Developing an engaging AI for a turn-based strategy game

Master's Thesis project proposal

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Brief

Fall Damage, a video games company based in Stockholm, are developing a turn-based strategy game. The game will offer one-versus-one play between humans. Fall Damage are interested in exploring the feasibility of constructing an AI for their game which offers human players both challenge and entertainment. If successful, this may result in human-versus-computer play modes in the final product.

Background: AI research, game AI and turn-based strategy games

AI research defines itself as the study of "intelligent agents". It is today an umbrella term that spans many different subfields - vision, natural language, decision theory, genetic algorithms, robotics etc.

Game AI refers to the generation of intelligent behaviors within video games. This draws on techniques and knowledge from AI research as well as computer science in general. The exact goal of a game AI depends on the particular area within which it will be used; sometimes the primary purpose is to increase the complexity of the game experience, sometimes it is to increase the richness of the world; sometimes it is to improve the play experience without requiring more people to participate. Human players often expect the behaviour of the game AI to be perceived as not only believable, but also as fair.

Turn-based strategy games originate from games such as chess. There is a world, with a well-understood state; a set of clearly defined rules; at certain points the players are allowed to choose between a predefined set of actions and thereby affect the continued evolution of the world state; there is a well-defined winning condition. The well-defined rule set, time-discrete nature and comparably low number of turns per game makes it feasible to apply many techniques from AI research to the problem of constructing AI players with human behaviour.

Good results require careful choice both of knowledge representations as well as planning strategies.

Project proposal

Fall Damage invites a student to investigate effective methods for creating engaging AI opponents for their upcoming game. Most of the available literature analyzes well-established games such as Chess, Othello and Go. Game design differences make it non-obvious which of the existing methods still apply to this game though. The focus of the project will initially be on creating an AI player that can play the game reasonably well and then gradually shift to demonstrating human-like characteristics when playing the game.

A lot of the existing game AI research focuses on performance. There are many established concepts for simulating human behaviour as well though. Some simulate cognitive behaviour of the mind; other simulate human interaction patterns when competing against another player. Surprisingly simple methods, such as making moves which force the other player to take high-stakes decisions, have been shown to result in engaging gameplay in other titles. Are there simple - or not-so-simple - ways to construct an engaging AI for this game?

The game is still in development. It is being built inside-out, so there will at all times be a playable core of the game. The boundaries and the set of available actions will change over time. The thesis project can choose to either follow the development of the game, or to take a snapshot of the game at one point in time and develop the techniques based on what is available in that snapshot.

Aim of Master Thesis

Explore different methods for creating an AI opponent for the game. Draw on previously published results as well as literature in the field and distill a set of strategies that work for the particular turn-based scenario that the game offers. Choose a set of strategies that can be adapted as the game develops. If applicable, showcase results and stimulate further dialogue about turn-based game AI within the games community, and demonstrate the use of recent AI research advances in a game AI setting.

How to apply

Send an email to thesis@falldamagestudio.com with a CV and personal letter, and subject line "Developing an engaging AI for a turn-based strategy game". You may be asked to take part in a technical interview and/or do a practical work test.

Practical details

Fall Damage are located in Stockholm. The thesis project will be pursued remotely, with regular video conferences and short on-site visits. Depending on the university, it may be possible for two Master's students to collaborate on this thesis project.

Related publications

Introduction to Machine Learning, Third Edition, by Ethem Alpaydin, ISBN 9780262325738

Reinforcement Learning: An Introduction, By Richard S. Sutton and Andrew G. Barto, ISBN 9780262332767

Machines that Learn to Play Games, by Johannes Fürnkranz and Miroslav Kubat, 2001, ISBN 1590330218

Behaviour Oriented Design for Real-Time-Strategy Games, by Swen Gaudl, Simon Davies and Joanna J. Bryson, 2013

Adversarial Hierarchical-Task Network Planning for Complex Real-Time Games, by Santiago Ontañon and Michael Buro, IJCAI 2015