Setting up MOOC Live Video System Based Upon Video Cloud Technology

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Abstract. After introducing live video, MOOC can provide flexible courses on the spot in real time. In this way, the distance learners can participate in the whole process of teaching activities, so that MOOC can establish an interactive and more authentic teaching situation. The essay has illustrated the construction process of MOOC live video system in details from the aspects of data transmission protocol, systematic framework, function design, network bandwidth and so on. In order to ensure the live telecasting effect and simplify the mechanism, the writer proposed the way of video hosting to complete the video push process. By deploying the video cloud tech platform hosting service and distributing the teaching video, the system can save the production time and investment costs.

Preface

As long with continuous development of educational informationization technology, MOOCs gradually increases the influence on the education. As per a up-to-date global statistic data, there are more and more people, schools and institutions that start using MOOCs, so long as they begin recognising and accepting this kind of mode [1].

However, after a few years of practical application, some defects of MOOCs have been emerged. In 2013, after issuing The Year of the MOOCs, the New York Times published another essay that pointed out: “The initial application outcome of MOOCs is disappointed, whose teaching effect could even hard to compete against college face-to-face courses. This resulted in suspicious introspect on the significance of MOOCs for higher education.” [2]

It has been found that MOOC over emphasised behaviourism-oriented strategical application of course content design, lecturing, exercise and information transfer, etc., but ignored the importance of the aspects in the scientific concept and learning techniques in terms of resource integration, design, learning process, support services and motivations, etc..

Nearly all MOOC programs are carried out by watching the video-taped courses, fulfilling the assigned homework and participating the exercises and test. Thus, the most obvious defect under such learning circumstances is that both lecturers and learners are difficult to communicate and influence on each other [3]. Under the circumstance of lack of self-motivation, partner’s information sharing and lecturer’s guide, the learners of MOOC has no way to interact with the course, neither can they infiltrate their personal conversion process.

In order to solve the problem of interactive deficiency and difficult self-infiltration, this paper proposes of introducing popular web live broadcast into MOOC by building
up a distance face-to-face learning circumstance in MOOC, so that it may solve and improve heavy iridescence and unicity of the media widely existing in MOOC.

Live Video and MOOC

About Live Video

By using the stream media video compression, live video is a live broadcast program based upon wide band resources, carrying out a series of coding and compression processing on the video-taped signals, to release it in real time on the Internet. As long as logging on the website, people are able to see the live broadcast program.

As live video keeps not only vivid pattern of manifestation of traditional broadcast television, but also possesses interactive nature of the Internet as required. Meanwhile, it makes the communication and application more effective for its traits of speeding, opening to public use, sharing, freedom and storage. After live broadcast, the system can provide the learners with replay and requesting program, which effectively prolongs the space time of the live broadcast, so that it exerts the maximum value of the live broadcast [4].

Based upon Internet teaching live video, the learners can take part in the live program and questions and answers of interaction while staying home. Teachers may, though, stay home and help students in distance via Internet, resolving the students’ bewildered issues in time, so as to improve the teaching quality and efficiency.

Why MOOC Needs Live Video

Providing More Authentic Teaching Scenario. At present, nearly all MOOC courses are the short video released after video-taping. Such a video clip is just a knowledge fragment, and the learners can only watch silently, by which the both sides cannot interact. The individualized principle told us that the same knowledge fragment should be delivered in different ways while referring to different majors, different fundamentals with different time frames. It should be flexible and renewable. Unfortunately, the fixed video clips of MOOC turn the knowledge fragment into a stagnant condition.

![Figure 1. Open demo in MOOC.](image1)

![Figure 2. VIP live broadcast.](image2)

If changing the media mode in MOOC, by introducing the live broadcast of teaching activities, it is practical for the integration design of whole process between the learning contents and learners. Therefore, the fixed video clips turn to be flexible real time teaching on the spot, which is correspondent to open the learning process and teaching space, instead of providing the public with learning resources only, which guarantees effective learning activities.
In Fig. 1, there is a scenario of open demo live broadcast. While you watch this live broadcast program, you may ask the teacher the questions as other students on the screen, listening to the explanations and discuss with other students. In Fig. 2, there is a pattern of face-to-face live broadcast, which is most favorable for VIP program, of course adaptable to one to more. The distance learners outside the screen in such a teaching live broadcast can take part in all teaching activities in the whole process, which sets up a teaching circumstance of being interactive and more authentic.

