Research on Animation Lip synchronization technology

A study on application and development of domestic animation Lip synchronization

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Abstract

Recently, linguistic communication and learning effect and even delivery of knowledge information and mutual communion was capacitated with English lip sync automation device and voice recognition technology based real time animation character in areas like movie, game, broadcasting, AR with application of animation lip sync. It connotes the possibility of these characters` lip sync using characteristic of animation to efficiently enhance the qualitative level of work in domestic animation creation`s linguistic expression with progress and application of automation technology. In a word, a study on development and practical use of Korean lip sync technique is needed to be made actively in industrial, technical progress of domestic animation. However, it is hard to find a research on commercialization method of Korean lip sync automation technique and excellent performance or example that these techniques were applied in domestic animation up to now.

The reason that development using Korean lip sync technique on domestic animation passed unobserved could be found in problem of sociocultural awareness, production environment and functional value feature. First, in Korea, animation is recognized as subordinate part of movie genre, and sociocultural stereotype that persisted with dictionary definition and feature that unreal and non-objective illusion image with playful exaggeration and symbol that brings optical illusion through apparition of movement is also a problem. Second, labor-intensive method that mobilized many labor was used in production of traditional 2D animation, and since the production was done by specific worker with long acumen and experience, thus it requires long period of production and big consumption expense.

Despite the fact that domestic animation is completed by overcoming poor surrounding with various risks, audiences yet feels that characters move their lip unlike the lines, and experience sound and image does not match, and it causes perception process of negative mental process and defensive mind like anger and distrust. These audiences of animation get interrupted to be empathized into true world that is essentially pursuing, and at the same time any kind of symbolic meaning and metonymic value also cannot be earned from animation.

This researcher look at technical standard which will influence qualitative level of domestic creative animation in the future, and try to think visualization and synchronization problem in linguistic expression of character lip sync scene which is required in 3D animation in production side and audience side.

This thesis try to study on need to develop related technology in the future and development plan by checking importance of Korean lip sync and current use state of technology in maker and audience of domestic animation. Also, looked at method and attitude for future creative animation to use technology with progress of animation Korean lip sync technology in technical side by emerging from non-linguistic act and behavior oriented research of animation. Also, in excellent cases of animation Korean lip sync, it could surpass the limit of children oriented domestic animation which massively produced with small scale and low budget, and contribute on newly illuminate and develop value and meaning of animation to more various and wider socio-cultural class.

Keywords: Animation Lip sync, Character facial expression, language visual expression

1. Introduction

As a development of computer animation production technology, (Cinematic) movie and game maximized sense of reality of character by combining with various attribution and fundamental work of animation. By using these technology, it feels like living in cinematic special effect that character that only exist in imagination of human actually exist with new terms such as digital actor or avatar. In those mainstreams, in the sense that animation character lip sync technology is visualization of lip movement of character`s speaking scene, possibility of success by applying progress of technology on creative work can be receive attention...

Development of digital technology to authentically express character in domestic animation made huge progress in technological areas such as producing 3 dimensional modeling data, automatically realizing animation movement, however, for lip sync technology for animation character, effort to develop technology to solve problem of awkwardness of foreign movie dubbing, and technology to perfectly match lip sync of Korean speaking character is poor. Actually, Hollywood animation productions develop new software that is needed in work, and use it as independent plug in every time they release new animation, and show off their amazing technology. Of course, under the poor production environment of domestic animation and difficult reality of social, financial limit, necessary expenses on development of high rank technology that requires R&D was inevitably low. Also, domestic animation is small scale industry compare to others, investment support system or research support for vitalization of production is poor.

While forecasting development with excellent use of various technology to surpass problem and critical situation of domestic animation, this chapter will start to discuss that if successful case of animation could be made when technology and art is well harmonized. Thus, this study is progress with purpose on looking at technological progress and present condition of animation lip sync which is method and technology of language expression of character, the core element of animation and finding future development plan.

