Virtual Reality Visions from Science Fiction Movies

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Abstract. Science fiction movies have been a source of entertainment for many decades, but they have also been an inspiration for many people in the science and technology domains. Science fiction is not just about entertainment: it has been recently adopted also as a speculative design approach useful for designing and reflecting on the possibilities of future technologies. In this paper, we take existing science fiction works (movies) as speculative designs to understand and reflect on the possibilities of virtual reality. We have created a database of science fiction movies, TV shows, and episodes and analysed it along the dimensions of technology, form factor, user's body position, and application domain. The result is a structured analysis of how existing science fiction movies have imagined the possibilities for virtual reality. This analysis may serve as further inspiration or for identifying research and development paths related to virtual reality.

Keywords: Virtual Reality · Science Fiction · Database · Survey.

1 Introduction

Virtual Reality (VR) technology has long captivated interest due to its transformative potential. Driven by visionary dreams, it aims to revolutionize our interaction with the digital world. Ivan Sutherland imagined an "ultimate display" where a chair would be good enough to sit in, handcuffs confining, and a bullet fatal. Such a display could be "the Wonderland into which Alice walked" [9].

Science fiction (Sci-Fi) has extensively explored virtual and augmented realities, inspiring technological advancements. Works like Pygmalion's Spectacles [18], Neuromancer [8], and Snow Crash [17] depict worlds where VR plays a crucial role. Brian David Johnson aptly describes Sci-Fi as "the playground of your imagination," a prototyping workshop testing ideas and their societal implications [10].

This paper examines influential Sci-Fi depictions of VR, supported by a database of VR-related movies and TV series. By analyzing these portrayals, we aim to understand the societal impact of VR and identify future research and development opportunities.

2 Related Work

Sci-Fi has traditionally been linked with entertainment, but recently it has been proposed as a serious design tool. Bruce Sterling introduced "design fictions" as the use of diegetic prototypes to explore future technologies and their societal impact [4]. Similarly, Brian David Johnson's Science Fiction Prototyping [10] views prototypes as fictional depictions of products, allowing emerging theories to be explored and developed further.

Blythe [3] discusses how design fictions can critically engage with and challenge assumptions about technology, offering new perspectives on potential futures. Kirby [12] explores how Sci-Fi films act as diegetic prototypes, influencing real-world technology by presenting speculative scenarios. Zaidi [19] highlights worldbuilding in science fiction as a method to envision and design new futures, integrating foresight and design thinking.

Brucker-Kley et al. [5] examine the emotional aspects of AI in Sci-Fi through prototyping, exploring how young people perceive friendships with AI, emphasizing affective computing and narrative methods to make technological consequences tangible. Bennett and Vijaygopal [2] investigate mobility and transportation futures for people with ambulatory disabilities through science fiction prototypes, illustrating how these speculative narratives can influence design and policy-making.

Schmitz et al. [15] survey human-computer interaction designs from Sci-Fi movies, relating them to current technologies and prototypes. Shedroff and Noessel [16] analyze user interfaces in Sci-Fi films from multiple perspectives, uncovering design lessons by examining input-output mechanics, aggregated interface descriptions, common gestures, and ways to make fictional interfaces feasible.

Giannotta [1] examines embodied Artificial Intelligence (AI) in Sci-Fi, connecting philosophical paradigms of mind and consciousness with future scenarios. Liz Faber's book, "The Computer's Voice: From Star Trek to Siri" [13], studies the cultural history of voice-interactive computer technology, from early fictional depictions to modern digital assistants like Siri.

While our work draws on these existing Sci-Fi analyses, at this point our aim is to present a structured examination of how VR has been imagined in Sci-Fi, rather than extracting design lessons.

3 VR Movies Database

The VR Movies Database[1] was developed to catalog and analyze portrayals of virtual reality in cinema and television. This resource aims to provide a comprehensive overview of how VR has been imagined in popular media, offering insights for researchers and enthusiasts alike.

