

How 4D Effects cause different types of Presence experience?

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Abstract

4D is a kind of marketing term, 4D film is a system that is added to various special effects like smell and vibration in the 3D films. Because the system means a technology is added to 3D visual system (3D+1D), it is called 4D. Since 2007 4Ds introduction, 4D system added more entertainment factor like a kind of theme park gives great benefit to film production. But in 4D films, audiences experience is showed different result depending on how 4D effects applied to. When 4D effect wasnt provided in a proper way, it is acting as interference to audience. This paper showed new audiences expience in 4D film and how 4D physical effects influence the audiences expience, Presence. For this study, a total of 7 films screened in South Korea in 2010 were chosen in the various genres and indepth interviews were conducted on an audience of 7 films. The interview results were analyzed through Ground Theory, which is a qualitative analysis method.

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1 Introduction

Recently, the film Avatar was released as a 4D film in Korea and was a huge commercial success. This led to an increase in the production of 4D films and the expansion of 4D cinemas around the world. The success of Avatar shows that movie audiences desire a new experience of Presence and an entertainment experience surpassing normal films. 4D films are rising as a new business model for movie studios and distributors. Despite the potential of 4D films, related research is nonexistent. This study aims to analyze Presence experienced through 4D films and to explore how 4D effects cause different types of Presence experience. This study is significant because it carried out empirical research on Presence experienced by audiences and 4D effects. This study aims to first examine new user experiences through 4D films, and then to classify the new user experiences to types of Presence. Also, this study aims to second explore how 4D physical effects influence the different types of Presences.

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2 Theoretical Background

2.1 Types of Presence

Precedent studies have found audience experiencing Presence through watching films. As shown in Lombard and Ditton [Lombard and Ditton 1997], Presence is an illusion that a mediated experience is not mediated. They divide and define 6 types of Presence: Presence as realism, Presence as immersion, Presence as social actor within medium, Presence as social richness, Presence as transportation "we are together", Presence as medium as social actor. In other words, the effects of a film can be maximized as audience is immersed into a film to be unable to perceive the boundaries of reality and virtual reality, experiencing Presence to accept film content as reality. Especially cinemas are the most ideal environment that has the elements that highly influence Presence. When physical effects are added to this, the Presence experienced by audience is heightened further. As can be seen in Table 1 this paper redefined and analyzed the Presences experienced by audience from 4D films based on Lombard and Ditton's 6 types of Presence and analyzed.

Type	Conceptualization
Presence as realism	state of feeling instinctive and materialistic vivid stimulus through senses such as sight, hearing, and touch
Presence as immersion	state of immersing into visual image and arousing curiosity and imagination of user
Presence as social actor within medium	state of communing with virtual characters through empathy
Presence as social richness	state of feeling emotional and warm human interaction with other users through the participating system
Presence as transportation "we are together"	state of feeling being there together through the medium and obtaining opinion agreement or same response
Presence as medium as social actor	state of users sharing their response of the media with other users as social actors

Table 1: Types of Presence.

2.2 4D Film Environment

KOCCA [KOCCA 2010] explains that 4D Film Environment in Korea as follows Figure 1.

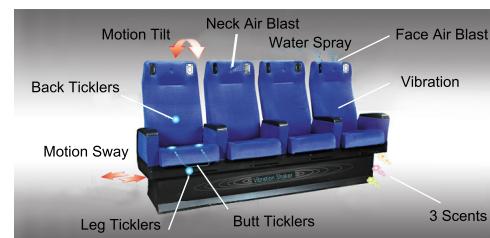


Figure 1: 4D Seat

This paper define and analyze 9 effects in 4D Environment: Air/Vibration/Water/Smell/Motion Control/Leg Tickler/Back Tickler/Butt Tickler/Light into physical effects of 4D films based on KOCCA [KOCCA 2010].

Type	Explanation
Motion Control	seat drop, tilt, sway of the seat to reproduce acceleration and actual movement
Vibration	vibration using a vibrator attached to the seat
Air	emission of compressed air near the face and neck area or overall wind in the cinema
Tickler	feeling touched or nudged by a leg tickle, back tickler, butt tickler
Water	feeling sprayed with fine water using face air blast or water spray
Smell	smell or fragrance in the whole cinema using scent machine
Light	various effects using lights installed on the walls and ceilings of the cinema

Table 2: Physical Effects of 4D films.