2. Background

2.1 Basic concept of Lip synchronization

Animation establishes plan for work in pre-production stage and all prior planning. At this point, voice actors record their voice according to animation script. Main-production which produced whole character animation through production of the first animation lip sync is made. On animation production pipe line, lip sync that starts from preparatory stage is short for lip synchronization, and it means the technical term that match voice on movement of lip of actor or singer on TV or movie.

Lip sync is used as essential part to express character in animation (character sketch), use of this technique can be the base to success exquisite and detailed visualization of character in animation, and it could perfectly reenact dynamic performance and expression in facial part.

In here, lip sync technique of animation is generally the work that perfectly match character`s lip movement with voice actor`s voice in 2D or 3D animation produced with computer graphic, it is particular technology that visualize lip`s shape and change according to vocalization of language to produce the scene that character is speaking. Especially, 3D animation is used as realistic animation production technique by performing emotional performance by managing facial coordinate of character with model data production and transformation. This narrows physical distance between animation and audience by close-up shot, and it becomes very important technology when performing character`s emotion. Therefore, recently, importance of it is more standing out in theater animation, and it is also recognized as one of the main working process in production pipe line.

In computer animation, in-between technique which computer automatically animate image between the first frame and the last frame that set on compute for movement of character in animation. Especially, when making facial animation with character`s face, it is easy to change data and modify lip movement of character model and facial expression, so lip sync which is involved in visualization of shape of lip is developed to work using computer

2.2 Lip synchronization technology of Animation

With amazing development of domestic and foreign animation image technology, American animation character production technique is especially changing huge. The convenience of function that can produce lip sync using morph feature or bland shape which computer 3D graphic program has, or development of motion capture technology that enabled immediate and stable data creation for facial animation by attaching sensor on actor`s face without distinction of language are the examples. Use of AR/VR technology which enabled real time interactive animation which is used in virtual reality area and real time game engine is accumulated for a quite long time. For example, "MGS4" series which received attention with the world best level real facial animation accomplished lip sync work in localize stage like animation production process.

It is excellent case of development and use of lip sync automation device which digitize phoneme component of each language and dividing expression (that can express emotion such as anger or laugh) in voice recognition stage by using own lip sync automation technology. Also, by enabling each lip sync in English and Japanese, this game could sold at the same time with each game title in two countries.

Case above showed successful case that is similar technology that recent theater domestic 3D animation to produce systematic animation lip sync by using voice recognition and data processing technology in pre-production stage. Additional research development is needed in each area to replace consumption of labor for Korean lip sync for domestic animation by using automation device and method technology above, and improve quality of production. The result of application for progress of animation lip sync technology and creation will actually reinforce expectation and trust on CG movie or theater animation character that audience be enthusiastic about, and it will do the role to find essential meaning and value of animation by emotionally approaching to audience without any detail act or movement.

Thus in the sense of marketability of domestic animation, children and even teenagers will remember positive influence of animation until they become elderly according to quality of animation character`s lip sync. Also, as being proved that watch of video with character lip sync technology has educational effect in Edu-entertainment area, it will do important role on becoming contents that reinforce emotional purification function of animation and perform positive social influence.

3. Discussion

3.1. Development of Lip sync technology

3.1.1 Lip sync of Animation production side
When televising American or Japanese animation, since it uses recording method that dubbing Korean on already made animation, audience lose their concentration because the line of character and mouth shape does not match, and sometimes it interrupted empathy or absorption to character. American style animation production has its advantage to perfectly match mouth shape with every frame with pre-recording method which is Pre-Recording & Voice Actor then sync with that sound or pre-recording method. Pre-recording method like American theater animation released after 90s, in other words, pre-recording voice before start to animating received a good evaluation that it made good work.

In traditional animation production, most of Korean style or Japanese style took a method that produce animation first, and voice actor record script while watching the video (after-recording), or experienced worker choose mouth shape of animation character which respond to actual pronunciation from mouth shape data base and make it to animation with individual sense. Since these methods do not reflect actual voice pronunciation of human, it decreases reality.

