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VR Noir: An AFTRS Applied Innovation Research Project

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The *VR Noir* Experiment: Exploring Format and Interactivity for Human-Centred Presence in an Interactive Virtual Reality Narrative

Executive Summary

In 2016, the Australian Film, Television and Radio School (AFTRS) partnered with Sydney-based virtual reality (VR) production house, StartVR, to go beyond the forms of storytelling employed in conventional screen formats by testing the boundaries of narrative in a VR environment. The key aim of the project was to create a narrative experience in VR by interrogating all aspects of the medium.

Industry practitioners, lecturers and students were recruited to employ a specifically designed research strategy: a framework of technical and creative questions applied to an iterative methodology that tested traditional filmmaking practices across the VR pipeline.

The end result is *VR Noir: A Day Before the Night*, an 18-minute pilot episode delivered in VR. The experience is a noir-inspired detective thriller set in a gritty urban Sydney and created using 360-degree, live-action, stereo, cinematography and computer-generated visual effects. At times, the viewer plays the lead character and interacts with the narrative by using game mechanics in a branching narrative structure to make choices based on their emotional response. At other times, the viewer reverts to a third-person observer.

The project was launched to the public as part of the Vivid Sydney 2016 program and has received recognition for innovation (Runner-Up: Most Innovative VR, Proto Awards 2016, Los Angeles). *VR Noir* is distributed for Samsung Gear VR, Google Cardboard, Oculus, iOS and Android.

Summary of Findings

THE KEY FINDINGS AND RECOMMENDATIONS OF THE
VR NOIR PROJECT ARE:

1) Format: The *VR Noir* story was crafted within the capabilities of technology at the time. The findings suggest that VR storytelling presents significant challenges to the control of narrative exposition and, by extension, the capacity to tell a story in the immersive space. In practice, a symbiotic relationship evolved in *VR Noir,* with technology serving story and story being tailored to technology.

2) Interactivity: The combination of game mechanics and a branching narrative facilitate interactivity within *VR Noir.* Achieving the right balance between interactivity and narrative in the immersive VR space was found to be critical. Audience feedback indicates that the choice points required by the game design sequences in *VR Noir* threatened to override the immersive nature of the narrative experience.

3) Production: Using a research strategy that interrogated time-honoured filmic principles in order to deliver innovation of new ones proved to be successful. It is recommended that the principles of traditional filmmaking continue to be analysed and methodically adapted to the fast-changing pace of the emerging entertainment technologies. An example of this is the significant benefits of shot-by-shot capture in *VR Noir,* which achieved high levels of control over performance, timing, position and lighting within a VR work.

4) Audience Engagement: As a measure of success, the *VR Noir* project draws on an audience engagement survey of 181 participants from the Vivid Sydney 2016 *VR Noir* launch. The statistical findings show that *VR Noir* is a distinct entertainment experience and that participants favour some specific creative and technical components over others.

The *VR Noir* project demonstrates that VR technology has the potential for extraordinary entertainment experiences of high production value, which may have a greater impact than any other platform.

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A new approach to VR filmmaking

Introduction

Virtual reality (VR) is not new (Choi, Jung & Noh, 2015; Grau, 2003; Rheingold, 1992); however, with the vastly improved processing capacities now available, more recent projects are exploring ways to reimagine the VR medium for contemporary audiences. In 2016, the Australian Film, Television and Radio School (AFTRS) partnered with Sydney-based VR production house, StartVR, to go beyond the forms of storytelling employed in conventional screen formats by testing the boundaries of narrative in a VR environment.

The key aim of the project was to establish a format for narrative VR and develop innovative techniques for a new human-centred, immersive storytelling medium. Industry practitioners, lecturers and students were recruited to employ a specifically designed research strategy, consisting of a framework of technical and creative questions applied to an iterative methodology that tested traditional filmmaking practices across the VR pipeline.

The end result is *VR Noir: A Day Before the Night*, an 18-minute pilot episode delivered in VR. This paper presents the intentions of the project, its provocations, methods and findings, and makes recommendations for future research. The project findings present a strong argument for the value of storytelling in the VR medium, which will be integral to reaching new audiences.

Audience
Engagement Data

To assess the outcomes that the project was designed to explore, this paper also draws on results from an audience engagement 'bookend' survey of a 181-participant sample group from the Vivid Sydney 2016 *VR Noir* launch. This consists of an Expectation Survey undertaken by respondents just prior to experiencing *VR Noir* and an Effect Survey undertaken immediately after.

The *VR Noir* Expectation Survey contains 10 questions: 1 qualitative and 9 quantitative, including multiple-choice, multiple-answer, open-ended and short-answer questions. The questions were designed to gather information about the participants' profile, their aesthetic and spatial preferences and expectations, and the extent of their prior engagement and familiarity with various entertainment mediums.

The Effect Survey contains 12 questions: 1 qualitative and 11 quantitative, including scaled, multiple-choice, multiple-answer, open-ended and short-answer questions. The questions were designed to capture first-response information about the participants' *VR Noir* experience, including technical efficiency, aesthetic and spatial preferences, immersive narrative impact and retention.

