

Script Based Pattern Recognition for a Portrait Tracking System on Broadcast Online Scenes

Qinyun Liu^{1,*} and Xiaopeng Xu²

¹Beijing Union University, Beijing, China

²Anhui University of Finance and Economics, Bengbu, Anhui, China

lytqinyun@buu.edu.cn

*corresponding Author

Abstract—The online broadcast scene is a novel scenario in culture and tourism industry in new period. However, the online broadcast control system has not been solved at the technical level. This research describes a collaborative smart control system for seizing actors and scenarios in broadcast online scene based on drama script with pattern recognition. Based on the script of the cultural and artistic forms under the online broadcast scenario, the training parameters of the pattern recognition algorithm are set to recognize the real-time capture of the face, dress, clothing, etc., and the tracking and overall setting control. The kernel algorithm is set with smart decision making system based for seizing actors and clustering algorithm (discrimination analysis) for seizing different scenarios on stage. Connections between equipment serving for the entire broadcasting drama and online presentations are achieved by the wireless network, software and kernel control system.

Keywords- Broadcast Online, Smart System, Decision Making Algorithm, Drama Scenery

I. INTRODUCTION

Tourism and culture area have lots of broadcast-based scenarios for enhancing the experiences for audience. The immersion experience is becoming an increasingly popular mode for culture and tourism scene. Many tourism scenes in developed countries have established such equipment, software and spaces for enhancing the immersion experience that the tourism area can bring tourists. However, most of the people in the world rarely have the chance to meet the drama off-line in the theatre. The online broadcast is limited for serving the films. Online broadcasting and related control system aimed at solving such problems. In the drama scenario, the sharing scene for increasingly people has positive influences on the drama industry. Further it is positive for the people who love the live drama as well. The online broadcast technique is based a series of equipment. In this research, a system for controlling the equipment in the drama live house for expressing the drama live online could be achieved, with architecture of the system and the control algorithm for the system. In this research paper, introduction, related work, smart decision making on the online broadcast on drama, and

conclusion are presented for illustrating the system, algorithm, and the application in the drama online broadcasting.

II. RELATED WORK

A. Immersion Experience

Immersion experience is also called Flow Theory and Immersive Experience. Immersion experience in the field of positive psychology [16] means that when people are fully engaged in the situation, pay attention and filter out all irrelevant perceptions, they will enter the immersion state [17].

Immersion experience is a positive and positive psychological experience, which will give individuals a great sense of pleasure when participating in activities, so as to urge individuals to repeat the same activities without getting tired [18].

With the development of computer science and technology, immersion theory extends to the discussion of human-computer interaction [1]. At this time, immersion experience also means that the activity participants enter the common experience mode, their consciousness is concentrated in a small range, and other irrelevant perceptions and thoughts are filtered [19], only responding to specific goals and clear feedback, and producing a sense of control over the environment.

VR and other virtual intelligence provide immersive experience. The immersive experience here is to use people's sensory experience and cognitive experience to create an atmosphere for participants to enjoy a certain state [17], provide participants with a completely immersive experience, and make users feel like they are in the virtual world.

Immersive experience refers to the integration of new media art, installation art, digital image, special effects, lighting equipment technology, etc. [19]. Through projection fusion technology, the projection screen is projected onto a large or multi-faceted projection screen [20]. With sound, light, smoke, etc., it surrounds the audience from all levels, fully covers the audience's perspective, and interacts with the audience through smart control of the interactive induction

system, such as moving flowers, hand dancing flowers, etc, let visitors immerse in interesting and dreamy experiences [9].

B. *Broadcast Online and NTLive*

In the academic field, the on online broadcasting is a research gap, and the concept of online broadcasting is proposed in recent years. A similar concept, NTLive, was initially applied in the field of drama and opera. It was a creative project carried out by the British National Theatre in 2009, aiming to present the best works on the world's opera stage to the UK and the world through online live broadcast. The project recorded the live drama performance with audiences by a professional shooting team, and led the shooting from the main perspective through rocker arm, and slide track and close-up shot, and watched the beautiful drama through the big screen. On this basis, online broadcasting integrates more perspectives and more presentation forms to provide users with more freedom and customized viewing scenes. Therefore, it has a wider range of applications, a stronger sense of experience, and greater research and application value. However, at this stage, NTLive still uses manual control, so it is unable to realize the automatic smart control system to achieve reasonable smart control of online broadcasting [8].

