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

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Declaration

I declare that this dissertation does not incorporate, without acknowledgment, any material previously submitted for a Degree or a Diploma in any University and to the best of my knowledge and belief, it does not contain any material previously published or written by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organization.

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Prof. Asoka S. Karunananda
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Date

Dedication

This Thesis is Dedicated to

My Parents,

My Wife Hasanthi and

Prof. Asoka S. Karunananda.

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Abstract

Designing complex and realistic 3D environments for modern video games is one of the time consuming challenges faced by current video game industry. Over the last 20 years many researches have been conducted to automate the 3D environment design. We have critically reviewed the major approaches used in existing techniques to automate the design of 3D environments. It was identified that current 3D environment generation techniques being specific to one type of environment and the lack of customizable frameworks which are common to many types of environments as the main issues to be addressed.

According to literature, surprisingly complex and interesting global behaviours can arise in multi agent systems as a result of 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 the emergent behaviours of natural systems arising from simple rules that are followed by individuals.

The proposed solution provides an approach to develop a framework which is common to design many types of 3D game environments. Each 3D model in a 3D game environment is associated with an agent with simple rules. Primary users of the system would be designers of 3D video game projects and this system allows users to introduce new 3D models and associate them with agent types. Based on the simple rules of agents, the system arranges 3D objects in the most appropriate places in 3D world while sensing the state of the surrounding environment. The main input for the proposed system is a parameterized description of an imaginary 3D environment. The design of the system consists of a multi agent system with specific agents named 3D environment definition agent, terrain explorer agents, 3D model placing agents and road network development agent. These agents are operating on the 3D game environment based on simple rules and come up with a surprisingly complex outcome. Output of the system is a 3D game environment with self organized 3D models located and oriented in most suitable places. The final output is rendered on a computer screen using an open source 3D game engine. The proposed approach has been evaluated by implementing a prototype and comparing the proposed approach with traditional 3D environment design approaches.

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