

Comp320 Literature Review

Alastair Rayner

November 6, 2017

What is the General Video Game AI (GVG-AI) Competition?

What is the General Video Game AI (GVG-AI) Competition?

- ▶ The GVG-AI is an AI competition that aims to create an AI that is able to play any game.

What is the General Video Game AI (GVG-AI) Competition?

- ▶ The GVG-AI is an AI competition that aims to create an AI that is able to play any game.
- ▶ There have been a few different AI competitions in the past.

What is the General Video Game AI (GVG-AI) Competition?

- ▶ The GVG-AI is an AI competition that aims to create an AI that is able to play any game.
- ▶ There have been a few different AI competitions in the past.
- ▶ However most of the winning AI strategies used in those games are very domain specific and it is often more about knowing the game than developing good general AI.

What is the General Video Game AI (GVG-AI) Competition?

- ▶ The GVG-AI is an AI competition that aims to create an AI that is able to play any game.
- ▶ There have been a few different AI competitions in the past.
- ▶ However most of the winning AI strategies used in those games are very domain specific and it is often more about knowing the game than developing good general AI.

Similar competitions

Similar competitions for general game intelligence

Similar competitions

Similar competitions for general game intelligence

- ▶ General Game Playing (GGP) has held competitions in AI for games since 2005.

Similar competitions for general game intelligence

- ▶ General Game Playing (GGP) has held competitions in AI for games since 2005.
 - ▶ GGP is similar to GVGAI as the competitor does not know which games their agent will be playing.

Similar competitions

Similar competitions for general game intelligence

- ▶ General Game Playing (GGP) has held competitions in AI for games since 2005.
 - ▶ GGP is similar to GVGAI as the competitor does not know which games their agent will be playing.
 - ▶ The games used in GGP are usually variants of existing board games.

Similar competitions

Similar competitions for general game intelligence

- ▶ General Game Playing (GGP) has held competitions in AI for games since 2005.
 - ▶ GGP is similar to GVGAI as the competitor does not know which games their agent will be playing.
 - ▶ The games used in GGP are usually variants of existing board games.
- ▶ Arcade Learning Environment (ALE) is based of the Atari 2600.

Similar competitions

Similar competitions for general game intelligence

- ▶ General Game Playing (GGP) has held competitions in AI for games since 2005.
 - ▶ GGP is similar to GVGAI as the competitor does not know which games their agent will be playing.
 - ▶ The games used in GGP are usually variants of existing board games.
- ▶ Arcade Learning Environment (ALE) is based of the Atari 2600.
 - ▶ In ALE the controller is presented with the raw screen capture of the game.

Similar competitions

Similar competitions for general game intelligence

- ▶ General Game Playing (GGP) has held competitions in AI for games since 2005.
 - ▶ GGP is similar to GVGAI as the competitor does not know which games their agent will be playing.
 - ▶ The games used in GGP are usually variants of existing board games.
- ▶ Arcade Learning Environment (ALE) is based of the Atari 2600.
 - ▶ In ALE the controller is presented with the raw screen capture of the game.
 - ▶ As well as a score counter.
 - ▶ ALE provides an interface for domain-independent agents to try hundreds of Atari 2600 game environments.

Similar competitions

Similar competitions for general game intelligence

- ▶ General Game Playing (GGP) has held competitions in AI for games since 2005.
 - ▶ GGP is similar to GVGAI as the competitor does not know which games their agent will be playing.
 - ▶ The games used in GGP are usually variants of existing board games.
- ▶ Arcade Learning Environment (ALE) is based of the Atari 2600.
 - ▶ In ALE the controller is presented with the raw screen capture of the game.
 - ▶ As well as a score counter.
 - ▶ ALE provides an interface for domain-independent agents to try hundreds of Atari 2600 game environments.

Challenges and goals

- ▶ The goal of GVG-AI is to create a generally intelligent agent that is able to win any game it is placed in, even when it doesn't know the game.

Challenges and goals

- ▶ The goal of GVG-AI is to create a generally intelligent agent that is able to win any game it is placed in, even when it doesn't know the game.
- ▶ During the tournament a completely new set of games are used.

Challenges and goals

- ▶ The goal of GVG-AI is to create a generally intelligent agent that is able to win any game it is placed in, even when it doesn't know the game.
- ▶ During the tournament a completely new set of games are used.
- ▶ This is done to avoid the agents becoming too domain specific.

Challenges and goals

- ▶ The goal of GVG-AI is to create a generally intelligent agent that is able to win any game it is placed in, even when it doesn't know the game.
- ▶ During the tournament a completely new set of games are used.
- ▶ This is done to avoid the agents becoming too domain specific.
- ▶ Another challenge is the time limit that an agent can choose an action

Challenges and goals

- ▶ The goal of GVG-AI is to create a generally intelligent agent that is able to win any game it is placed in, even when it doesn't know the game.
- ▶ During the tournament a completely new set of games are used.
- ▶ This is done to avoid the agents becoming too domain specific.
- ▶ Another challenge is the time limit that an agent can choose an action
- ▶ This is because one of the goals is to make a real time agent, and this makes the competition more challenging.

Challenges and goals

- ▶ The goal of GVG-AI is to create a generally intelligent agent that is able to win any game it is placed in, even when it doesn't know the game.
- ▶ During the tournament a completely new set of games are used.
- ▶ This is done to avoid the agents becoming too domain specific.
- ▶ Another challenge is the time limit that an agent can choose an action
- ▶ This is because one of the goals is to make a real time agent, and this makes the competition more challenging.