The statistical findings show that *VR Noir* is a distinct entertainment experience and that participants favour some specific creative and technical components over others.

Project Provocations/
Research Questions

The research framework of the *VR Noir* project defined a set of exploratory provocations against two key areas of inquiry: What is the right format for VR, and what is the participant's role in VR? These provocations or research questions surfaced in early development sessions with the key collaborators.

A review of existing forms is a useful starting point for the first question. Cinema is predominantly a feature-length concept for passive engagement. It occurs in a room where people sit for a period of time and look in the same direction to watch the same thing at the same time, as a shared experience. Television has changed format, moving towards multi-part, long-format season arcs for a relatively passive engagement. It is experienced individually or as a group, mainly in domestic or commercial settings. In the interactive space, formats vary for console games and mobile games, and the audience experience is generally more interactive but not immersive. The *VR Noir* experiment posits that VR is a combination of all these formats; heavily about visual aesthetics, where a participant's visual perception is critical to the experience. Consequently, key filmmaking considerations are framing, fidelity and frame rate, as well as design, production and authenticity for a physiological sense of presence.

The second key question explores the role of the viewer in VR. In cinema and television, the audience is invisible and the audience role is relatively observational, with no possible impact on what is happening. Aligning with the position that VR is a '...more direct, intuitive channeling of information through the senses' (Lauria, 2001:1), the *VR Noir* experiment suggests that the VR participant enters into an immersive state and relies on a complex network of physiological and psychological stimuli to understand their place in that environment. One of the most significant considerations for immersive content design is that, in the immersive state, participants can also potentially experience feelings of isolation; without purpose or agency, they can lose interest and seek to leave the space.

These two key areas of inquiry generated the following set of provocations for the project:

1. What is the role of narrative in VR? How will story contribute to audience engagement over and above concepts of presence and motivations derived from game mechanics?
2. Can 270-degree (or less) shooting techniques offer a satisfactory immersive viewer experience?
3. What types of cameras and shooting techniques offer best results?
4. How is perspective important in VR with relation to first-person and third-person positioning of the audience?
5. Can the design aesthetic of the film support stylisation and abstraction without affecting VR presence?
6. How do editing and concepts of montage change within VR? Which techniques work and which do not?
7. How do interactive techniques such as branching narrative models affect the efficiency of the production?
8. How does character gender affect VR when the audience is asked to play a role? Does this change for players depending on their own gender?
9. How can we use camera and compositing technology to enable close-up shots in VR/360? Will this help or hinder concepts of presence for the viewer?

Method and Experimentation

This section will outline each provocation using a three-phase structure: what was known, what method was used to explore the unknown, and what the findings were. It will be followed by a discussion of findings in light of the two key areas of inquiry.

WHAT IS THE ROLE OF NARRATIVE IN VR? HOW WILL STORY CONTRIBUTE TO AUDIENCE ENGAGEMENT OVER AND ABOVE CONCEPTS OF PRESENCE AND MOTIVATIONS DERIVED FROM GAME MECHANICS?

The starting point for the project was to acknowledge VR filmmaking as a previously established concept with story as the lead component in existing VR, such as Stenger's Angels (1989–1991). From there, practitioners worked to drive stronger engagement in the narrative by introducing subtle interactive techniques, including gaze-activated clue reveals. Experimentation established that story is still the master (as with other screen content), but specific game techniques within immersive narrative experiences provide an opportunity to further engage audiences.

CAN 270-DEGREE (OR LESS) SHOOTING TECHNIQUES OFFER A SATISFACTORY IMMERSIVE VIEWER EXPERIENCE?

At the time the project commenced, most VR projects were only made in 360 degrees. Practitioners introduced entire 'montage scenes' that had 150 degrees or less of activity. They also developed the 'rooftop scene' to have focused areas that were less than 360 degrees. The audience engagement Effect Survey results show that when VR is not in 360 degrees, while it is important for a sense of presence, it indicates a more passive mode of consumption. As shown in Figure 1, the most popular spaces with this study's sample group are: 'Rooftop and Beyond' at 39.6 per cent; 'The Apartment' at 26.2 per cent; 'The Detective's Office' at 14.4 per cent and 'all of them' at 7.5 per cent. Less favoured spaces in *VR Noir* with this sample group are: 'The Apartment Windows' at 5.9 per cent; 'Montage: Walking the Streets' at 3.2 per cent; 'Opening: Office Block/City Scape' at 2.7 per cent; and 'none of them' at 0.5 per cent.
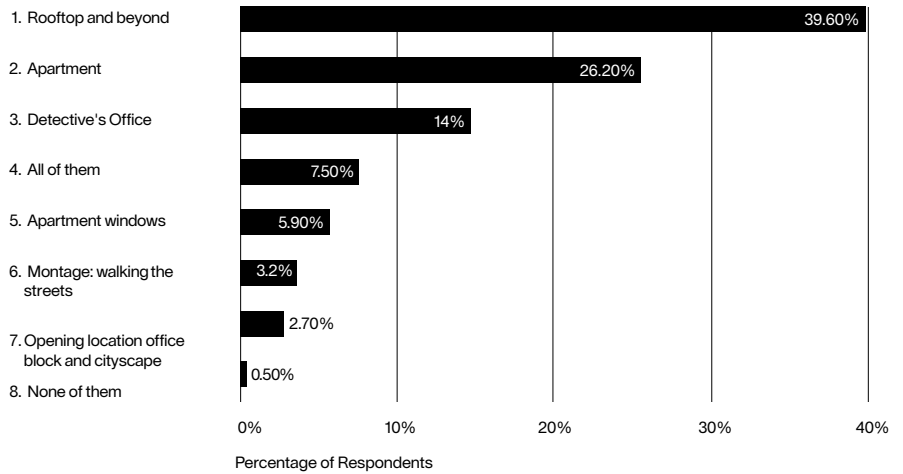
1. Rooftop and beyond	39.60%
2. Apartment	26.20%
3. Detective's Office	14%
4. All of them	7.50%
5. Apartment windows	5.90%
6. Montage: walking the streets	3.2%
7. Opening location office block and cityscape	2.70%
8. None of them	0.50%

