

Research on The Design of Video Sharing Mode of Sports Highlights

Haonan Tan, Chuansheng Wu

University of Science and Technology Liaoning, China

Abstract

This project belongs to the technical field of wireless video transmission system, in particular to the wireless sharing system of goal video in sports competitions. Comprises a control layer consisting of a data server, a management server and an OpenFlow controller, and a transmission layer consisting of a base station and a plurality of OpenFlow switches; The data server is used for encoding, storing, managing and sending game videos; The management server is used for video transmission control, and the data server acquires the compression setting instruction issued by the management server and sends the corresponding video data; The management server is provided with a receiving end management module, a compression setting module and an information transmission module; The wireless sharing system of sports game goal video based on this project can reduce the repeated transmission and storage of the same resources, improve the efficiency of data transmission in the local network, improve the smoothness of watching the game, and reduce the data transmission pressure of the whole system and the cost of watching the game.

Keywords

Sports competitions, highlights, videos, sharing methods.

1. Preface

With the rise of group events such as basketball in China, live broadcast and cloud live broadcast of cloud events have been rapidly promoted. Although online video watching has certain limitations on the intuition of watching games, it also gives viewers more freedom to watch, replay and selectively watch games at will. During the transmission of game videos of sports games and other events, we found that the video clips in the scoring stage are the focus of a large number of viewers. It will be played repeatedly, even after a long delay, and it will be opened repeatedly, which leads to the online video playing process, in which the video clips of the game goals will be cached and cleared in the memory for many times, and the resources of the transmission system will be occupied repeatedly. For colleges and other areas, a large number of spectators watch the game at the same time, which will make the transmission of the wireless system keep a high load rate for a long time. At the same time, there are many unreasonable phenomena, such as repeated transmission of resources, large memory occupation, etc., which is not conducive to meeting the observation requirements in some situations with large access and large number of spectators.

2. Project Content

The purpose of this project is to provide a wireless sharing system based on OpenFlow wireless data transmission structure, which can effectively utilize the video clips transmitted in the system by rationally utilizing and controlling the existing resources, avoid unnecessary occupation of transmission lines, improve the feedback speed of food playing, and promote the goal videos of sports competitions and other events.

To achieve the above purpose, this project adopts the following technical scheme.

The video sharing mode system of sports highlights includes a control layer composed of a data server, a management server and an OpenFlow controller, and a transmission layer composed of a base station and a plurality of OpenFlow switches.

The data server is used for encoding, storing, managing and sending game videos.

The management server is used for video transmission control. Specifically, the management server receives the receiver information and transmission request transmitted by the transmission layer, sends a path request instruction to the control layer according to the receiver information, receives the receiver network topology data fed back by the control layer, calculates and selects the data transmission path and sends it to the OpenFlow controller; According to the video request information related to the transmission request, and sends it to the data server.

OpenFlow controller is used to monitor and maintain the working state of the system, specifically, to collect the necessary system structure and network topology path; Sending the network topology data related to the receiving end to the management server according to the request instruction; Generate flow table data according to the transmission path of the management server and send it to each OpenFlow switch on the corresponding path.

And the base station OpenFlow switch form an out-of-band transmission network, and the specific structure is an interrelated cellular network.

The data server obtains the compression setting instruction issued by the management server and sends the corresponding video data.

The management server is provided with a receiver management module, a compression setting module and an information transmission module.

The receiver management module stores a header receiver data table, which includes a single-end data group and a multi-end data group uniquely corresponding to a certain receiver, and the single-end data group stores the IP address of the receiver, the protocol type identification code of the receiver, and the ID of the video data being transmitted by the receiver; The multi-terminal data group stores the source ID of the transmitted video data (the sender of the video), the corresponding source protocol flag code, and the structure information of each layer of the transmitted video; The compression module stores the video compression rate algorithm.

OpenFlow controller includes information receiving and sending module, path generation module, flow table receiving and sending module and information interaction module.

The information transceiving module is used to control OpenFlow switches to periodically send test signals. Each OpenFlow switch collects signals and signal strengths of surrounding OpenFlow switches to form a network topology connection relationship and receive signal strength index data, and transmits the latest network topology to the management server periodically or according to the request instruction.

The path generation module is used to generate the existing network topology based on the network topology connection relationship, and when a new video transmission task is found at the receiving end or the signal strength change is detected, a new data transmission path is re-planned. In this embodiment, Freud algorithm and interpolation method are preferably used to plan and calculate; The data transmission path is determined by the minimum hop from the data server to the receiving end.