New scenes of culture and tourism. However, the online broadcast control system has not been solved in the technical level. Machine learning technology can realize the mining of tourism data and cultural connotation. The existing research mainly focuses on tourist comment analysis, text data mining, machine translation and other aspects. However, there is no in-depth study on the new scene of online broadcasting, especially the smart control and intelligent change of different devices according to different scene requirements. There is no high-quality architecture for the intelligent system of new scene of online broadcasting culture and tourism, and there is no intelligent identification and smart control algorithm development and application for new scene of online broadcasting. At the same time, before AI iteration becomes an intelligent system, human behavior and judgment are the most intelligent and reliable system control mode. Therefore, the identification and analysis of human in the control system is particularly important for the development of innovative smart control systems and their algorithms. The development of the control system under the demand of the new scene through the pattern recognition theory and cybernetics will lay a solid foundation for the intelligent operation of culture and tourism online broadcasting and clarify the underlying logic.

Ideal broadcast online could solve the problem for promoting drama and related culture and tourism activities to the people all around the world. The culture and tourism promotion can improve the communication between different

people and enhance the experience in the tourism and culture scenery for most of the people.

The broadcast online is required the recording device, application software, and platform for online presentation. The experience of the people is affected by the quality of film that recorded by the devices. Smart decision-making system and related algorithm is required for improving the automatic recording progress and the recording quality.

C. *Smart Decision-Making System for Equipment Control*

Smart control is a control mode with intelligent information processing, intelligent information feedback and smart control decision-making. [1, 11] It is an advanced stage of control theory development, mainly used to solve the control problems of complex systems that are difficult to solve with traditional methods [12]. The main characteristics of smart control research object are uncertain mathematical model, high nonlinearity and complex task requirements [2].

The idea of smart control appeared in the 1960s [13]. At that time, the study of learning control was very active and was applied well [14]. For example, self-learning and adaptive methods have been developed to solve the problems of stochastic characteristics and unknown models of control systems; in 1965, Fu of Purdue University first applied AI heuristic inference rules to learning control systems [15]; in 1966, Mendel first advocated the use of AI in the design of spacecraft control system. [3]

Based on control theory, computer science, artificial intelligence, operations research and other disciplines, intelligent control expands relevant theories and technologies, including fuzzy logic, neural network, expert system, genetic algorithm and other theories, as well as adaptive control, self-organizing control and self-learning control technologies [4].

Expert system is a control system that uses expert knowledge to describe special or difficult problems [13]. Although expert system has been successfully applied in solving complex high-level reasoning, the practical application of expert system is relatively few.

Fuzzy logic describes the system with fuzzy language, which can describe both the quantitative model and the qualitative model of the application system [14]. Fuzzy logic can be applied to any complex object control.

As a non-deterministic quasi natural stochastic optimization tool, genetic algorithm has the characteristics of parallel computing, fast searching for global optimal solution, etc. [14]. It can be mixed with other technologies for optimal control of parameters, structures or environments of intelligent control.

The combination or comprehensive cross combination of relevant technologies and control methods of intelligent

control constitutes intelligent control systems and intelligent controllers with different styles and functions, which is also a major feature of intelligent control technology and methods. [5]

The main goal of intelligent control research is no longer the controlled object, but the controller itself [6]. The controller is no longer a single mathematical model analytical type, but a generalized model combining mathematical analysis and knowledge system, and a control system combining multi discipline knowledge. Intelligent control theory is to establish the characteristic pattern recognition of controlled dynamic process, and control based on knowledge, experience reasoning and intelligent decision-making [7]. A good intelligent controller itself should have the characteristics of multi-mode, variable structure, variable parameters, etc. It can identify, learn and organize its own control mode according to the characteristics of the controlled dynamic process, change the controller structure and adjust parameters.