Because of the production process and reason above, realization of animation character lip sync is mostly made by experienced person without benefit of technical progress. In order to match recorded voice and mouth shape of character,

this requires abundant labor from specific worker with know-how in relevant experience and long production time. This has been a reason to entire production cost in social, economic sense. Especially domestic animation industry which mainly targets children uses relatively small production cost, thus it has huge burden on developing character lip sync technology and it is hard to invest money on this part.

3.1.2 Lip sync of Animation appreciator side
Like in <Hen that left garden> which was successful of audience appeal as domestic theater animation, it used production system that record voice of actors first then work according to that, and it is different from previous method of existing Korean animation that drew first then record voice of voice actor. This is excellent successful case of animation character lip sync which ruled out awkwardness of character`s line and expression and maximized audiences` immersion.

<**Fig. 1**   Pre-recording for Lip sync by Famous actors,
"Hen that left garden", Myung FIlm, Animation production
2011>

Like the case above, domestic animation was successful on character lip sync by successfully using voice performance of famous actors, it also suggest possibility that development of voice recognition technology that analyze pre-recorded voice file will contribute on realizing character`s mouth shape and expression vividly according to animation production feature. In marketability of domestic animation, the factor that can successfully make a box office hit most efficiently and fast might be voice recording of actors` voice performance.

In progressive aspect of industrial technology according to sales increase tendency with market size, like the case of <Hen that left garden> which was successful case that applied Korean character lip sync technique using pre-recording, entire case including <Guardians, dream works> that opened in Korea received great respond from Korean audience with voice performance of the best actors, expansion and use of Korean animation character lip sync automation device technology will continue in the future, and applying field of technology will be expanded and artistic application of important technical factor to producer and audience.

It could be seen that absolute majority of current animation market is animation that targets children, but since this animation targeting pre-school children is made with relatively small production cost, it has great burden on producing character lip sync. However, case study of children audio-visual education which is main target of animation

shows matching between animation character voice and mouth shape influence verbal development and language learning. Also, currently U.S has legal regulation on broadcasting that all imported animation must have match of character`s lip sync to be televised. In order for animation to be developed and successful in domestic and foreign market, lip sync of animation character must be perfectly realized phonetically and visually. It will bring positive synergy effect that fusion of art with utilization of effective technology to children animation producer who has to produce high quality animation with low cost and individual creator as well.

3.2 Application of Animation Lip sync technology

3.2.1 Necessity of Animation Lip sync technology

In the aspect of audience, lip sync technology directly connects with various elements of animation that consist animation such as image and word, story and sound, and music. It is tend to develop into human-based technology that formats individual sense, experience and cultural context with technique that match visual image and voice, and help it to experience animation world with playful and creative method directly and indirectly, and help to understand world, oneself, and others and to communicate with.

In industrial technology aspect, there is technology like <lip sync animation offering method with real time voice recognition> which is registered patent of domestic company, it has somewhat complicated process and method with 5 step process starting with changing to digital type voice data, however, it is the method that offers lip sync animation with real time voice recognition, it is utilized as simple voice information service using web based cyber helper, thus it has distance from technology required to produce animation.

However, excellent case that is utilized in actual animation in animation production, producer and 3D character animation contents development firms` project with domestic IT technology development firm in 2005 could be found. Utilization of this technology was developed based on the fact that Korean learning tool that is provided to hearing impairment children are based on foreign software and it is inappropriate source to learn Korean language.

Practical use technique log detail process regarding need of animation lip sync will be looked into. It is technology that input real time voice of human through recorded sound, file and script information of voice, then analyze start and end time of each Korean pronunciation syllable and phoneme, and size information of each syllable pronunciation, and output that information with each image frame of available animation.

It is 'lip sync animation key-frame automatic generation method' that automatically produce key frame information by synchronizing 3D face model`s mouth movement and mouth shape to voice file based on this voice recognition technology.