**Facilitating A Complete Knowledge Network.** The short video clips in MOOC can only take the learners spare time to study. However, after the fragmentation learning, it requires the lecturer thinking through on how the learners summerise, systemise and digest in time. Quite a few MOOC programs fail to work out the knowledge closed cycle. After viewing the relevant video clips and PPT, they can only discuss something in the forum, but all the fragment knowledge may not be integrated and formed to be a complete knowledge network. Only with having completed the knowledge network, can those knowledge nodes further expand, developing more knowledge nodes by realising extension, progression and flexible application, so that it facilitates the practically effective learning [5].

The integral knowledge network construction needs a complete knowledge inductive summary, by which the fragmentation study is hard to proceed. In this case, if the lecturers and learners can carry out once or more times of live broadcast at the appointed time, the problem can be resolved effectively.

**Setting up MOOC Live Video System**

The following section is to discuss the MOOC live video system setup in the aspects of RTCP/RTP, systematic framework to functional design and network bandwidth, etc..

**Protocol Selection**

If one wishes to invest on building up MOOC live video system server and network context, he/she at first needs to consider which protocol shall be adopted. As the transmission in MOOC live video is real time stream media which can be transmitted and played at any moment, a proper streaming media protocol must be selected, so as to ensure the compatibility of media stream bandwidth and network connections, so that the program can be viewed in real time.

Nowadays, the streaming media protocol mainly includes RTSP, RTMP and HLS, etc.. HLS means HTTP Live Streaming of Apples, based upon the streaming media progressive download protocol of HTTP, suitable for video on demand, but not appropriate for live broadcast in MOOC. Since RTSP and RTMP are the real time streaming media protocol, they all can be applied for live video in MOOC.

Unfortunately, RTMP (Real Time Messaging Protocol) is the private protocol of Adobe, which is not entirely opened yet. But, on the other hand, RTSP and HTTP are the commonly shared protocol, and their maintenance is attributed to specific institutions. Moreover, since the transmission of RTMP is format bitstream of flv and f4v, RTSP in general transmit format bitstream of ts and mp4.

The streaming media of live video in MOOC is in general MP4 format, thus in order to combine both protocol’s openness and transmission media format, RTSP should be selected. RTSP can not only carry out streaming media data transmission, but also has higher transmission efficiency and reliability, which is one of the most widely used coding schemes recently.
Nevertheless, RTCP should be applied together with RTP. RTSP (Real Time Streaming Protocol) is a conceptual protocol of streaming media, which itself may not transmit the data. The real time transmission of streaming media is completed by RTP. RTCP and RTP work together to facilitate flow control and congestion control. By coping with each other, the streaming media real time transmission can be most likely optimized [6].

**System Framework**

After deciding to adopt RTCP/RTP, how to set up live video systematic framework in MOOC should be further discussed.

From the aspect of data transmission, the video live broadcast system in MOOC is comprised of three parts. There are video capture, video delivery and video presentation [7]. With respect to logic workflow, it firstly uses video capture workstation making video teaching spot; then, the delivery software hands over the teaching spot video information to the streaming media server of the control center; later on, the streaming media server sends the integrated video data to the intellectual teaching platform in MOOC, finally to the Internet; the users review the live broadcast streaming data via IE or live broadcast software. In Fig. 3, there is a systematic framework diagram of live video system in MOOC.

![Figure 3. Systematic framework of live video system in MOOC.](image)

Practically, the live video system in MOOC includes the following aspects:

- **Coding Instrument.** Used in creating, capturing and editing the multimedia date on the spot of MOOC teaching activities, which forms the streaming media format. This can be worked out by PC with audial and visual hardware interface and production software used in the PC.

- **Server.** Applied for storing, distributing and controlling streaming media data.

- **MOOC Intelligent Teaching Platform.** It integrates orderly general video on demand and live video, realising consolidated management, issuance and application on the same MOOC platform.

- **Network.** Providing the network context based on RTCP/RTP.

- **Client-side.** The users review the live video via server or dedicated player.