3 Method of Research : Indepth interview

For this study, indepth interviews were conducted on an audience of 4D films. 35 participants (16 male, 17 female) who had visited the 4D cinema at least twice were selected for the interview. A total of 7 films were chosen in the genres of action thriller, horror, romance, science fiction, and animation for analysis of 4D films. The survey questions of the indepth interview were composed focusing on the Types of Presence and 4D effect in 4D films. Each interview lasted 1-1.5 hours.

4 Analysis

The interview results were analyzed through Ground Theory, which is a qualitative analysis method. We transcribed all voice data to text data. The interview script was grouped by 4D effects and attempted to clarify any connection between the 4D effects and each types of Presence. In grouping process, analysis was performed on how physical effects of 4D films influence the type of Presence experienced by the audience. As can be seen in Figure 2 this paper found out experience proportion of audiences as each Presence through Indepth interview.

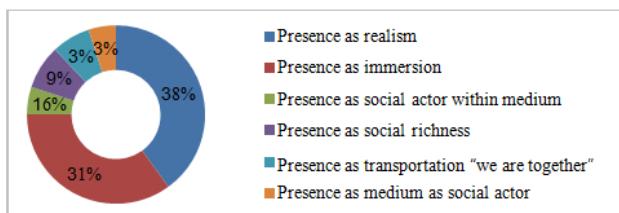


Figure 2: Proportion of Presence Experience.

As can be seen in Table 3 this paper found out how physical effects of 4D films influence the type of Presence.

B A	Presence as realism	Presence as immersion	Presence as social actor within medium	Presence as social richness	Presence as transportation	Presence as medium as social actor
Motion Control	31%	21%	45%	23%	55%	15%
Vibration	14%	18%	19%	-	10%	8%
Air	19%	27%	5%	-	-	8%
Back Tickler	9%	1%	14%	23%	-	8%
Leg Tickler	4%	3%	3%	23%	3%	15%
Butt Tickler	-	9%	-	-	-	-
Water	11%	7%	6%	8%	13%	23%
Smell	9%	10%	8%	15%	19%	15%
Light	3%	4%	-	-	-	8%
Total	100%	100%	100%	100%	100%	100%

* A: 4D Physical Effects / B: Types of Presence

Table 3: 4D Physical Effects cause different types of Presence.

5 Results of Analysis

5.1 Presence as realism

According to analysis results, the type of Presence that is most influential as an audience is watching 4D films is Presence as realism. In other words, through 4D films, audiences experience Presence that is realistic and vivid. This coincides with the purpose of 4D films that reproduce scenes in films through various senses contrary to existing films which only provided visual and auditory experience. 4D effects that are most influenced by suitability were Motion Control/Vibration/Air/Smell.

"In the car chase scene, the movements of the seat matched the image so the scene felt real. This seems to apply as movements normally experienced in life are effectively reenacted in the car chase scene."

One study participant who watched "Haunters"

- In the film "Haunters", the audience accepted the well-matched Motion Control effects as vivid stimulus. Movements experienced in everyday life were reflected through this effect, so audiences showed heightened experience of Presence as realism by recalling everyday memories.

"In the scene where a gas gun was used in a fire, an incredibly strong stream of wind was blown at us. It seemed to suit the scene well because it was a sharp wind, unlike the natural wind from before."

One study participant who watched "Haunters"

- Air effect was provided in the same intensity as the wind in the scene so the audience could experience heightened Presence as realism.

As shown in Lombard and Ditton [Lombard and Ditton 1997], social realism of content makes experience different Presences. That is to say content is more realistic, people get more Presence. But this study showed interesting result. Action thriller and horror films have realistic content, audiences of these films felt experience heightened Presence as realism. Animation and science fiction films have less realistic content, but contrary to expectations,

audiences of these films felt experience more heightened Presence as realism. In less realistic content case, if 4D effects are provided appropriately, audiences can feel content of imagination like real and then experience heightened Presence. So, Motion Control effect reproduced hero experience and Smell/Water effects reproduced scene environment are mostly affected this Presence.

"In animation can feel it is possible to exaggerate the situation. For example, hero go flying to the moon...etc. I think animation is possible to appropriate 4D effect more. Wind effects and moving chairs often come out seems to be an affordable animation genre."

One study participant who watched "**Despicable Me**"

"Thriller film is suitable to, 4D effects. Thriller is more startling than fun. The chair is moving and effect of the wind coming make me more surprise. It was well matched the purpose watching films, so I was better."