Percentage of Respondents

Figure 1. Survey percentages representing preferred immersive. 'spaces' in *VR Noir*.

WHAT TYPES OF CAMERAS AND SHOOTING TECHNIQUES OFFER BEST RESULTS?

This was a significant unknown at the commencement of the project with most rigs being a combination of existing traditional cameras in an array. As shown in Figure 2, practitioners built a rig by putting two Blackmagic studio cameras into an array to create a stereo pair: forward facing with fisheye lenses. One of the key challenges of the project was to achieve excellent stereo results despite the technical limitations at the time, that is, the ideal rig being one unit of multiple lenses. At an early stage, it was decided not to attempt to capture the dramatic action simultaneously with a multi-lens array, but rather to capture 16 'wedges' or 'slices' of the action separately and assemble or 'stitch' them into a 360-degree image in post-production. Although this added a substantial production overhead to the process, it permitted far greater control over the capture of separate elements.

The development of this production strategy, of capturing simultaneous dramatic action in wedges not filmed simultaneously, is a primary example of the way the team applied techniques from traditional filmmaking to create a narrative experience in VR. It is common practice in creating traditional screen drama for a number of 'shots', each of which portrays a different angle of view of a sequence of continuous action, to be captured separately and edited together, according to accepted film vernacular, creating the illusion of continuous action.

To date, the defining property of VR was that the full spherical field of view is captured simultaneously: this is what produces the convincing effect of a complete and plausible world. This project sought to harness the significant benefits of shot-by-shot capture: achieving much higher levels of control over performance, timing, position and lighting in a VR production. For example, the post-

production team now had the option to shift the timeframe of one character's performance in relation to another character's performance, or to use alternate takes of one performance, which is not possible in real-world multi-array VR capture.
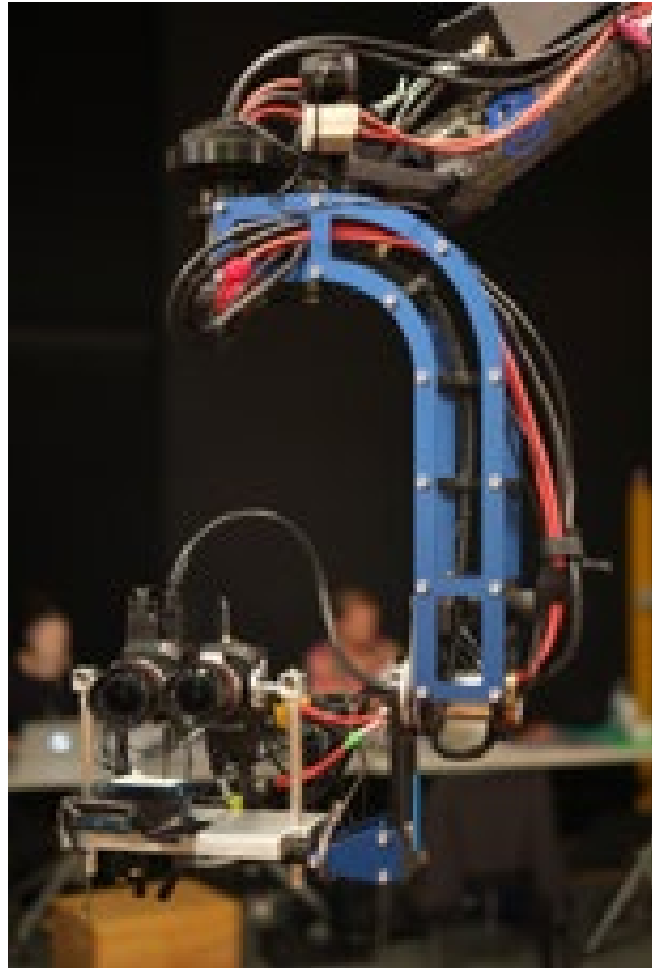

Figure 2. The camera rig built by practitioners for *VR Noir*.