The database includes entries from:

[1] https://www.notion.so/jorgecardoso/VR-Movies-Database-5226dc5aeb354021b4b7d030a6f4fc11

– Cinema Movies: Full-length films where VR is a central theme or technology.
– TV Movies: Made-for-television films with significant VR elements.
– TV Series and Episodes: Entire series or specific episodes focused on VR. If only one or a few episodes in a series feature VR, those episodes are included as separate entries.

For simplicity, all entries are referred to collectively as movies.

Movies are included in this database if: a) VR plays a significant role in the storyline or setting; b) the portrayal of VR contributes meaningfully to the understanding of VR technology and its implications. Movies were collected from well-known and blockbuster films due to their significant impact and recognition; recommendations from peers and experts in VR and media; unstructured searches on IMDb and other databases using VR-related keywords. In the future we plan to conduct a systematic search and analysis of VR-related movies, but in this work in progress, we report on an analysis of movies that have been collected as described.

The database currently features 57 entries: 51 movies, 5 TV series, and 1 episode. The year distribution of the movies featured in the current version of the database shows that they span the years 1973 (Westworld) to 2024 (3 Body Problem). Most movies concentrate in the 1990's (18 works) and in the 2010's (19 works) decades. The average IMDb rating for the movies in the database is 6.6 (the rating distribution can be found in Fig. 1). In terms of genre (as classified by IMDb, see Fig. 1), the five most frequent genres are Science Fiction (44), Action (35), Drama (18), Thriller (16), and Adventure (15).

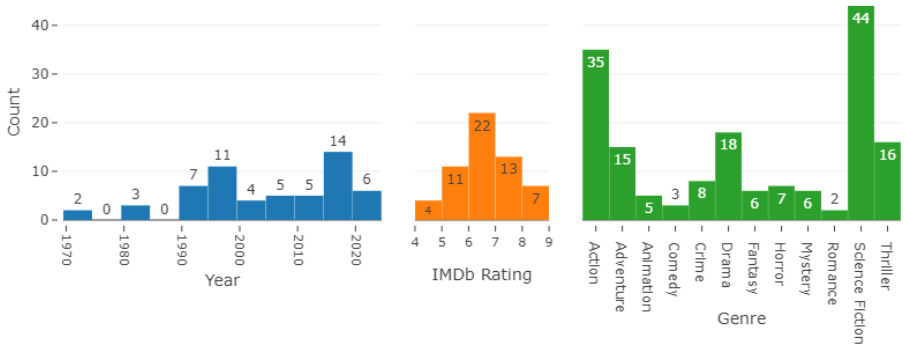

Fig. 1. Distribution of release years, IMDb ratings, and genres in the VR Movie Database.

4 VR Visions from Sci-Fi

Movies were analysed along four main dimensions: Technology, Form-factor, Body position, and Application domain (Fig. 2). The process for arriving at

these dimensions was through iterative analysis and a mix of bottom-up and top-down approaches. In a bottom-up approach, we identified individual characteristics of the VR technology depicted in the movie and then grouped those into more general dimensions (Form-factor, Body position). In a top-down approach, we specifically looked for how pre-defined dimensions (Technology, Application domain) were instantiated in the movies and what categories where depicted. It should be noted that the frontiers between the chosen dimensions and categories within those dimensions are not always clear-cut and may, of course, in some cases be subjective. Individual movies may be associated with more than one dimension/category.

Fig. 2. Dimensions and categories found in Sci-Fi movies and that form the basis of the analysis.

4.1 Technology

The technology dimension refers to the core technological solutions used for placing users in simulated virtual worlds. We classified the technology envisioned in the movies into eight types:

Robotics Physical constructions and robotic agents with AI as characters in a simulated physical world: e.g., *Westworld* (1973), *Vice* (2015), *Westworld* TV Series (2016).

Matter Projection Creating physical environments through computer-controlled matter: e.g., Holodeck in *Star Trek*.

External Sensorial Hardware Hardware targeting specific human senses: e.g., *Disclosure* (1994), *Johnny Mnemonic* (1995), *Ready Player One* (2018), *Spider-Man: Far From Home* (2019).

BCIs External Brain-Computer Interfaces affecting the human brain directly: e.g., *Brainstorm* (1983), *Surrogates* (2009), *Avatar* (2009), *The Peripheral* (2022).