The flow table transceiving module and the flow table transceiving module comprise a pipeline for providing two-level flow tables for OpenFlow controller, wherein the first-level flow table judges the data category by using the source IP address and the receiver IP address in the single-ended data group and the multi-ended data group; if it is judged as video data, the second-level flow table identifies the layer data in the multi-ended data, and correspondingly processes the corresponding video layer structure data.

And the base station OpenFlow switch is the basic hardware structure of OpenFlow network, in which the OpenFlow switch is mainly used to carry out data transmission tasks in the network, transmit data or instructions with the controller through the OpenFlow protocol, and receive control instructions such as flow table and transfer priority level transmitted by the OpenFlow controller.

To further improve the wireless video sharing system of sports game goals, the OpenFlow controller is also provided with a quality control module, which is used for quality control. When the information transceiver module detects that the signal strength is out of balance or does not meet the quality requirements of the original transmission network, it will sort and control the transmission and reception according to the importance of video transmission, so as to adjust the type of real-time data transmission and reception of OpenFlow switch and ensure the preferred transmission of critical or more demanding data.

For the further improvement of the above-mentioned wireless video sharing system of sports game goals, the video compression algorithm aims to obtain the best video transmission efficiency or the best video quality under the predicted transmission blocking probability; The information transmission module includes a connection controller, which can be connected to the data server and the OpenFlow controller, respectively, and establishes data communication connection with other layers by using TCP.

To further improve the wireless video sharing system of sports game goals, the video compression algorithm takes the video information to be transmitted and the real-time network status information as input variables, and the number of layers and code rate of the video to be transmitted in the transmission process.

The algorithm and parameters used in video compression algorithm are based on the existing deviation theory and probability algorithm.

3. Specific Realization

The wireless sharing system of sports game goal video of this project is mainly used for wireless transmission of sports game video. At present, the existing game video is generally transmitted through the network after editing and compressing the game structure. Because during the game watching process, the video against the score during the game scoring is often watched repeatedly by the spectators. When a large number of spectators use online players to watch the game, due to repeated playback caching and downloading, the relatively short goal segments in the game video will be downloaded and used repeatedly without offline playing, resulting in network congestion.

Therefore, this project provides a wireless sharing system of sports game goal video based on OpenFlow protocol system, which can realize the caching and sharing of goal video segments in and between the end of the game, which is used to effectively reduce the total amount of online data transmission, meet the repeated playing demand of goal video in some areas, and avoid the phenomenon of short-term or periodic network transmission load surge.

The wireless video sharing system of sports game goals in this project includes a control layer composed of data server, management server and OpenFlow controller, and a transmission layer composed of base station and multiple OpenFlow switches.

The data server is used for encoding, storing, managing and sending game videos.

The management server is used for video transmission control. Specifically, the management server receives the receiver information and transmission request transmitted by the transmission layer, sends a path request instruction to the control layer according to the receiver information, receives the receiver network topology data fed back by the control layer, calculates and selects the data transmission path and sends it to the OpenFlow controller;

According to the video request information related to the transmission request, and sends it to the data server.

OpenFlow controller is used to monitor and maintain the working state of the system, specifically, to collect the necessary system structure and network topology path; Sending the network topology data related to the receiving end to the management server according to the request instruction; Generate flow table data according to the transmission path of the management server and send it to each OpenFlow switch on the corresponding path.

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The receiver management module stores a header receiver data table, which includes a single-end data group and a multi-end data group uniquely corresponding to a certain receiver, and the single-end data group stores the IP address of the receiver, the protocol type identification code of the receiver, and the ID of the video data being transmitted by the receiver; The multi-terminal data group stores the source ID of the transmitted video data (the sender of the video), the corresponding source protocol flag code, and the structure information of each layer of the transmitted video; The compression module stores a video compression algorithm, which takes the video information to be transmitted and the real-time network state information as input quantities, and takes the number of layers and code rate of the video to be transmitted in the transmission process, and its algorithm aims at obtaining the best video transmission efficiency or the best video quality under the predicted transmission blocking probability; The specific algorithm and parameters can be optimized from the existing deviation theory and probability algorithm; The information transmission module includes a connection controller, which can be connected to the data server and the OpenFlow controller, respectively, and establishes data communication connection with other layers by using TCP.

