

BSc in Artificial Intelligence and Computer Science

Artificial Intelligence In Racing Games



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BSc in Artificial Intelligence and Computer Science

Sections

1. History of AI in Racing Games

2. Neural Networks in Games



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History of AI in Games (Racing)



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History



Gran Trak 10

Single-player racing arcade game released by Atari in 1974

Did not have any AI

Pole Position

Single- player racing game released by Namco in 1982

Considered first racing game with AI



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History



Super Mario Kart
Addition of Power Ups
Released in 1992 for the *Super Nintendo Entertainment System*.

Driver

Free- form World

1998 video game developed by
Reflections Interactive



Vehicular Combat: Power Ups + Free Form World



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Simple Areas of AI in Racing Games

1. Steering

Sort of Basic

Used in Formula One-Built to win, GTA3
2001

for background animation purpose.



2. Pathfinding

Becomes more free-form world

Would need to make decision on where
to go.

Need to find the best path between two
points, avoiding any obstacles.



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Steering + Racing Lines

Racing Lines methods was used extensively until there was CPU power to do something else.

It is just a drawn line in which the cars follow that line or stuck to that line.

It uses Spline, where addition information such as velocity is included.

Advantage

It is very easy to create cheap spine creation tool

Disadvantage

Very limited- and gets very difficult

Not very realistic- as car follows line, no response to deflection



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Pathfinding + Tactical AI

Racing line does not really work with free-form world so one of the solutions is having set path to where the car/character is fleeing.

Many different types of pathfinding problem exist. Unfortunately, no one solution is appropriate to every type of pathfinding problem. The solution depends on the specifics of the pathfinding requirements for any given game. For example, is the destination moving or stationary?

Pathfinding are becoming the main and popular issue in gaming

industries



Tactical AI involves decision making . For example, police cars trying to create road blocks, where the path would go, in ways the character did not see it coming.

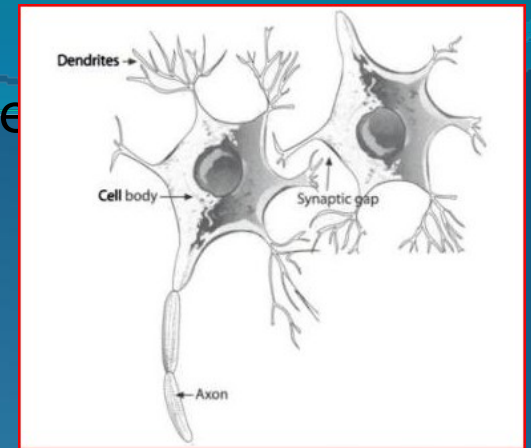
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Neural Networks in Games (Racing)



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Neural Networks



Neural Networks are capable of learning and improving their performance with their previous experience.

Artificial networks used in games are quite simple in comparison to the human brain. For many applications, artificial neural networks are composed of only a handful, a dozen or so, neurons.

This is far simpler than our brain. Some specific applications use networks composed of perhaps thousands of neurons, yet even these are simple in comparison to our brain as they contain about 10^{11} neurons.

The network itself is a function giving a unique set of output for the given input.



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Uses of Neural Networks in Games

For game, neural networks offer some key advantages over more traditional AI techniques.

First, using a neural networks enables game developers to simplify coding of complex state machines or rule-based systems by relegating key decision making processes to one or more trained neural networks.

Second, neural networks offer the potential for the game's AI to adapt as the game is played. This is rather compelling possibility and is a very popular subject in the game AI community.

In spite of these advantages, neural networks have not gained widespread use in video games. Game developers have used neural networks in some popular games; but by and large, their use in games is limited. This probably is due to several factors, of which is described

next.



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Limitation of Neural Networks

First, neural networks are great at handling highly nonlinear problems; once you cannot tackle easily using traditional methods. This something makes understanding exactly what the networks is doing and how it is arriving at its result difficult to follow.

Second, it's difficult at times to predict what a neural network will generate as output, especially if the network is programmed to learn or adapt within a game.

These two factors make testing and debugging a neural network relatively difficult compared to testing and debugging a finite state machine, for example.



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Artificial Neural Networks in racing car game Video

http://www.youtube.com/watch?v=QSP36H8_AbU

<http://www.youtube.com/watch?v=FKAULFV8tXw>



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The End



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