Visual Signal Affecting the mind through visual signals delivered by the TV: e.g., *Videodrome* (1983), *Brainscan* (1994).

Direct Brain Tap Directly interfacing with the human nervous system: e.g., *The Matrix* (1999), *Ghost in the Shell* (1995), *eXistenZ* (1999), *Bliss* (2021).

Brainsoftware Reprogramming the brain through drugs or nanotechnology: e.g., *OtherLife* (2017).

Mind Digitization Transferring a person's mind to a computer: e.g., *TRON* (1982), *Rakuen Tsuiho: Expelled from Paradise* (2014), *Upload* (2020), *Archive* (2020).

4.2 Form-factor

The form-factor dimension refers to the physical size and configuration of the VR system, and how it is used or worn by the user. We classified the form-factor into six categories:

Rooms Room-sized systems for experiencing VR: e.g., *Star Trek: First Contact* (1996), *Assassin's Creed* (2016).

Beds and Chairs Systems requiring users to lie down or sit: e.g., *Total Recall* (1990), *Avatar* (2009), *Raised by Wolves* (2020).

Drones Mobile systems projecting images and sound: e.g., *Spider-Man: Far From Home* (2019).

Wearables Devices worn on the body: e.g., headsets, goggles, helmets, suits, gloves (e.g., *Brainstorm* (1983), *Ready Player One* (2018)).

Body Connections Systems connecting to ports on the body: e.g., *The Matrix* (1999), *eXistenZ* (1999).

Drugs VR experienced through ingestion or injection of drugs: e.g., *OtherLife* (2017).

4.3 Body Position

The body position dimension describes how the VR system is used in terms of the user's body position. We classified movies into five categories:

Suspended User's body is suspended: e.g., *Assassin's Creed* (2016), *The Cell* (2000).
Lying Down User is lying down: e.g., *Until The End Of The World* (1991), *Surrogates* (2009).
Sitting User is sitting: e.g., *Total Recall* (1990), *Inception* (2010).
Upright User is standing or walking: e.g., *Disclosure* (1994), *Ready Player One* (2018).
No Body User's mind is simulated without a physical body: e.g., *TRON* (1982), *Upload* (2020).

4.4 Application Domain

The application domain dimension characterizes the main function of the VR system as depicted in the movie. The categories include:

Communication/ Information Management VR for communication and information management: e.g., *Disclosure* (1994), *Johnny Mnemonic* (1995), *The Peripheral* (2022).
Deception VR used for deception: e.g., *Inception* (2010), *Spider-Man: Far From Home* (2019).
Empathy VR used to generate empathy: e.g., *Empathy, Inc.* (2018), *Bliss* (2021).
Entertainment VR for entertainment and gaming: e.g., *Brainstorm* (1983), *Ready Player One* (2018).
Life/Afterlife VR as a primary existence or afterlife: e.g., *The Matrix* (1999), *Surrogates* (2009), *Upload* (2020).
Long Distance Travel VR for long-distance travel: e.g., *Virtuality* (2009), *Raised by Wolves* (2020).
Healthcare and Medical VR for healthcare and medical purposes: e.g., *Until The End Of The World* (1991), *The Cell* (2000).
Punishment VR for punishment: e.g., *Altered Carbon* (2018), *OtherLife* (2017).
Remote Work VR for remote work: e.g., *Sleep Dealer* (2008), *Surrogates* (2009).

5 Discussion

The purpose of the VR Movies Database is to gather in one location information about VR-related movies. Collecting this information allows us to analyse how science fiction has envisioned VR as part of society from different perspectives. By presenting futuristic and often fantastical visions of VR, these movies generate excitement and curiosity, influencing consumer expectations. However, they can also evoke fear and ethical concerns, as seen in movies depicting VR for

punishment or deception. Understanding these influences can help developers manage public expectations and address potential fears. The creative concepts in Sci-Fi movies serve as a rich source of inspiration for VR developers. Sci-Fi continues to push the boundaries of what is possible, encouraging innovation in VR development, not only technologically but also in terms of applications (e.g., afterlife).