HOW IS PERSPECTIVE IMPORTANT IN VR WITH RELATION TO FIRST-PERSON AND THIRD-PERSON POSITIONING OF THE AUDIENCE?

At the commencement of the project, most VR films were in third person with the audience as a passive observer. *VR Noir* practitioners experimented to place the audience in first-person perspective throughout the episode to generate a greater sense of character engagement and tension, as in the final 'apartment scene'. The method included switching to third person at certain points for specific reasons: to avoid a jump cut or indicate a change of consumption mode, as with the montage. Figure 3 shows the method used to connect interactivity with perspective and repositioning. The results demonstrated that using first-person perspective is a highly effective technique to create meaning and give the individual 'agency' within a scene. In addition, using third person provides a necessary counterpoint to reposition the individual and provide essential context for the narrative.
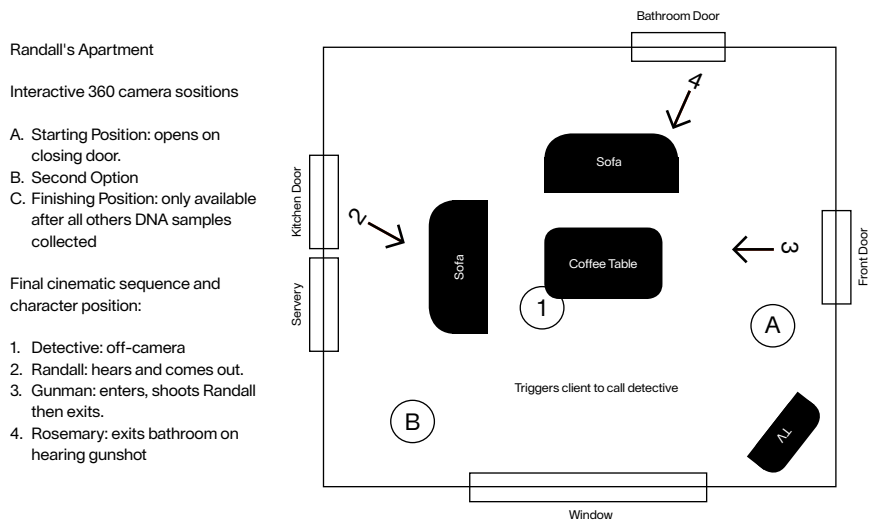
Randall's Apartment

Interactive 360 camera sositions

A. Starting Position: opens on closing door.
B. Second Option
C. Finishing Position: only available after all others DNA samples collected

Final cinematic sequence and character position:

1. Detective: off-camera
2. Randall: hears and comes out.
3. Gunman: enters, shoots Randall then exits.
4. Rosemary: exits bathroom on hearing gunshot

Bathroom Door

Kitchen Door

Servery

Sofa

Sofa

Coffee Table

Front Door

Triggers client to call detective

TV

Window

Figure 3. Plan showing the method of connecting interactivity to perspective.

CAN THE DESIGN AESTHETIC SUPPORT STYLISATION AND ABSTRACTION WITHOUT AFFECTING VR PRESENCE?

The starting position for the project was that a sense of the familiar would assist the viewer to transition to the immersive experience of VR. Practitioners decided to use the familiar noir genre and avoid using overly abstract elements to provide more realistic spatial and environmental representation. Although this approach for the *VR Noir* project contributes to potential design aesthetic principles for VR, only a broad range of future immersive content development will reveal how audiences cope with various design aesthetics.

Authenticity of space also contributes to the feeling of presence. The audience engagement survey asked if the objects in the *VR Noir* space seemed real. The objects in *VR Noir* are approximately 50 per cent 'real' (live action) and 50 per cent computer generated (CG). The results from the highest to lowest percentages are: 'Mostly real' at 43.6 per cent; 'Yes' at 32.4 per cent; 'Some seemed real' at 11.2 per cent. These results are favourable, indicating that, for the most part, objects in *VR Noir* construct a plausible version of reality.

HOW DO EDITING AND CONCEPTS OF MONTAGE CHANGE WITHIN VR? WHICH TECHNIQUES WORK AND WHICH DO NOT?

One of the most significant challenges of the project occurred in post-production. Traditional editing techniques rely on tightly controlling where the audience is looking; however, with VR this is not possible. Practitioners used a variety of cuts and edit points to build dramatic engagement and hide jump cuts. Interactivity and narrative context provided a way to direct audience focus. The findings demonstrate that employing a range of techniques to direct audience focus, and aligning zones of focus across the edit points, work to maintain audience attention. The 'office scene' serves to demonstrate where the use of branching narrative and

interactivity in the form of dialogue selection directs audience attention towards the client and away from a potentially jarring cut.

WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF INTERACTIVE TECHNIQUES SUCH AS BRANCHING NARRATIVE MODELS?