**Function Design**

After including the live video of teaching on the spot, the functional design relevant to live video within the platform in MOOC should be considered in general. With respect
to unified management of MOOC platform, the following functions relating to the live video should be created:

**Live Telecast Bulletin Board.** The difference between live telecast and video on demand is that there is time limit and number of participants restriction. The time and content of live telecast, restriction number of people should be notified to all users on the bulletin board beforehand.

**Messaging Platform.** Opening the massaging platform, at the same of issuing notice on the bulletin, the same message should be sent to the users via messaging platform, so that the users can receive the important information to prevent missing the live telecast.

**Clocking Memory.** In order to save the video program while carrying out live telecast, a flexible automatic saving mechanism should be available, which can realise the storage of the contents at different time frames.

**Auto Recording.** The automatic recording is required while carrying out live telecast, which can be converted to video on demand for the users. In this way, it could replay the recorded courses though the users missed the time of live telecast.

**Voice Communication.** After installing webcam and microphone at user’s end, the user’s head portrait can be displayed on the teaching spot (unnecessary at open demo), and two-way real time voice communication can be realised.

**Pop-outs Function.** The popular popout function can be included so that the popout literature of repeating, hanging out and more action special effect can be realised, which is convenient for the users to cope with learning by communication, as well as establishing MOOC circle of friends.

**Open Demo.** It is the same as organising a class for the program, allowing more users to watch the program, and providing them with distance questioning, cross communication and real time interaction with the on the spot program.

**VIP Venue.** Opening one-to-one basis VIP teaching live video. Apart from specific users, VIP courses may not open to other learners. Of course, such courses have to be paid additionally.

**Video Hosting**

Referring to live video system in MOOC, network bandwidth is normally troublesome, and maybe turns out to be a bottleneck against system normal operation. With respect to one-to-one basis VIP program, it has no such a problem. However, to the open demo, when the online clients who request watching same program reach up to a certain number of people, it is easy to lead data congestion of the streaming media server, so that the image and voice might not be smooth at the user’s end, which seriously impacts on effect of live telecast.

The web live video is strict with upstream bandwidth. In accordance with calculation, if the live telecast is a standard definition, the upstream bandwidth should be over 450K, video 400K with audial 64K; in case the live telecast is of high definition 720P, the upstream bandwidth should at least reach 800K above [8].

If, possibly, one wishes to invest on setting up a live video system himself/herself, he/she needs to purchase complicated application software, expensive hardware, hire professionally tech staff and provide sufficient network bandwidth, which might in utmost waste human, material and financial resources. Generally speaking, to realise a live video system of intermediate level, the investment only on hardware needs at least RMB 3 million [9].

In order to simplify the working mechanism, referring to live video in MOOC, the subtle solution could be video hosting. The video hosting was firstly proposed by two
American institutions Frost & Sullivan. The video hosting is actually a kind of online video platform, a video solution based on paying SAAS mode, which helps the owner of the program upload, transcode, save, manage, safeguard and issue the online video[10]. MOOC only needs to entrust the online video platform for the services and distribute the teaching telecast, as they don’t have to establish streaming media server and related facilities, which in utmost saves the construction time and costs.

Therefore, in order to save the costs, while carrying out live video in MOOC, by collecting on the spot teaching video at workstation, and transmitting the video to the online video platform (such as POLYV ) to deliver it by means of video hosting; MOOC platform opens up live video linking ports, which applies abutting joint with video cloud tech platform; FTTH is recommended for the live video users with Wifi reception, so as to ensure the upstream bandwidth at the user’s end to be 1M above.

Conclusion

Recently, MOOC has been developed in tremendous speed for its teaching openness, flexibility and individuality of teaching design, particularly by providing the learning context of gamefication and socialisation. But, when learners in MOOC review the recorded course video clips which are unchangable via the platform, the learners and lecturer are difficult to communicate directly or influence on each other. Once on the spot teaching live telecast is introduced, the learners can take part in all teaching activities in whole process, so that it helps them set up interactive and more authentic teaching scenario.

To establish MOOC live video system, the network context should be constructed on the basis of RTCIP/RTP, thus a systematic framework comprised of video capturing, video delivery and video presentation should be worked out, and the operational functions related to live video can be created on the MOOC platform. With respect to smaller MOOC platform with limited investment, the video delivery can be realised by video hosting. The time and costs can be massively saved through online video hosting and the distributive teaching video clips.

References

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