This is the basis of the broadcast control system establishment.

III. SMART DECISION MAKING ON THE ONLINE BROADCAST ON DRAMA

A. Equipment Connections

In this research, the drama is picked to be the target application scenery. In recording the drama, the equipment connections is the basis of system and related algorithm for achieving the smart control and record in the drama. Currently, the equipment are cameras, projectors, recording devices and monitors: a 800 Li streaming media server software system, an acquisition card, for convert video analog signal to digital signal, a hardware encoder to encode the video source into the streaming media format.

These devices can help you record and capture video and audio, and transmit them to the live broadcast server to enable the audience to watch live broadcast.

There are many advantages for using professional live broadcast equipment. Firstly, it is helpful for high-quality live broadcast. Secondly, it implements synchronous sound acquisition and transmission, which can make your voice more authentic. In addition, using professional live broadcasting equipment can also suppress interference to, keep voice and picture synchronized.

In Figure 1, the connections between drama scene and customers are achieved by connectors, cloud resources and terminals. The connectors are the equipment for transmitting camera signals to the cloud resources.

In the drama scene, the equipment includes cameras, aural receiver, lights controller, background and related controller,

sound and related controller. Different equipment is recording the drama to be live online for the customers based on scripts. It can be controlled by system and algorithm to automate recording process.

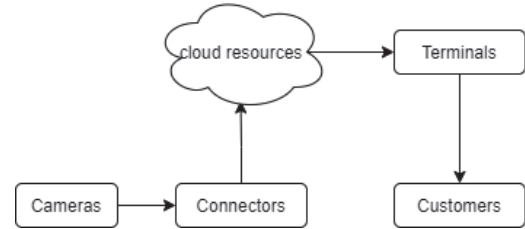


Figure 1. Equipment Connections in the Broadcast System

B. System Infrastructure

The template is used to format your paper and style the text. All margins, column widths, line spaces, and text fonts are prescribed; please do not alter them. You may note peculiarities. For example, the head margin in this template measures proportionately more than is customary. This measurement and others are deliberate, using specifications that anticipate your paper as one part of the entire proceedings, and not as an independent document. Please do not revise any of the current designations.

As shown in Figure 2, the smart decision making system has five levels, including basic level, system level, problems processing, natural language processing and connections between customer and scene. The system can be applied in the drama scenery with controlling equipment. The system is established in the scenery for recording or broadcasting the drama.

In the drama scenery, the decision-making system can be detailed in Figure 3.