A key aim of the project was to achieve innovation by including interactivity within a VR experience. Practitioners experimented to combine a branching script format with interactivity, and game mechanics were built into the film to enable participants to choose the direction of the narrative through gaze activation techniques. As shown in Figure 4, the set of narrative choices within the scene allows the individual to take on the role of a character and have an impact on the scene, but not to determine how it ends. There were both advantages and disadvantages to the branching narrative technique. A key advantage is that the branching narrative is a very powerful narrative tool for audience engagement. The audience engagement survey results indicate that audiences liked selecting the way the lead character could respond: 'Yes' at 53.8 per cent;
'Yes, but I wanted to experience both responses' at 23.7 per cent; 'No' at 13.4 per cent; and 'Other' at 9.1 per cent. The sum of the two positive responses at 77.5 per cent indicates that this interactive aspect of *VR Noir* is a preferred component of the overall experience. The key disadvantage of branching is that it increases production overheads and costs without providing additional benefit for the audience in terms of screen time.
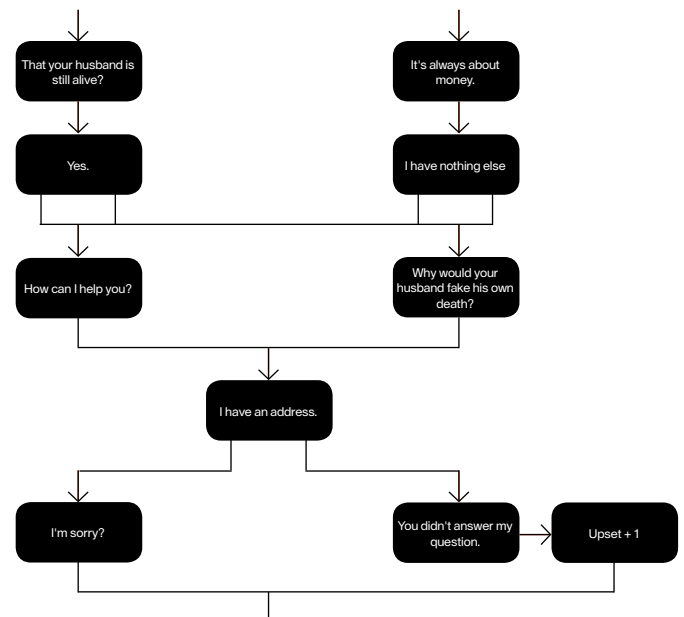

Figure 4. A sample of the branching narrative script for *VR Noir*.

HOW DOES CHARACTER GENDER AFFECT VR WHEN THE AUDIENCE IS ASKED TO PLAY A ROLE? DOES THIS CHANGE FOR PLAYERS DEPENDING ON THEIR OWN GENDER?

The technique of switching audience perspective to first person and the need for optimal authenticity of this experience raised questions around assuming gender-opposite characters and corresponding levels of audience engagement. Findings from the audience engagement survey indicate that audiences were able to connect with the main character (female) and therefore gender and gender-opposite play do not seem to have a impact on audience engagement. Respondents were asked what they thought about playing the lead role at times and switching to the first person. More than one response could be selected, and 187 participants selected 253 responses in total. The results from the highest to lowest percentages are: 'I liked it' at 63.1 per cent; 'I wanted to play the character more' at 28.9 per cent; 'I liked playing a female character' at 14.4 per cent,; 'I felt confused' at 10.7 per cent; 'Other' at 8.6 per cent; 'I didn't notice' at 5.3 per cent; 'I didn't like it' at 3.7 per cent; and 'I did not like playing a female character' at 0.5 per cent.

HOW CAN WE USE CAMERA AND COMPOSITING TECHNOLOGY TO ENABLE CLOSE-UP SHOTS IN VR/360? WILL THIS HELP OR HINDER CONCEPTS OF PRESENCE FOR THE VIEWER?

The starting point for the project was that close-ups are not possible in VR due to the wide angle nature of 360-degree cameras. Practitioners used a pair of conventional cameras to capture stereo images, which were composited with either virtual sets as with the 'office scene', or traditional shots as with the 'montage scene'. The results demonstrate: 1) close-ups are possible, but not necessarily in expected ways; 2) audio can take on the role of a close-up in VR; and 3) direct eye contact with a character can also have the effect of creating a sense of close or intimate contact.

The Story

VR Noir: A Day Before the Night. Veronica Coltrane, a Sydney-based private detective forced out of the police department, is in need of work to relieve mounting debts and to face an ongoing custody battle for her daughter. A woman approaches Veronica to take on a case: the woman suspects her husband has faked his death and changed his identity for insurance purposes. Veronica's task is to prove he is still alive. In a thrilling narrative twist, Veronica is drawn into a conspiracy that leads to murder.
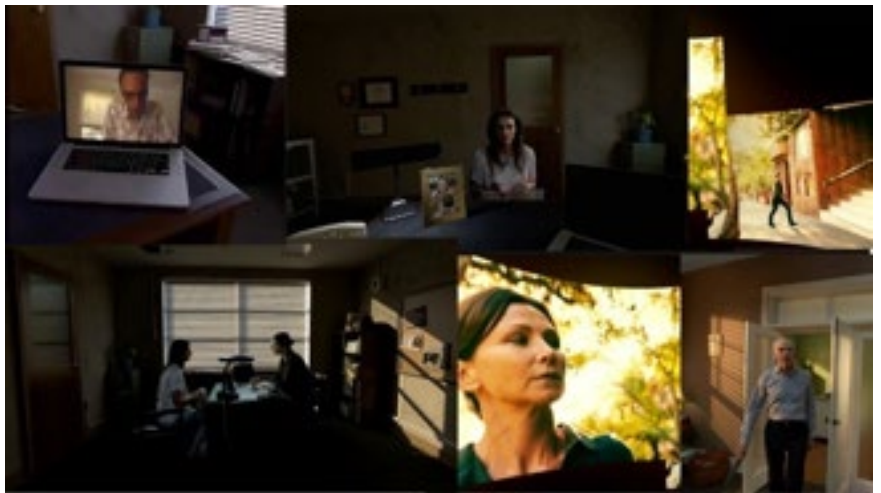

