INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN 2278 – 0211 (Online)

Adapting Latest Video Compression Technology in Cloud Gaming

Arjun Gullbadhar
Student, Chandigarh University, Ghrauan, Punjab, India
Lovepreet Singh
Student, Chandigarh University, Ghrauan, Punjab, India
Deepanshu Garg
Assistant Professor, Chandigarh University, Ghrauan, Punjab, India

Abstract:
Cloud gaming is becoming more and more popular day by day in the industry as given by the number of startup companies and research papers related to cloud gaming. The idea of scalability and gaming on the go is really impressive. A cloud server executes a game and sends it in form of a video to the user over the internet. In this paper, we discuss the current cloud gaming model and propose a modification in the video codec and the advertisement model for cloud gaming.

Keywords: *cloud gaming, video codec, streaming, macro blocking*

1. Introduction

Cloud gaming or on-demand gaming provides the user the ability to directly play games across various platforms and devices via internet. The idea is to just stream the game in form of a video to the device while simultaneously taking input from the device. While all the heavy lifting is being done on the cloud and your device is just receiving the video. This gives an advantage to devices with less-powerful hardware and provides cross-platform compatibility. This also provides us the feature to play any game on any device instantly without downloading any file.

Even your Smartphone can run a 1080p video and can connect to the internet. You can even play games on your T.V. using devices like Google Chrome cast to send input and receive the video. No longer is overheating of GPU [graphic processing unit] an issue. You could run the same game on Android, IOS, Windows, Linux, Mac and gaming consoles thus bringing together the gaming community at one single place. Hardware and compatibility problems can be easily ignored. Your games will be updated automatically. Piracy of games will be eliminated as the user will only receive the video not the files of the game. This makes online gaming more productive. You will not have to upgrade your hardware on buy a new gaming console just to play the latest games. Games cannot be hacked or modified by the user thus prevent cheating in online gaming. Now gamers of all the platforms can come together and play online thus removing the barrier between the platforms.

Gaming on cloud will affect the creation of games in a huge way. The games will only be created for one platform. The developers of the game know exactly what kind of hardware they are interacting without even a slight bit of modification.

The protocol used for cloud gaming is [Real time streaming protocol] RTSP and UDP [user datagram protocol] since the latency has to be minimum which cannot be achieved by the usage of other protocols.

However, cloud gaming remains in its early stage and there remain significant theoretical and practical challenges towards its widespread deployment.

In this article, we propose modification in the video codec streaming, the change in the use of streaming protocols, the model of an integrated cloud based model, allocation of resources based on the game being played, the generation of game audio on the device itself rather that streaming it from the cloud and provide an advertisement model for an effective business model.

2. Cloud Methodology

2.1. Current Scenario

The current scenario of the cloud gaming industry is that it is still in its initial phase. Games are still being developed for different platforms rather than developing them for one cloud platform.

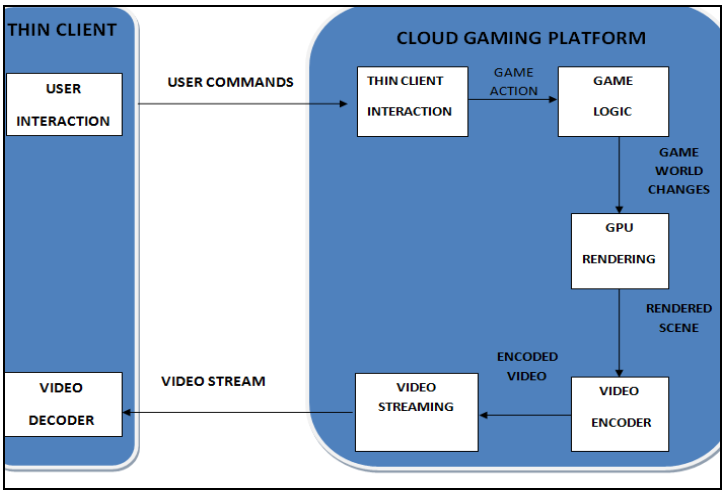

Figure 1

Figure 1 explains the current working model for the cloud gaming environment which involves the usage of thin client to receive the video and send game instructions given by the user.

2.2. Proposed Scenario

In the current cloud gaming models the audio of the game is generated on the cloud and then encoded, sent to the client via internet and then decoded and then it is played. It uses a lot of bandwidth and processing power. Instead of that our method stores the audio on the client device and plays it automatically when it is executed.

For cloud business to be an effective business model we can add advertisements while the game is being loaded.

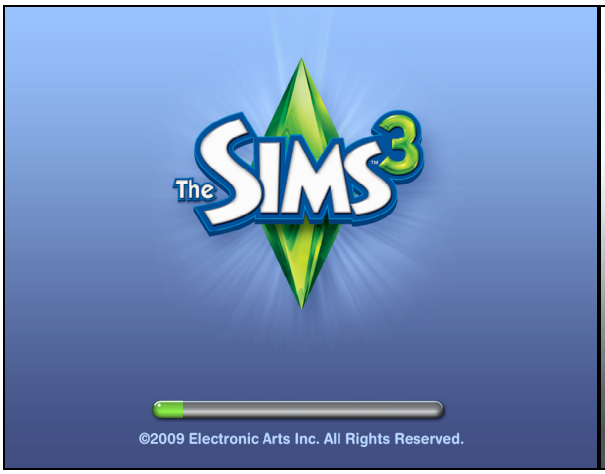

Figure 2

Figure 3

Figure 2 and 3 demonstrate the use of advertisement while a game is being loaded to increase the business revenue model of cloud gaming.