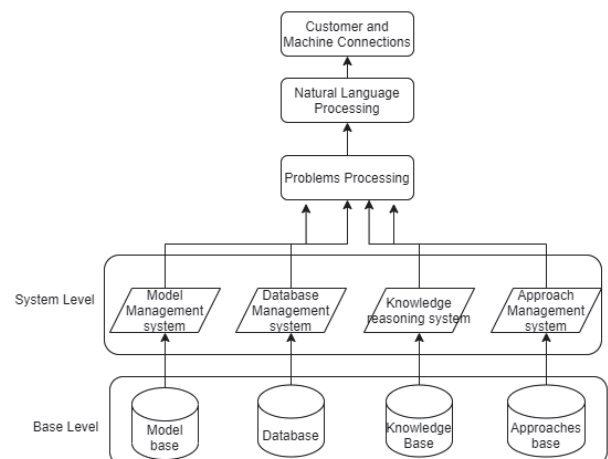


Figure 2. Smart Decision Making System Structure

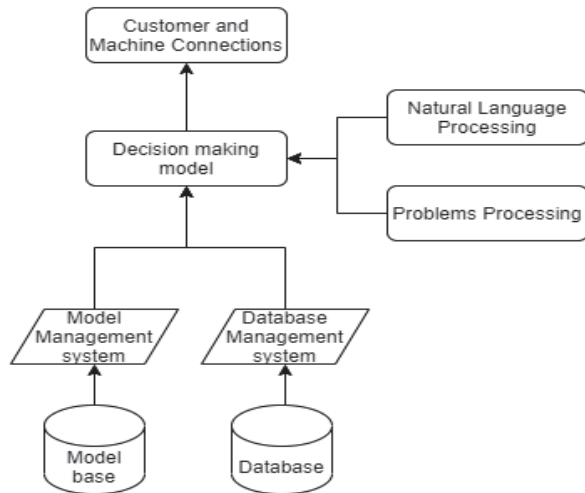


Figure 3. The Workflow of the Algorithm for Controlling and Decision Making

C. Algorithm for Controlling and Decision Making

The algorithm for decision making includes neural network based classification and clustering algorithms, decision tree based algorithms, and so forth. In the drama scenery, the algorithm is required to be re-designed and created to match the needs. Based on the equipment in the scenery, there are four kinds of devices, which are motion capture, sound capture, light effects and stage background effects. The algorithm model is designed containing four parameters at least. The formula is:

$$T=a1M+a2S+a3L+a4ST+b.$$

The entire flow of the algorithm is presented in Figure 4.

In Figure 4, the input data is the drama scripts. In the scripts, the entire story of the drama is presented by natural language with marks on some devices changing, such as lights, sounds, background of the stage and so forth. In this research, the four kinds of devices are the targets for generating the algorithm for automatic broadcast online devices controlling, which are cameras, sounds, lights and stage backgrounds. The target of the algorithm is to confirm the devices moves based on scrips analysis. Therefore, the algorithm has three steps, which are NLP processing, classification algorithm and detector generating, order separation system.

NLP is used for classifying the scrips based on the devices kinds, which are motion (actors), sounds, lights, and stage backgrounds. The contents in the scripts are extracted for order generating.

Scripts contents include the devices operating points, which are the recording guiding for the drama. The changing points are the target of the detector. The detector can be used

for detecting target points, such as the key words about motion changing, light changing, and background changing. Further, the actors changing points are detected as well. The cameras would chasing for the key actors or actress based on the scripts for presenting better drama live for the audience.

Eventually, order system is aimed at combining device movement and script movement points to make the final order, moving the devices to broadcasting or recording.

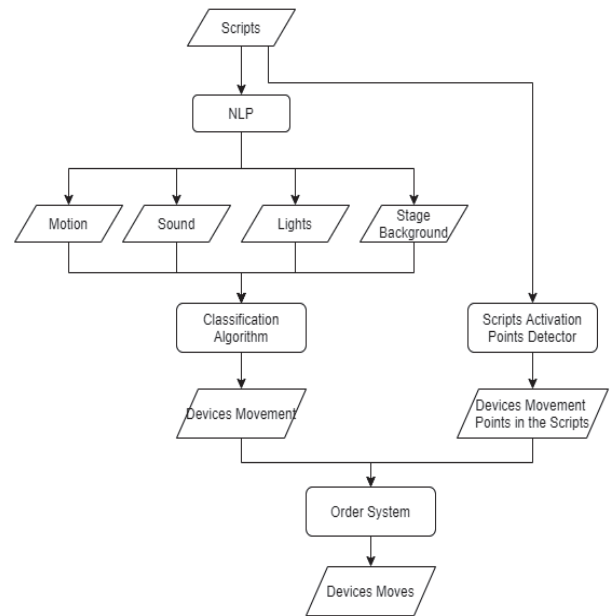


Figure 4. The Workflow of the Algorithm for Controlling and Decision Making

IV. A CASE STUDY

In the drama industry in China, there are a list of famous novels that are transferred into drama for spreading thoughts and realities in the developing Chinese history. Such as Bailuyuan.

"Bailuyuan Film and Television City" is the first cultural tourism science and technology comprehensive park in Shaanxi integrating film and television shooting, cultural leisure, wonderful performances, children's entertainment, and scientific and technological experience, relying on the award-winning work "Bailuyuan" of Mao Dun Literature Award by the famous writer Chen Zhongshi and the film of the same name.