Figure 5. Scenes from *VR Noir: A Day Before the Night.*

Discussion of Findings

The *VR Noir* research findings will be discussed in light of three intersecting topic areas on the format and the role of the audience: interactivity, narrative and perspective.

There is a limit to how long passive, 360-degree video can maintain interest and engagement. The inclusion of interactive scenes within the VR experience facilitate a more active audience mode, which in turn allows for longer session times. This section will discuss how interactivity has been integrated into *VR Noir* and associated considerations, such as which traditional filmic principles to retain; the amount and level of interactivity; and the right balance of interactive and passive engagement.

The project findings show that the technique of a branching narrative included mechanically in *VR Noir* greatly enhances audience engagement. Although there were only two instances of this, the survey results indicate that it elevated the scene and the audience experience. A consideration that may explain this is the way interactivity is blended with story in *VR Noir*. When audiences select a response in this scene, the intention is to provide for the selection of a broad emotional response, not a selection of dialogue. This retains the more traditional filmic principle of learning about character through dialogue. In *VR Noir*, audiences are still surprised and informed by the dialogue that their character uses.

Early in the project, practitioners found that breaks from the interactivity would be essential because participants would need to adjust to being in a new medium and immersive space. This consideration connects the traditional filmic principle of screen time to the key research question of format. VR is an intensive experience and those moments of non-activity and observation permit a longer session time. To provide for this balance, practitioners created montage sequences within *VR Noir* using third-person 'travelling' or relocation sequences between the three main interactive scenes. Audiences are able to take respite in the montage scenes and observe scenes, shots and video. Rhythmically, this inactivity punctuates the first-person active scenes. In this format, the switch between first and third person facilitates the balance between active and passive modes of engagement.

Another main finding here is the need for audiences to be clear about what they are expected to do. *VR Noir* demonstrates that the oscillation between first and third person to facilitate active and passive modes can be achieved and is not necessarily a jarring experience. This finding supports the concept of blending interactivity and story.

Figure 6. *VR Noir* — behind the scenes

The level of interactivity within *VR Noir* is another important aspect of the project. Here, practitioners considered the concept of 'refused closure' and the impact it might have on a scene or the entire experience. Any level of refused closure represents an inherent complex aspect of gaming, where game play can affect the ability to have a story conclude. With *VR Noir*, practitioners wanted to maintain story and ensure that the level of interactivity did not override the more traditional filmic narrative experience. To achieve this, the scenes move ahead if audiences do not trigger an interactive scene marker within a set period of time. The client interview scene demonstrates this principle, where the branching narrative enables audiences to select the detective's emotional response as 'antagonistic' or 'supportive'. Irrespective of the participant's choice, the detective eventually accepts the client's case and the story progresses to the next scene. This enables all audience members to proceed through the story, irrespective of how they interact within the virtual environment. While this is not an optimal feature, results from the audience engagement survey indicate that the experience of moving through the narrative this way in *VR Noir* is seamless.

Another consideration throughout the project was to minimise audience frustration. In gaming design, this aspect has a specific quantifiable measure where audiences are challenged to a level where they can achieve, or feel like they can achieve, but are not ever completely able to fully achieve. With *VR Noir*, the rooftop scene has the potential for frustration, as audiences are able to zoom into the window if they activate the mechanics correctly, that is, to see a camera to the lower left and then gaze-activate

scenes in the apartment windows. Data shows that not all audiences understood this mechanism. For this reason, the story is still designed to move forward at 90 seconds and audiences still see an exchange between two characters through a window. This feature provides an illusion of choice, while maintaining a linear narrative arc to avoid story failure.

Taking a position that the format for any drama requires narrative to be the key element (otherwise the end result is a game with rules, like chess), practitioners explored ways that narrative could integrate with interactivity in *VR Noir*. One area of inquiry was the potential impact of interactive techniques on storytelling efficiency in a non-traditional narrative form. Game design mechanics and audience immersion in a scene enables a concept of environmental storytelling or narrative architecture (Jenkins, 2004). This suggests that the immersive space in which an audience member is placed to navigate a narrative becomes a key element of the narrative itself. In *VR Noir*, this is most evident in the final scene where the audience (in first person as Veronica) needs to move through Randall's apartment to collect DNA. During this scene, audiences move through three different positions in the room, each one getting closer and more visible to Randall, who is obscured in the next room. At the climax of the scene, the viewer is positioned in the centre of the room to witness the murder of Randall and feels close to being caught in the crossfire. Another critical plot development within this scene is revealed in the second position with the wedding photo of Randall and Rosemary. This placement implies that Rosemary's identity is in question (reinforced by dialogue overheard at this point), indicating that incorrect information is being supplied and the audience (as the detective) is probably being manipulated or deceived.