From these cases, it could be known need and usefulness that enables to produce natural and realistic lip sync animation of 3D character in animation for verbal expression issue of animation lip sync.

< **Fig.2** Facial expression in Game MSG vs. Animation>

It is as an animation character lip sync automation device and method that could maximize efficiency of animation production, it pre-records script voice before starting animation in main production, choose matching mouth shape by separating consonant and vowel in script track, perfectly match mouth shape of animation character and voice of voice actor and output computer graphic animation synchronize video. It has effect that makes audience to understand the world of various characters meet from media in daily, cultural space and enable immersion of emotion and communication by enhancing perfection of animation video and enhance quality. This thesis had pre-industrial technology study on inevitable reason and purpose of lip sync technique for verbal expression of animation character. Industrial flow and vision of technique that automate animation character`s lip sync industrial technology development of animation character was looked into, and in the aspect that un-matching of animation voice and verbal expression will hinder development of animation in the future, issue of current condition and utilization of lip sync technique was looked into from current animation industry.

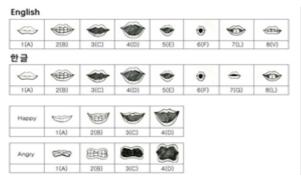### 3.2.2 Practical use of Animation Lip sync system

First, in production technique side, pre-recording method to make lip sync work is developing related technology on auto-mating device and process to utilize in animation in the future. It is as a pre-production process of one animation, it is the pre-recording process of voice actor`s voice of character accordance with script. Lip sync is pre-recording and work method, and that is work stage that produce mouth shape of character`s speaking in animation. In this stage, pre-record planned scenario script with casted actor`s voice performance, and lip sync technology device or software recognize and analyze voice file.

It is considered as part of animation about character`s facial part until now, and it has certain device feature that made method of computer that lip of model follow the moving representative dot and make lip sync automatically for computer character made into data process technology method. Computer software such as <Bland shape> and <Morph>, the data changing technique method is used for animating the face of digital character.

Core contents of production process with device that compose

lip sync technology is divided into synchronization process that enable to choose voice information to mouth shape and visualization process that play after combining data to video.

Invention of lip sync automation device and method that could be found in recent patent technology in Korea suggest realistic method that automatically realize lip sync of animation character by accurately reflecting production feature of animation and Korean pronunciation structure by using voice recognition technology.

If development of these technologies can be commercialized to technology that could be used in actual animation work production, it would have meaning on developing both animation industry and creation that use mother language and contribute on quality increase of domestic animation. Also, this possibility of using animation lip sync automation technology on work in poor production environment of domestic animation would have to provide computer recording medium that recorded program that could be operated in computer.

< **Fig. 3** Comparative table of Mouth Chart English vs. Korean for lip sync in animation by Tak hoon Kim, 2009>

In development of domestic technology, Takhoon Kim suggested in his thesis that Korean lip sync has difference of mouth shape compare to English due to vocalization that opens mouth small for all pronunciation. This issue based on expansion of animation character`s feature. Therefore, it is deeply agreed that lip sync Korean mouth chart is studied as a part of art work that visualize mouth shape by dividing dialogue into syllables rather than linguistic or phonetic side. Thus, it is considered as a point of view that suggest various applicability of animation in visual image medium as a pop culture art rather than one dimensional industrial technology with use of lip sync technology.

In animation of American major movie production, it improves audience` immersion by producing high quality animation by perfectly show character`s performance with realization of perfect lip sync, so it could perfectly realize Korean lip sync when developing domestic animation, and furthermore, if development of Korean based character`s facial animation continues, industry that could use lip sync automation will be useful in domestic purely creative 3D animation as well as movie that requires high quality CGI in the future.