Competition & Rules

- ▶ A competition approach to this AI problem is a common way to motivate research in a certain field of AI.

Competition & Rules

- ▶ A competition approach to this AI problem is a common way to motivate research in a certain field of AI.
- ▶ The controllers are allowed up to 40ms to compute the agents action(s)

Competition & Rules

- ▶ A competition approach to this AI problem is a common way to motivate research in a certain field of AI.
- ▶ The controllers are allowed up to 40ms to compute the agents action(s)

The GVGAI Framework

- ▶ The Framework is developed in the Java Environment

The GVGAI Framework

- ▶ The Framework is developed in the Java Environment
- ▶ The framework uses a Video Game Description Language (VGDL) to describe a wide variety of video games.

The GVGAI Framework

- ▶ The Framework is developed in the Java Environment
- ▶ The framework uses a Video Game Description Language (VGDL) to describe a wide variety of video games.
- ▶ The VGDL is based on a python version developed by Schaul (2014) called PyVGDL

The GVGAI Framework

- ▶ The Framework is developed in the Java Environment
- ▶ The framework uses a Video Game Description Language (VGDL) to describe a wide variety of video games.
- ▶ The VGDL is based on a python version developed by Schaul (2014) called PyVGDL
- ▶ Furthermore in the GVG-AI Competition the AI agent does not have access to the whole games description, where as in GGP the agent was able to see the whole game description.

The GVGAI Framework

- ▶ The Framework is developed in the Java Environment
- ▶ The framework uses a Video Game Description Language (VGDL) to describe a wide variety of video games.
- ▶ The VGDL is based on a python version developed by Schaul (2014) called PyVGDL
- ▶ Furthermore in the GVG-AI Competition the AI agent does not have access to the whole games description, where as in GGP the agent was able to see the whole game description.
- ▶ This means that the agent has to analyze and simulate the game in order to figure out the rules and goal of the game.

The GVGAI Framework

- ▶ The Framework is developed in the Java Environment
- ▶ The framework uses a Video Game Description Language (VGDL) to describe a wide variety of video games.
- ▶ The VGDL is based on a python version developed by Schaul (2014) called PyVGDL
- ▶ Furthermore in the GVG-AI Competition the AI agent does not have access to the whole games description, where as in GGP the agent was able to see the whole game description.
- ▶ This means that the agent has to analyze and simulate the game in order to figure out the rules and goal of the game.

Game Search Techniques

There are a lot of game tree search techniques used in AI such as;

- ▶ Alpha beta pruning

Game Search Techniques

There are a lot of game tree search techniques used in AI such as;

- ▶ Alpha beta pruning
- ▶ Minimax

Game Search Techniques

There are a lot of game tree search techniques used in AI such as;

- ▶ Alpha beta pruning
- ▶ Minimax
- ▶ Breath First Search

Game Search Techniques

There are a lot of game tree search techniques used in AI such as;

- ▶ Alpha beta pruning
- ▶ Minimax
- ▶ Breath First Search
- ▶ Depth First Search

Game Search Techniques

There are a lot of game tree search techniques used in AI such as;

- ▶ Alpha beta pruning
- ▶ Minimax
- ▶ Breath First Search
- ▶ Depth First Search
- ▶ MCTS

Game Search Techniques

There are a lot of game tree search techniques used in AI such as;

- ▶ Alpha beta pruning
- ▶ Minimax
- ▶ Breath First Search
- ▶ Depth First Search
- ▶ MCTS
- ▶ Evolutionary Algorithms

Game Search Techniques

There are a lot of game tree search techniques used in AI such as;

- ▶ Alpha beta pruning
- ▶ Minimax
- ▶ Breath First Search
- ▶ Depth First Search
- ▶ MCTS
- ▶ Evolutionary Algorithms

Most of these techniques are provided in the GVG-AI framework as sample agents. Some of them actually did quite well in the competition.

Game Search Techniques

There are a lot of game tree search techniques used in AI such as;

- ▶ Alpha beta pruning
- ▶ Minimax
- ▶ Breath First Search
- ▶ Depth First Search
- ▶ MCTS
- ▶ Evolutionary Algorithms

Most of these techniques are provided in the GVG-AI framework as sample agents. Some of them actually did quite well in the competition. For example the sample MCTS agent came 3rd in one of the competitions.

What research will my project will be built upon?

- ▶ The 2014 General Video Game Playing Competition paper by Diego Perez et. al. covers how each different agent in the submission compares them by victories and points.

What research will my project will be built upon?

- ▶ The 2014 General Video Game Playing Competition paper by Diego Perez et. al. covers how each different agent in the submission compares them by victories and points.
- ▶ The potential of finding out where each AI algorithm succeeds best in what situation, could lead to the development of a hyper/meta heuristic that is able to select what algorithm to use when it gets into a certain situation.

Research Questions

My Research questions I aim to answer

- ▶ How does game tree search techniques compare for GVGA?

Research Questions

My Research questions I aim to answer

- ▶ How does game tree search techniques compare for GVGAI?
- ▶ Where does each tree search technique do well in each game?

Research Questions

My Research questions I aim to answer

- ▶ How does game tree search techniques compare for GVGAI?
- ▶ Where does each tree search technique do well in each game?
- ▶ What are the strengths and weaknesses of different search techniques and how can they be improved?

Research Questions

My Research questions I aim to answer

- ▶ How does game tree search techniques compare for GVGAI?
- ▶ Where does each tree search technique do well in each game?
- ▶ What are the strengths and weaknesses of different search techniques and how can they be improved?