One study participant who watched "**Midnight F.M.**"

5.2 Presence as immersion

The second most heightened experience of Presence gained by the audience of 4D films was Presence as immersion. This presence type is an experience that uses 4D effects to arouse the curiosity and imagination of the audience to immerse them in the film. 4D effects of Vibration/Air/Motion Control mostly affected this Presence.

"In the flying helicopter scene, a wind was blown into the cinema. Since it was a gentle wind throughout the cinema rather than a strong wind, I felt happy, as I felt I were in the world of the avatar and it was easy to be immersed in the movie."

One study participant who watched "**Avatar**"

- In the film "**Avatar**," the Air effect was provided in an appropriate intensity to the scene and audience could experience heightened Presence as immersion.

"When the avatar took a bite out of the mysterious fruit, I thought it would smell of a mysterious fragrance never experienced before. However, an air freshener was sprayed in the cinema and it did not suit what I had imagined. It was a shame because I felt my imagination being restricted."

One study participant who watched "**Avatar**"

- In the film "**Avatar**," the fragrance of the "Smell" effect did not match the anticipated fragrance of the scene, so it impeded the audience from immersing in the film's mysterious atmosphere. Especially, smell has characteristic that cannot control lasting time of scent. So the audience could not experience heightened Presence as immersion.

"In the shot scene, I felt prodding effect hips in the chair. That was so ridiculous because a man was shot into chest in the film. The shot of the area was so different. Rather effect of beating back seems to more realize."

One study participant who watched "**Saw 7**"

- In the film "**Saw 7**," when a man was shot, Tickler effects applied to completely different areas like Butt Tickler, so acting as interference to Presence as immersion. Audience was ill at ease and repulsed by 4D effects such as Back Tickler and Leg Tickler because it is an unfamiliar effect.

"The effect I most disliked was the water. I did not like it because it was water directly sprayed on my face. Having water splashed on my face when I am not prepared actually interfered with watching the film."

One study participant who watched "**Saw 7**"

- In the film "**Saw 7**," the Water effects were used for scenes where blood splattered, but this effect was frequent and mostly directed on the audience members' faces, triggering an unpleasant response and acting as interference to Presence as immersion.

"The repetitive movement of the seat made it possible to predict, 'Oh, the seat is going to move again in this situation and vibrate' while watching the film, so it interfered with immersing into the film."

One study participant who watched "**Avatar**"

- Audiences that had prior knowledge about Motion Control effects were able to anticipate movement, which interfered with immersion.

"I think 4D effects are helpful in watching the film but it seems to decrease immersion into the story. However, when we choose to go to a 4D film, it is to experience the film through effects rather than be deeply immersed into the story, so it was not an interference."

One study participant who watched "**Despicable Me**"

"The moments that interfered with immersion were when movements suddenly started. In some scenes the seat moved and not in others... That interfered with immersing into the film. It was not a continuous movement but a disconnected movement, and it was confusing to have movement matching the scene and then not."

One study participant who watched "**Avatar**"

5.3 Presence as social actor within medium

When the scene was shown from the viewpoint of the character and Motion Control effects coincided, the audience empathized with the character and experienced strong Presence as a social actor within the medium. It was affected more by 4D effects that reconstruct movement, such as Motion Control and Vibration rather than those that reconstruct space such as Air and Smell.

"The camera angle moved with the fighter plane and so did the seat. Thus it was more comfortable and realistic, and I felt the effect and scene were well suited."

One study participant who watched "**Skyline**"

- In the film "**Skyline**," the point of view of the film and movement of the audience due to Motion Control effects coincided, which led the audience to experience heightened Presence as a social actor within the medium.

"In the flying Ikran scene, the Ikran leaned to the right, but my chair leaned to the left in the opposite direction. When my viewpoint, the Ikran's viewpoint and direction of my chair are different, I felt I were not to be immersed in Jake anymore."

One study participant who watched "**Avatar**"

- In the film "**Avatar**," the consistency of viewpoint was not match. When the viewpoint of screen and direction of motion control are different, it was acting as interference to Presence as a social actor within the medium.

5.4 Presence as social richness

In the 4D film, the audiences showed following phenomenon. The audiences wanted to share and converse with the next person and they wanted to look around and listen to the other audience's reaction. This is the audiences experienced strong Presence as social richness. Motion Control effects also appeared to be the typical effect that induces Presence as social richness. This seems to be be-

cause seats in the cinema are connected and Motion Control effects are not felt individually but rather in unison with audience members on each side.