Bailuyuan Film and Television City is a diversified film world built by watching, touching, acting and presenting. The film museum includes four exhibition halls: the first exhibition hall focuses on visual experience, explores the brief history and origin of film development, and gets on the film train through early film projectors to truly enter the film; The second exhibition hall is centered on interactive clock in.

Through interactive devices, costume props, new and old special effects, we can understand the space in front of and behind the film stage; The third exhibition hall adopts digital technology, optical, mechanical and other means to form a series of special effects shooting methods, such as model, reverse shooting, synthesis, multiple exposures, etc., and through the classic traditional special effects, it shows such wonders as landslides, violent waves, volcanic eruptions, flying eaves and walls, flying clouds, flying stars, and historical reproduction; The fourth exhibition hall takes technology as the core. From the early 16 grid film era to the current XR era, movies have evolved from 2D to 3D and imax. The park has also built a super T station for movies through various heavy industry technologies.



Figure 5. The Live Scene in the Film City

In the drama, the Heiwa romance is one of the popular parts. In the film city, Bailuyuan · Heiwa Romance is a film and television technology experience interactive project integrating shooting, acting and playing of large live film in the scenic area, and is known as the largest indoor studio in Asia. The performance film technology shows that the whole process goes through the four seasons, integrating film technology, imaging technology, film and television technology and other new science and technology, taking tourists to experience the film technology of spring, summer, autumn and winter, feeling wind, rain, thunder and snow, using digital technology for real-time shooting and editing, real-time film production, and real-time broadcast.

In the Bailuyuan area, the drama is presented in different stages. The different chapters in the entire novel are expressed with distinguished scripts based on the original novel. In Figure 5, Figure 6, Figure 7 and Figure 8, different stages in the film city are presented. The system could balance the stages with the entire script of Bailuyuan. The stages are

numbered with labels, such as A, B, C and so forth. Further, the equipment is labeled as well in the system.



Figure 6. Equipment and Online Broadcasting environment in Bailuyuan

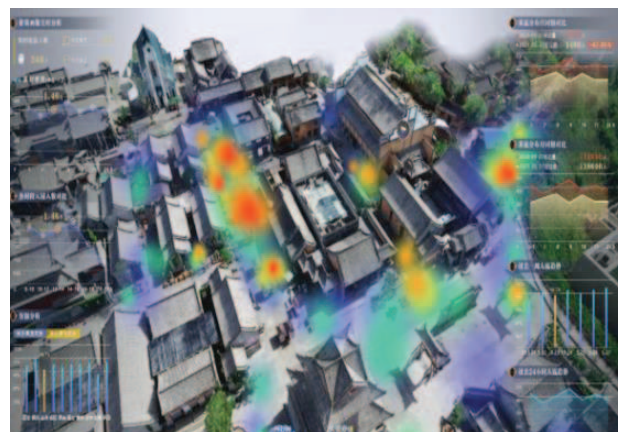


Figure 7. Smart Detecting and Managing System Hotspot Map in the Broadcasting Live Area



Figure 8. Smart Detecting and Managing System Scene in the Broadcasting Area

The smart decision algorithm aimed at ordering the equipment with the script catching the actors and actresses, stages and stuff, lights and voice. Meanwhile, the bailuyuan drama is required different stages types and lights, voice changes, actors and actresses expressions are required to be considered in the algorithm parameters as well.

The final decision-making system is based on the equipment and stages related stuff to match the scripts of Bailuyuan.

V. CONCLUSION

In this research, a collaborative smart control system for seizing actors and scenarios in broadcasting online scene based on drama script with pattern recognition. Based on the script of the cultural and artistic forms under and the online broadcast scenario, the training parameters of the pattern recognition algorithm are set to recognize the real-time capture of the face, dress, clothing, etc., and the tracking and overall setting control. The final output of this research is the entire system structure and algorithm workflow. The guidance for establishing a smart decision making system for broadcasting online of drama, Increasing the recording and broadcasting quality of drama for the online audience online.