OpenFlow controller includes information receiving and sending module, path generation module, flow table receiving and sending module and information interaction module.

The information transceiving module is used to control OpenFlow switches to periodically send test signals. Each OpenFlow switch collects signals and signal strengths of surrounding OpenFlow switches to form network topology connection relationship and RSS (Received Signal Strength) strength index data, and transmits the latest network topology to the management server periodically or according to the request instruction.

The path generation module is used to generate the existing network topology based on the network topology connection relationship, and when a new video transmission task is found at the receiving end or the signal strength change is detected, a new data transmission path is re-planned. In this embodiment, Freud algorithm and interpolation method are preferably used to plan and calculate; The data transmission path is determined by the minimum hop from the data server to the receiving end.

The flow table transceiving module and the flow table transceiving module comprise a pipeline for providing two-level flow tables for the OpenFlow controller, wherein the first-level flow table judges data by using the source IP address and the receiver IP address in the single-ended data group and the multi-ended data group.

Category, if it is judged to be video data, the layer data in the multi-end data is identified by the secondary stream table, and the corresponding video layer structure data is correspondingly processed.

Particularly, in this embodiment, the OpenFlow controller is also provided with a quality control module, which is used for quality control. When the information transceiver module detects that the signal strength is out of balance or does not meet the quality requirements of the original transmission network, it will sort and control the transmission and reception according to the importance of video transmission, so as to adjust the type of real-time transmission and reception data of the OpenFlow switch and ensure the preferred transmission of critical or more demanding data.

And the base station OpenFlow switch is the basic hardware structure of OpenFlow network, in which the OpenFlow switch is mainly used to carry out data transmission tasks in the network, transmit data or instructions with the controller through the OpenFlow protocol, and receive control instructions such as flow table and transfer priority level transmitted by the OpenFlow controller.

4. Concluding Remarks

The wireless sharing system of sports game goal video based on this project can effectively utilize the data resources existing in the transmission network, so that they can be reused and shared with each other, reduce the repeated transmission and storage of the same resources, improve the efficiency of data transmission in the local network, improve the smoothness of watching the game, and reduce the data transmission pressure of the whole system and the cost of watching the game.

References

- [1] Technical and tactical analysis of China's outstanding female table tennis player Wang Yidi [J]. Feng Yidi, Lu Yunfei. China Sports Coach .2021 (04).
- [2] Knowledge map and hot trend analysis of table tennis in China in recent 30 years [J]. Ding Ying, Hong Chenlu, Wu Fei. Journal of Shandong Institute of Physical Education .2021 (03).
- [3] Research progress of video analysis system based on CNKI database in sports [J]. Leng Xin, Chu Zhidong. Journal of Jilin Institute of Education .2021 (05).
- [4] Review and prospect of analysis theory of table tennis techniques and tactics in China in the past 70 years [J]. Xu Jinlu, Liu Changli, Jiang Jinjun, Zhang Mingyin. Journal of Hebei Institute of Physical Education .2020 (02).
- [5] Problem analysis and skill combing: the establishment of volleyball technical statistical standards from the perspective of internationalization [J]. Chen Zhenxiang, Lu Yajun, Zhao Defeng, Cai Guang. Journal of Tianjin Institute of Physical Education .2020 (01).
- [6] Research on a table tennis video data mining algorithm [J]. Ren Xiangyu. Automation Technology and Application. 2019(05).
- [7] Research and development of video analysis system for special techniques and tactics of "Ping-pong strategist" [J]. Xiao Dandan, Liu Shuai, Liu Guozheng, Sun Jing, Zhou Xingdong. China Sports Science and Technology .2019 (04).
- [8] Research on the characteristics, causes and development trend of men's game techniques and tactics in the new ball era [J]. Xu Junwei. Journal of Shandong Institute of Physical Education .2018 (04)
- [9] Research on the evolution and development trend of table tennis three-stage index evaluation method under the background of rule reform [J]. Xu Junwei. Journal of Shandong Institute of Physical Education .2018 (01).
- [10] Analysis and Research on Hirano Miyuki's Technique and Tactics and Fighting Psychology in 23rd Asian Table Tennis Championships [J]. Li Tianjian, Zhang Shilin. journal of anhui sports science. 2017(06).

Author: Tan Haonan, born on November 25th, 2001, native of Jining, Shandong Province, majoring in computer science and technology, e-mail :120203504206@stu.ustl.edu.cn.