"In the rollercoaster scene, I could hear cheers from other audience members. I cheered with them. It was more realistic and fun because the seats moved together and people showed the same reaction. Roller coasters are more enjoyable when there are a lot of people like in the theme parks."

One study participant who watched "**Despicable Me**"

"It's fine to see normal films alone, but 4D films with seat movement and effects are more fun when there is the enjoyment of sharing and talking with others. Films can be watched alone but I want to talk about the effects with friends such as 'Hey! The chair moved~ 'There's wind!', and if I was watching a 4D film alone I think it would be awkward and dull."

One study participant who watched "**Haunters**"

5.5 Presence as transportation "we are together"

From the responses of other audiences, the Presence as transportation, which emphasizes identical response and sympathy and the feeling of connectedness is experienced. The experience of Presence as transportation "we are together" was strong especially in the cases of animation, science fiction and action films. 4D effects of Motion Control/Smell mostly affected this Presence. An interesting point in this Presence was that audience members preferred to watch 4D films with others rather than alone. It is as if watching 4D films has become an active entertainment experience like theme parks, and audience members prefer to be together with many others.

"I usually don't watch animations in the cinema. The plot is predictable. However, this was really fun. The chair was moving in all direction. It feels like I have been to a theme park and we all said it was fun during the entire film. I think I should definitely watch animations in 4D from now on."

One study participant who watched "**Despicable Me**"

"I like it when there are many people when watching 4D films. When I am having fun and laughing at a scene, it affects my emotions if others are laughing and having fun as well. 4D films seem to be more enjoyable when it is noisy and crowded rather than quiet. I don't want to be alone when the seat is moving."

One study participant who watched "**Despicable Me**"

5.6 Presence as medium as social actor

This type is a Presence where audiences share their response to the 4D film with other users as social actors, sharing their experience of 4D effects with other people. 4D effects of Water/Motion Control mostly affected this Presence. This effect was frequent and mostly directed on the audience members faces, triggering an unpleasant response. Especially women worried about their makeup and clothes.

"We talked about the 4D effects. Realistic moving chair... in the scene knife stab, I was really surprised. Friend was same. And we talked about water. Is it clear water? I hope so. It was unpleasant because water entered my mouth."

One study participant who watched "**Despicable Me**"

6 Conclusion

The results of this study show that audiences of 4D films experience various Presences through audio-visual images and interaction of 4D effects provided from the film. If effects such as Motion Control/Vibration are applied at the suitable timing of character movement, the audience experiences heightened Presence as realism and Presence as immersion. Also, when effects of Air/Smell/Water are provided in suitable intensity and frequency to reconstruct similar environments with the film scene, the audience experiences vivid reality as if they are in the scene together. For the audience to experience heightened Presence as immersion, the comfort of the user environment should be considered. In the case of Water effects, there is a need to alter spray areas to decrease displeasure or adjust the spray strength. When there is repulsion from unfamiliar effects such as Back Tickler and Leg Tickler, alternative effects should be considered for similar effects. To experience Presence as social actor within medium, the camera needs to be from the viewpoint of the character, and Motion Control effect movements of the audience and the movie scene need to coincide. There is a need to consider whether viewpoints of all the characters will be applied and how strength of Motion Control effects can match the movement in the film.

Presence as social richness, Presence as transportation "we are together" and Presence as medium as social actor are all influenced commonly by Motion Control effect. Especially when the audience strongly experiences Presence as immersion and Presence as realism through Motion Control effects, they experience Co-experience of Presence that they want to share and converse with the next person about their experience and want to check the same reaction to the other audience by 4D effects. This means that films are moving from a level of personal appreciation to collective entertainment, where feelings and sensory experiences are shared. Furthermore, since the audience prefers to watch 4D films with many others rather than alone, many potential audiences will go to cinema when Co-experience of Presence is achieved through suitable Motion Control and other 4D effects.

The limitations to this study would be that it was conducted on an audience of one nation (South Korea) and that the rate of 4D effects provided in the selected films was not identical. Despite these limitations, this study shows empirically that 4D films give various Presences through a range of sensory stimuli different from the current film experience. Since this study shows concretely experiences and reactions of audiences about application of 4D effects, this study may be helpful to various 4D entertainments production in the next.

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