As looked into production technology side earlier, it would be important to take a look at what influence would utilization of audiences` lip sync who are target to watch that object. In the aspect of audience, implication of regulation on recent American public TV animation mentioned earlier has great social and cultural impact. Bill that permits only matched lip sync with character for broadcasting of all imported animation in America would be the case. From animation <Duli> that made big flow in vitalization and development of animation in domestic market to <Pororo> and currently hitting <Lava>, the case of all these TV series animation mainly targeting children, critical mind occurs on educational influence that if mouth shape of character`s lip sync would influence language learning side.
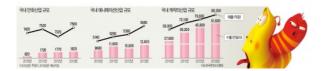
There is assumed situation that opportunity to crate high value would be increased in movie and game that realized high quality animation character. In those situations, animation producer or creator`s position accordance with progress and development of lip sync technology would have to be using this as a tool to make accurate language expression by surpassing existing concept that lip sync would just visualize talking shape of mouth. This would make opportunity to change social recognition that could re-illuminate important meaning and value of animation and it would be developed more.

4. Conclusion

After 2000, as production technology of whole world animation industry becoming 3D from 2D digital method, it used mixed type between 2D and 3D, and from 2004, it changed fast to 3D animation. With this international trend, 3D creation has been increasing in Korea recent few years and it is urgent to develop animation production technology that could reduce risk by reducing production cost and production period of animation. Especially, as the game that use real time animation character and virtual reality based digital character video production assumes live air as well as 3D production type TV animation, company tend to increase their related projects, and demand to develop animation production technology that could enhance efficiency of contents production is rapidly increasing as well.

In industrial aspect, since cartoon/animation/character industry has low cultural barrier such as linguistic, geological and racial, thus it is easy to expand to overseas and it is soft industry with great effect to create work, thus it is considered as representative advanced country type industry. It is because one hit product could expand into overall cultural contents industry such as movie, drama, game, play, musical and character, and create high value added product.

However, since domestic animation industry is produced based on character`s gesture performance by leaning too much

towards children market, thus it seems need to develop Korean character lip sync technology that could visually accurately express pronunciation expression with linguistic characteristic of Korean character in animation or detailed emotional and cultural difference is passed unnoticed.

<**Fig. 4** From Duli to Lava animation character, Economic growth prospective table by Korea economy, 2013>

As it shown in the table above, domestic animation market will record 568 billion KRW this year. Start with baby dinosaur "Duli" in 1983, there are virtual characters in the center of domestic animation like "Pucca". As commercialized animation <Pororo> that had greatest success until a recent date has been produced since 2003, 2013, currently domestic animation is growing fast such as "Robocarpoly" and "Lava".

In recent domestic patent technology of Korean cultural contents and industries, effort to develop real time lip sync animation production technology using voice recognition in idea stage or theory stage could be found. This will make Korean speaking character to have authentic speaking scene more efficiently and easily in domestic animation. Also, as effect of Korean character that can correspond in real time, Korean lip sync automation device that applied in real time animation character, and the technology that compose that was revealed in areas like movie, broadcasting, smart contents, game video, AR/VR which claims to be high technology, it is being commercialized.

However, it could be told that animation made base of creation with pure domestic animation technology is growing centered on children. This means mass media animation expand its range of influence on growing children and audience. Also, it has been developing hectic by considering movement of character as a main technology with strategy to show plausible scene in real world with exaggeration and personification, thus technology development of lip sync in domestic animation and discussion on its utilization could not be done. The point of view that just match mouth shape of character for animation lip sync like dubbing foreign movie and having pattern of modification would affect as cause of hindrance in development of animation in the future.

Thus, for linguistic problem and that influence of domestic animation that aiming world market, industrial technology development that realize character`s script and facial expression is prior project, and it could be used as core value technology with superiority of technology competitiveness that make animation Korean lip sync character based on creativity and originality of country`s culture through progress of industrial technology to success in domestic and foreign market.

In the future, like the development of device technology that automates character Korean lip sync technology of animation, change of recognition on proper use and technology of animation lip sync technology for visualization of language expression would be needed in production of domestic animation rather than just focusing on non-linguistic expression

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