Sci-Fi often highlights the ethical dilemmas associated with advanced VR technologies. Issues such as privacy, mental health, and misuse are prevalent themes. These concerns are not far removed from real-world VR applications. Addressing them requires proactive measures, including ethical guidelines and user protection protocols. Analyzing the psychological and physical effects depicted in Sci-Fi movies can offer valuable insights. Movies like *The Matrix* (1999) and *Ready Player One* (2018) illustrate both the exhilarating possibilities and the potential dangers of immersive VR environments. These narratives can inform the development of safety guidelines and health recommendations for VR users.

It is interesting to note that entertainment has been a continuously envisioned throughout the years as an application for VR. From *Westworld* (1973) to the *3 Body Problem* (2024), passing through iconic movies such as *Brainstorm* (1983), *Total Recall* (1990), *eXistenZ* (1999), or *Ready Player One* (2018). In these movies, VR is used for diverse entertainment activities such as: experiencing an adventurous vacation – *Westworld* (1983), *Total Recall* (1990), *OtherLife* (2017); gaming – *eXistenZ* (1999); *Avalon* (2001); *The Call Up* (2016); *Sword Art Online The Movie: Ordinal Scale* (2017); experiencing (dark) personal fantasies – *Brainscan* (1994); *Strange Days* (1995); or experiencing life in different eras – *The Thirteeth Floor* (1999).

Many movies depict lying down body positions while in VR. This approach seems interesting because it has not been much explored by today's commercial VR systems. Only recently Meta has introduced a Lying down mode in its Meta Quest device, but there are few apps that work in lying down mode. Is is unclear what the use cases could be, how interaction techniques could be adapted to this usage mode, or how it would impact feelings of presence, cybersickness, etc. A relevant example of research that explores the lying down paradigm, inspired by the *Avatar* (2009) is IRL415's VR prototype [14] where a headrest detects motion intention and moves the virtual environment accordingly.

Many of the technologies depicted in the movies seem far-fetched and seem to break the laws of physics, such as the Holodeck room in Star Trek movies. Other technologies, however, seem to depend only on scientific and engineering progress. Things such as robotics, BCIs, direct brain taps, brainsoftware, or mind digitisation, seem to be only very advanced forms of technological solutions we already have. Directly manipulating brain signals or simulating the brain in a computer seem like the only way to achieve a full VR experience where any sensation can be created [6].

Particularly the matters related to the future of brain technologies, which have been well discussed by Michiu Kaku [11], have an enormous potential to

disrupt the concept of VR. Although the body connections depicted in the movies seem gruesome, the fact is that we already have many examples of people that have computerised connections to the inside of their bodies, be it for controlling prosthetic limbs, connecting visual sensors to replace damaged eye-sights, etc.

Another intriguing VR application often found in movies is afterlife: either a temporary – *Archive* (2020) – situation to give loved ones time to say goodbye, or a permanent environment where the person's consciousness "lives" on forever in a digitised form, allowing other people (living or otherwise) to interact – *Upload* (2020). Existing endeavours that pursue this possibility are Somnium Space's Live Forever Mode [7] and the VR Afterlife Laboratory[2] from Korea University of Technology and Education. For entertainment computing, an interesting issue would be how AI avatars of deceased people could allow for shared entertainment activities such as playing a game together.

6 Conclusion

Sci-Fi has been an inspiring movies and books genre for many scientists and technologists. Sci-Fi has also been proposed as methodological design approach for conceiving future scenarios and reflecting on their impact on users and society. A review of the ways that VR has been imagined in Sci-Fi movies has the potential to make us re-think the definitions, frontiers, and societal implications of VR, but also to think about open research and development issues.

In this paper, we have described an ongoing database of VR-related movies, TV series, and episodes. We have used that database to analyse the visions of VR that have been proposed in several Sci-Fi movies along the technology, form-factor, user's body position and application domain.

The result from this analysis shows a very rich set of envisioned VR systems which can further inspire us to accomplish the proposed visions, or to stay away from dangers that have also been depicted by Sci-Fi movies.

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