses the approach to solve the identified issues with multi agent systems technology.

4.2 Multi Agent based Approach to Assist the Design of 3D Game Environments

To solve the main issue identified, we have proposed a solution based on the emergent behaviour of multi agent systems to assist the design 3D game environments. According to literature, in multi agent systems surprisingly complex and interesting global behaviours can arise from simple rules that are followed by number of simple agents operate in an environment. We hypothesize that this emergent behaviour of multi agent systems can be used to design 3D game environments with emergence properties that were not visible in initial constituents. This hypothesis is inspired by emergent behaviours of some natural systems arising from simple rules that are followed by individuals.

It is proposed to associate each 3D model in game world with a simple agent rule set. The agents in the multi agent system will use these simple rule sets to place 3D models in the most appropriate places in 3D environment. The proposed solution is mainly focused on solving the specific problem of automating the arrangement of already created 3D models in a game environment. However automating the creation of 3D models is considered out of the scope of this project and the proposed system will use a collection of 3D models created by human artists which are pre-stored in the system.

The proposed approach is used to develop a framework which is common to design of many types of 3D environments. This common framework will allow users to define simple rules for agents based on the type of agents. The users can introduce 3D models to the system as agents, specify parameters of agents and define the behaviours of agents. Also it is possible to define the hierarchies of agent rule sets and inherit rule sets (behaviours) of agents.

The main input of the system is a parameterized description of an imaginary 3D environment. This input includes parameters such as list of 3D models required, size of the terrain, size and number of towns/ villages/ industries, type of terrain and an height map (A height map is a greyscale raster image used to represent surface elevation data, for display in 3D computer graphics). Upon the request of desired game environment relevant agents will be created and place required 3D models on environment based on the agent rule sets associated with 3D models. With the help of these rules when placing 3D models, the agents will consider aspects such as type of the terrain which a given 3D model is located, types of neighbouring 3D model, sizes of neighbouring 3D model, locations of neighbouring 3D model, orientation of neighbouring 3D model, road network distribution and messages/ requests received from other agents. Output of the system is a 3D game environment with required 3D models located and oriented in most suitable places. The final output will be rendered on a computer screen using an open source 3D game engine.

Primary users of the system would be designers of 3D game projects. In a typical game project, designers spend a considerable amount of effort and time to create 3D game environments. The proposed system will assist them to generate 3D game environment within a short time period. Defining the agent rule sets which are associated with 3D models should be done using Java programming syntax and that activity should be conducted by users who have a basic knowledge on programming. However once users have defined the rule sets and 3D models, those 3D models can be reused in any number of 3D game environments.

The ability to define agent behaviours and agent rule sets programmatically, is provided to increase the extendibility and flexibility of the proposed system. In addition, the system provides facilities for users to manually modify the generated 3D game environment as required and flythrough the generated 3D game environment with a moving camera.

4.3 Summary

This chapter discussed the proposed approach to solve the identified issues with multi agent systems technology. The next chapter of this thesis provides a detailed description of the design of the proposed system.