The technique of switching the audience perspective from third to first person in *VR Noir* serves both creative and technical requirements. Creatively, it allows the audience to see their character: when a line of emotional response is selected, the cut transitions so the audience sees the character they have just played and the line selected. This provides an understanding of the role being played, particularly as the character is already established through backstory in the scene set up (placement of family photographs, etc.). The switching of perspective also serves a technical purpose, in this case to conceal a jump cut that would appear in first person because there are two choices. The jump cut is a traditional media challenge that editing works to solve. In *VR Noir*, the switch between perspectives not only provides the user with narrative information, but enhances the experience and prevents discontinuation in the scene.

Figure 7. *VR Noir* — behind the scenes

Working from the premise that the format for VR is a multi-faceted combination of story and interactivity, experimentation explored what that combination should be. If there is a benefit in defining the format for VR, it is within this balancing of narrative as lead, with interactivity used to subtly engage users. The relationship between these opposing forces, essentially story and gameplay in immersive film, offers the best opportunity to refine the format for VR. Techniques such as subtle interactivity based on the concept of 'no fail states' are proving to be more engaging than passive content: attrition rates indicate that *VR Noir* audiences tend to finish the experience.[1]

Finally, in the search for a format for VR, the project achieved innovative aspects, including: the intentional oscillation of perspective for narrative purposes; the use of traditional cameras and techniques (montage) in VR; the exploration of alternative cameras with no 360-degree cameras used in production; VR branching narrative dialogue sequence and character interaction in live action; the use of Nuke Studio's CARA VR plugin for a scripted drama project; the use of stereoscopic segment shooting techniques for a live-action performance scene. These achievements have received recognition as a significant contribution to the body of work in VR innovation (Runner-Up: Most Innovative VR, Proto Awards 2016, Los Angeles).

Audience Engagement Survey

The *VR Noir* audience engagement survey (consisting of the Expectation and Effect Surveys) of 187 participants provide a measure of success for the project. The following excerpts from the Effect Survey focus on questions that elicit audience responses to the experience. One question asked how participants felt immediately after *VR Noir*, with the option to select more than one response or provide a qualitative written response. A total of 282 selections were made by 187 respondents.

Nearly all respondents who selected more than one response included 'curious' and/or 'captivated' in their selection. As shown in Figure 8, the results are: 'Curious' at 42.8 per cent, 'Great' at 31 per cent, 'Inspired' at 25.7 per cent, 'Captivated' at 24.1 per cent, 'Light-Headed' at 11.2 per cent, 'Other' at 11.2 per cent, 'Strange' at 7 per cent, 'Confused' at 6.4 per cent, and 'Flat' at 5.3 per cent.

It is clear from these results that most participants had a positive and/or interesting experience with *VR Noir*. With such a definitive result, analysis will focus on whether anomalies indicate anything of value. There are two unique responses in the qualitative data: 'bored' and 'I don't know'.

The respondent who provided 'bored' made similar responses in other questions about not liking the *VR Noir* experience at all, but did not provide any reasons. The respondent who provided 'I don't know' made similar responses in other questions including 'not sure' and 'undecided'. Two of the more nuanced options that scored very low were 'Flat' and 'Strange'. Four of the six respondents who selected 'Flat' also had problems with the functionality of the headgear, specifically focus and sound. The two respondents who selected 'Strange' also each selected 'Curious' and 'Captivated', and responded favourably to the experience in other questions.
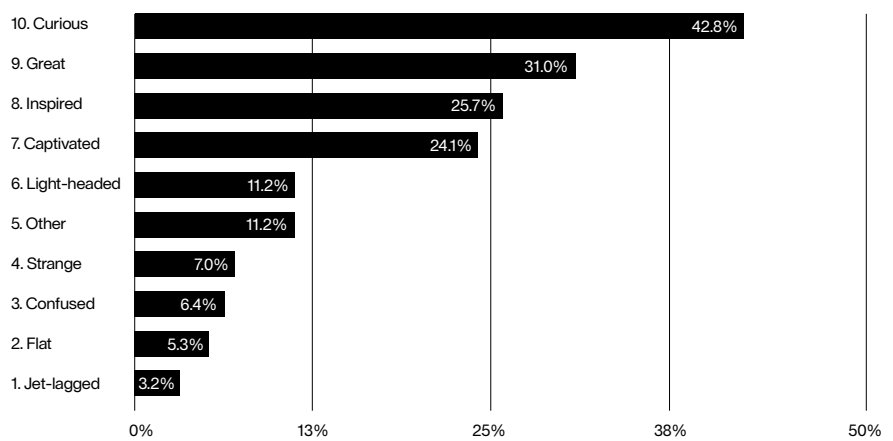
Figure 8. Survey percentages representing how respondents felt immediately after *VR Noir*.