REFERENCES

- [1] Z. Liu, "AlexNet-based Visible light communication devices fingerprint extraction and authentication in broadcast systems", 2022 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting (BMSB), IEEE, 2022.
- [2] S. Canard, H. Duong and C. Viet, "Attribute - based broadcast encryption scheme for lightweight devices", IET Information Security, Wiley Online Library, England, vol.12, No.1, 2018, pp. 52-59.
- [3] A. Pathak, "IoT based smart system to support agricultural parameters: a case study", Procedia Computer Science, Elsevier, Halifax, Canada, vol. 155, 2019, pp. 648-653.
- [4] H. Benyezza, B. Mounir and R. Samia, "Zoning irrigation smart system based on fuzzy control technology and IoT for water and energy saving", Journal of Cleaner Production, Elsevier, New York, US, vol. 302, 2021, pp. 127.
- [5] A. Jain, "A smart system for fake news detection using machine learning", 2019 International Conference on Issues and Challenges in Intelligent Computing Techniques (ICICT), vol. 1, IEEE, 2019.
- [6] M. Souza, "A survey on decision-making based on system reliability in the context of Industry 4.0", Journal of Manufacturing Systems, Elsevier, New York, US, vol. 56, 2020, pp. 133-156.
- [7] S. Van, S. Henk and H. Siri, "The role of the opioid system in decision making and cognitive control: A review", Cognitive, Affective, & Behavioral Neuroscience, Springer, Germany, vol. 19, no. 3, 2019, pp. 435-458.
- [8] S. Yoo and K. Bo-Young, "A decision-making model for adopting a cloud computing system", Sustainability, Sustainability, US, vol.10, no. 8, 2018, pp. 295.
- [9] J. Park, and K. Ga-eun, "Study on the Production Process of Performance Arts Visualization Projects: Focused on a Case Analysis of NT Live Cinema Broadcasts", The Journal of the Korea Contents Association, Korea Science, Korea, vol. 21, no. 7, 2021, pp. 45-58.
- [10] S. Ventura, "Immersive versus non-immersive experience: Exploring the feasibility of memory assessment through 360 technology", Frontiers in Psychology, Frontiers, Portugal, vol. no. 10, 2019, pp. 2509.
- [11] A. Amin, and M. Khalid, "A review of fault tolerant control systems: advancements and applications." Measurement, Springer, US, vol. 143 2019, pp. 58-68.
- [12] X. Zhang, "Networked control systems: A survey of trends and techniques", IEEE/CAA Journal of Automatica Sinica, Springer, US, vol. 7, no. 1, 2019, pp. 1-17.
- [13] X. Jin, "Simulation of hydraulic transplanting robot control system based on fuzzy PID controller", Measurement, Springer, US, vol. 164, 2020.
- [14] E. Mousavinejad, "A novel cyber attack detection method in networked control systems", IEEE transactions on cybernetics, London, UK, vol. 48, no. 11, 2018, pp. 3254-3264.
- [15] N. Macintosh and L. Richard, "Management control systems and departmental interdependences: an empirical study", Management Control Theory, Routledge, US, 2019, pp. 289-302.
- [16] A. Klippel, "Transforming earth science education through immersive experiences: Delivering on a long held promise." Journal of Educational Computing Research, Sage Publishing, New York, US, vol. 57, no. 7 2019, pp. 1745-1771.
- [17] D. Shin and B. Frank "Exploring immersive experience in journalism." New Media and Society, Sage Publishing, New York, US, vol. 20, no. 8, 2018, pp. 2800-2823.
- [18] V. Distler, L. Carine and B. Thierry, "Acceptability and acceptance of autonomous mobility on demand: The impact of an immersive experience", Proceedings of the 2018 CHI conference on human factors in computing systems, ACM, New York, US, 2018.
- [19] L. Michailidis, B. Emili and H. Xun, "Flow and immersion in video games: The aftermath of a conceptual challenge", Frontiers in psychology, Frontiers, Spain, vol. 9, 2018, p. 1682.
- [20] H. Lee, "Experiencing immersive virtual reality in museums," Information & Management, Elsevier, New York, US, vol. 57, no. 5, 2020.