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1 Abstract

With the development of Artificial Intelligence, various of video games also attract a lot of people. This article introduces the application of Artificial Intelligence technology in defferent aspects of video games like intelligent virtual game roles and the development and promotion of games. And finally discuss the future of the application of AI on video games, put forward some direction of the development.

2 Introduction

Aritificial Intelligence is a kind of technology that can help machine to think or act like human. It tells machines how to analyze situations and make corresponding actions. In the past, it learn models from developers' codes, what model people write down is the behavior it will take. But nowadays, with the appearence of Data Science, it start learn models and experience from data. People don't need to enter fixed behavior pattern anymore, which make machines more human and rational.

Video games, a kind of game that has attracted countless people since its birth. It depends on digital technology and equipments, so AI has a very close relationship with it. From its development method, game construction to planning and promotion, also includes the basic technology like Virtual Reality, all of these fields are using Artificial Intelligence technology and Data Science.

3 Development Progress

3.1 What it used to be

In the 1980s, the appearence of "Pac-Man" and "Half-Life" set off a frenzy among players. But at that time, Artificial Intelligence was not strong enough, so what the game roles in "Half-Life" are really simple. It like a single relfection machine that when facing with a situation, it will check the if-then rules writen by developers an do the reaction according to the if-then rules. So, it looks like a gear, if we don't touch or move it, it will not act. These game roles do not have any complex action and only have really easy

mode of action, it will let players feel so boring. Since when people keep playing they will find the game stay the same as before. It also bother the game developers, because if they want to let the game to be diversification, they need spend a lot of time to enter the reaction rules for the game roles, but it just slows down the players' boredom, it does not solve the problem.

3.2 The main application nowadays

However, the AI technology in video games has become quite developed and has been used to a lot of different fields. The most significant difference from the past is that the sometimes the virtual game roles are more powerful than humans.

Another application is on the development of the cheating detection mechanism. Cheating is really an abomination that most of the players hate these cheating man. If all of the cheating in video games can be identified, most of the FPS games will save many disappointed players. This is reflected in many of my friends. I used to paly PUBG, a famous video game, but there are too many cheaters in this game. With the accumulation of disappointment, my friends and I eventually abandoned this game, although it is really interesting.

The third application is in game design and operation. There are so many games nowadays and how to make their comanies' games stand out become a severe problem to the game developers and operators. The appearence of Data Science has been a big boost. They used to use traditional business analysis before, but sometimes it's hard to know what can really decide the sales. But Data Science make it be possible for these companies. The model from the data can help companies know how to design games that can make players keep interested and participating in the games. Also, Artificial Intelligence can help game companies know how to design the advertisement and put in them.[1]

3.3 Why would have such improvement

What let human can build such powerful robot now? The development of devices is one of the most important reason, because now we have larger memory and faster operators, which help our robots can do more things

than before. However, another one reason is that now we have Data Science, with Data Science, we have ability to analyze the large scale data, which contains a lot of information we cannot use before. Also, we can get some new models by algorithms.

4 In Adversarial Game

4.1 Act as a real human

If the game roles looks like a real human, or it can chat with you activly and shows its happiness, sadness or angry, will people wrongly assume they are real human? Although it sounds ridiculous, but it has truly happened. Robots are able to analyze people's emotion from their sentences, they can know whether you are happy or not, whether you are sad or not, which can really help robots to build emotion and have compassion and empathy. With compassion and empathy, these game roles can easily build a close relationship with gamers and let gamers love the game and feel it like in a real world. Also, sometimes the machine is even better than human, because they will always care about users' emotion, they are really selfless and would not blame players. With such empathy, players will feel the game roles are really nice and friendly. Whatever they believe this is just robot or not, they will try to express themselves and soon build a good relationship atmosphere in the game.

Also, act as a real human means these robots can help you in the game like a player. Sometimes, people are busy with their own jobs and will let someone play the game lonely. But there are some games that really need players' teamwork, like "League of legends". At that time, robots can replace players to play with those lonely players. It is really a good development of the application of AI on video games.

4.2 Analysis what is the goal of players

When the game developers design the games, one of the most important questions is that what makes people love this game? What can make different people all feel interested? It is really a hard question, because nowadays we have seven billion people, and all people are unique individuals with dif-

ferent preferences, different backgrounds and different purposes when playing the game. The Data Science help people to be a fantastic game designers now. With study on the data from game players, researchers find that there are four main types of players: superachievers, mastery-only, performance-only, and non-achievers. Also, gender and gaming frequency are significantly related to gamaing achievement goals. There exists a motivation called "mastery goals", which will let people strive to be better in the game. Another motivation called "performance goals", which will let people try to do better than others, but it may have back action. The reward system orachievement system in the game let people with these two motivation can play really happy, because they can get honor, get points, get rewards, get the feeling of leader, get the feeling of needed.

People with "performance goals" like to fight with other people, they like the feeling of better than other people, they like to show their ability and really confident. To attract these people, the game designers will provide some battleground for players to play against each other, or set some unique goals or pets that only one or small quantity of players can achieve these goals or catch these pets. With more comparison scenarios, people with "performance goals" will be really excited and will fight for the higher goals. Sometimes we call such way "PVP", if players need to battle with each other and like a game game.

People with "mastery goals" like to learn from the failure, they are interested in developing their competence instead of fight against other people. So they always ignore the part that should battle with real human, they like to collect more things, make themselvers better and pass through one and another one difficult levels. Also, some of these players like to have a team work, because people can do more things when they are in a team. Mutual benefit is what they like most, instead of zero-sum game. Sometimes we call these people "PVE players". [3]

4.3 Defeat the top game player

There is a virtual palyer built by deep learning, called "AlphaStar", it has defeated some of the top players in a human way.[2] It is a new robot build by machine learning like "AlphoGo", but it do not know how to play Go, it can play "StarCraft II", a really complex real-time strategy adversarial game.

Which is not possible with the single if-then reflection rules before, because this game has too many status that even more than Go game. The state space of Go is about 10^{170} and the state space of "StarCraft II" may have 10^{1685}. It is far more beyond what human can totally think about. Also, it is an incomplete information game, what we should consider is almost all of these state every second. But now we can done this. With the help of Data Science, we can analyze what these top players always do in such situation or in such time, and then let computer understand these model that come from data. Soon, the game robots will know what should they do now. Also, since computers and algorithms are absolutely rational, these robots can handle the game better than people, they seldom make mistakes. But they are still have defect that they are always try to do things with the best way and get the best reward, sometimes it can be predict by human and they are unfamiliar with deception. If players know it is just a robot and try to make some illusions, this robot will no longer control the game.

5 In Checking Cheaters

5.1 Really a struggle

Although cheating is really hateful, but those game developers still don't have effective ways to check and ban cheaters.

5.2 What can be done is not possible before

6 In Game operation and Promotion

6.1 What makes people want to play a game

[3]

9 Reference