The second opinion-oriented survey question that provides a measure of success asks how respondents felt overall about the *VR Noir* experience. This is an open-ended, qualitative question. All language used by respondents has been built into a corpus and sorted using linguistic software. The corpus contains 1520 word tokens and 584 word types. With this section of analysis, a keyword search technique will be used to show how the language used in the open-ended questions of the *VR Noir* Effect Survey compares with that of the Expectation Survey. 'Keyness' involves probability, where a word in one corpus is 'key' when it appears more often than what would be expected by chance in comparison to another corpus.

Figure 9 shows the top 12 keywords, that is, words that appear more often than would be expected by chance in the Expectation Survey, compared with the language corpus of the Expectation Survey. The highest-ranking keyword was not surprising, as respondents are reflecting and recalling something they have just done. Language in proximity includes both positive and less positive meanings, from great, beautiful and intriguing to frustrating and clunky. Other popular responses are good and great relating to ideas, experience, story, action and tech, as well as the comparative, qualifying and descriptive expressions more, first, pretty and quality. Similarly, the keyword very (ranked sixth) indicates that respondents found *VR Noir* interesting, intrigued, positive, cool and exciting.

The comparative more, ranking fourth, is informative, as a closer analysis of language shows that respondents wanted more to do, more clues, and more immersive and gaming components. One keyword stands out due to its language in proximity: but provides information for future practice. Closer analysis shows that each time but appears, respondents preface it with a positive affirmation about *VR Noir* being something new and experimental and follow it with less favourable responses: slow, unsure, confused, stilted, clunky and disappointed. As with other questions, the less favourable responses here are about the functionality of the experience rather than *VR Noir* itself.

Figure 9 lists other keywords and accompanying language in proximity that demonstrate a similar trend (i.e. positive and less favourable both occurring against a keyword): very appears with both interesting and jarring; bit appears with both great and uncomfortable. The keyword not is accompanied by language that describes a lack of something or doubt: not/smooth, not/enough, not/sure and not/properly; and would has positive or neutral language in proximity: would/like, would/make, would/prefer, would/good, would/help and would/be. Interestingly, the keywords liked and loved clearly attach to specific aspects of *VR Noir*: liked is used with interactivity, story, audio and visuals; and loved is used with interactivity, sparkly (story triggers) and control (activating the story triggers). Finally, the keyword feel is minimally accompanied by items: immersed, didn't, realistic, hard and make.

Rank	Keyness	Word	Language in Proximity
1	32.2	was	great expected cool story interesting amazing potential beautiful frustrating intriguing clunky
2	17.9	good	really quality tech action immersive pretty
3	16.7	great	initiative ideas potential experience first story entertainment fascinated more make
4	16.6	more	clues do forward wanted gaming immersive
5	13.9	but	great interesting good slow unsure confused stilted clunky CGI disappointed
6	13.9	very	interesting intrigued positive cool exciting jarring well engaging immersive closed
7	11	bit	great interesting uncomfortable blurry needed tinny realistic clichéd best
8	10	not	smooth sure usual legs enough properly
9	13	would	like make prefer good help be
10	7	liked	interactivity story everything visuals audio
11	6	loved	it interactivity sparkly to control
12	5	feel	immersed didn't realistic hard make

Figure 9. Survey results: Language used by respondents to describe the *VR Noir* experience.

Statistically, the language used by participants to describe how they felt about the *VR Noir* experience overall is mostly positive, with the most favourable descriptions being about the interactive and immersive aspects. The less favourable expressions are mostly about the functionality of the VR experience, such as problems around pace and user-orientation.

Conclusion

The introduction of interactivity in media presents some significant challenges to the control of narrative exposition and, by extension, the capacity to tell a story in the immersive space. As new media forms continue to proliferate and heritage forms evolve, alternate narrative structures may come to light for popular entertainment media.

The *VR Noir* project worked to define a potential format and to innovate compelling storytelling techniques for the VR medium. The greatest challenge was in finding the right balance between interactivity and story. The project's extensive audience engagement survey indicates that audiences favour specific technical and interactivity techniques. In fact, many respondents did not realise that it was interactive and simply felt more immersed in the story. This alone suggests that the game design in *VR Noir* was subtle enough to not override story and that the interactivity balance was at the right level.

Filmmakers rightly advocate story as master. However, in practice, the *VR Noir* story was crafted within the capabilities of the technology at the time. Interestingly, a symbiotic relationship evolved, with technology serving story and story being tailored to technology. With the pace of change, VR technology, by the very nature of the format, will influence narrative. If executed well, by drawing on time-honoured filmic principles for the innovation of new ones, VR audiences will have a future of extraordinary experiences with perhaps more impact than any other platform.

Figure 10. Scene from *VR Noir: A Day Before the Night.*

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Endnotes

1. Start VR, attrition rate statistics (2016). If audiences reach the 5-minute mark in *VR Noir*, the completion time is very high: 11 minutes and 30 seconds at optimal speed.

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