3. Modification In Different Streaming Methods

3.1. Adaptive Rendering of Frames for Better Speed

- The video streaming configuration we propose uses macro blocks (blocks of pixels) of different sizes based on with H.264/AVC/MPEG-4 Part 10. By using H.264 codec the video frames can be categorized into differ types of frames.
  The video is mainly divided into three types of frames, an I-frame, P-frame and B-frame.
- I-frame [1], or intra frame, is a frame that is separately decoded without any reference to other images. The initial image in a video is an I-frame. I-frames are the starting points of the video.
- A B-frame [2], or bi-predictive inter frame, is a frame that makes references to an earlier reference
  Frame and as well as a future frame.
- A P-frame [3] or predictive inter frame, makes references to parts of earlier I and/or P
  Frame to code the frame.

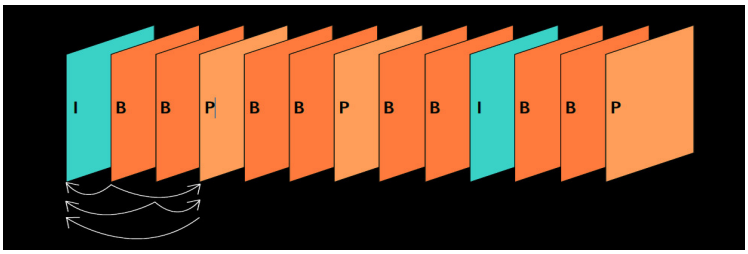

Figure 4: A typical sequence with I-, B- and P-frames. A P-frame may only reference preceding I- or P-frames, while a B-frame may reference both preceding and succeeding I- or P-frames

While encoding the frame is compared to the earlier frame and only those pixels are changed which are different from the previous frame.
When encoding a frame with respect to the previous frame only those parts of the image are changed that are moving.

3.2. Block Based Motion Compensation
While rendering a frame most of the graphics can be found in the reference frame, so can be copied from the reference frame[4] and adjust their position from the initial position to the required position.

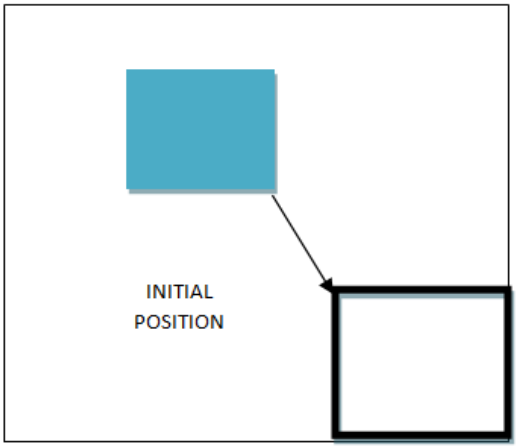

Figure 5

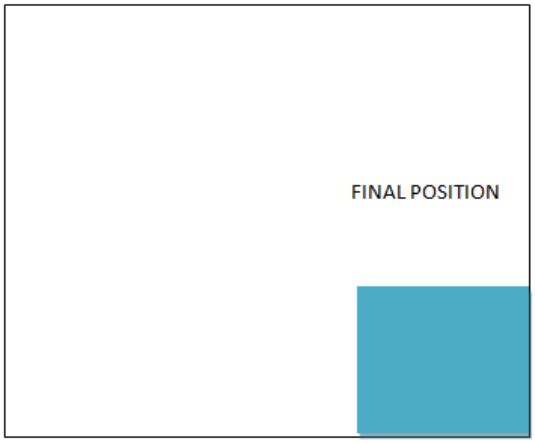

Figure 6

3.3. Data Reduction using Reference Frame
While using motion images only those parts of the image can be Rendered that are in motion and are different from the previous Frame [5].

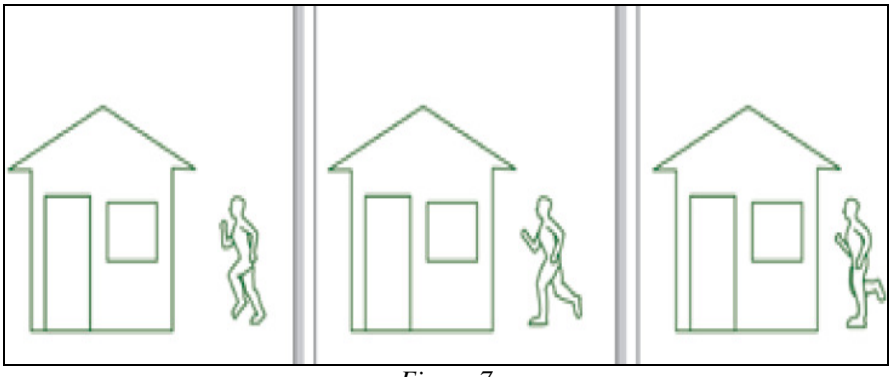

Figure 7

Figure 7 demonstrates data reduction using macro blocks,

In the above image, only by rendering person who is running while keeping the house stationary. This will reduce date usage as the frame, will not be fully rendered but will be partially rendered.

4. References

i. Prabhat K. Andleigh and Kiran Thakrar, ― Multimedia System Design ‖2011.
ii. Rafael C. Gonzalez and Richard E. Woods, ―Digital Image Processing‖3rd ed.
iii. T. Wiegand, G. J. Sullivan, G. Bjontegaard, and A. Luthra, ―Overview of the H.264/AVC video coding standard‖, IEEE Transactions on Circuit and System for Video Technology, pp. 560-576, Jul. 2003.
iv. Video Compression using H.264 AVC Standard Rucha Bahirat, Amit Kolhe Electronics and Telecommunication, CSVTU University, India
v. H.264 video H.264 video compression standard. New possibilities within video surveillance.