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RESEARCH-ARTICLE

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Digitally Induced Altered States as Facilitators of the Future Augmented Human Sensorium: Analysis of Science Fiction Representations

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Abstract

This work analyses science fiction narratives for the intersections between the evolution of sensory augmentation technologies and altered states of consciousness as means of adaptation to this evolution. It identifies four types of sensorium manipulation, namely replacement, expansion, sharing and suppression, with each relating to unique cognitive shifts. Their representations in science fiction suggest that at least three of them can benefit from the facilitation of these shifts through appropriate types of digitally induced altered states of consciousness.

CCS Concepts

• **Human-centered computing** → **HCI theory, concepts and models**; *HCI design and evaluation methods*; *Mixed / augmented reality*.

Keywords

Science Fiction, Sensory Augmentation, DIAL

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1 Introduction

Altered states of consciousness, such as out-of-body experiences, synesthetic experiences, and psychedelic hallucinations, have a long history of application. They have been used by shamans to converse with spirits and the other worlds [13], to cultivate mental well-being [11], and to rethink traditional art [2]. In this paper, we

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consider the way they help us interact with modern technologies, focusing on digital mind alteration to help people adapt to sensory augmentation. Most sensory augmentation technologies are just emerging on the market and are fairly straightforward, yet by using popular science fiction as a source of scenarios [7] to track the trajectory of these technologies, we discovered what problems may arise as they become more complex. The authors of the analysed science fiction narratives presented situations in which digital alteration of consciousness serves as a catalyst for overcoming both physiological and psychological limitations in manipulating the human sensorium. By structuring these situations, we created a framework that demonstrates how digitally induced altered states (DIALs) might become an integral part of interactions with different types of sensory manipulation.

2 Background

2.1 Digitally Induced Altered States of Consciousness

Digitally induced altered states of consciousness are emergent cognitive and perceptual conditions brought about using digital technologies designed to disrupt, enhance, or reconfigure ordinary states of users' minds. Unlike traditional altered states, such as those induced by psychoactive substances, sensory deprivation, or intense emotional or spiritual experiences, DIAL is technologically mediated and could be purposefully designed [3]. They may be simulated or induced through, for example, immersive virtual reality (VR), neurofeedback systems, brain-computer interfaces (BCIs), artificial sensory stimulation, or algorithmically generated environments that manipulate temporal, spatial, or embodied experience [8]. These states potentially span a wide phenomenological range indistinguishable from those induced through non-digital means. The concept of DIAL potentially opens new pathways for exploring the emerging human-machine convergence and how consciousness can be shaped by digital technologies. As digital systems grow more embedded in human cognition and perception, DIAL provides a conceptual framework for understanding the shifting boundaries between the mind, the machine, and the co-created altered realities.

2.2 Popular Science-Fiction for Sensory Augmentation Technologies Analysis

Science fiction and innovation have a long history of intersection [1]. First, novels, movies and other fictional narratives are a source of inspiration for many contemporary developments, including those that extend the capabilities of sensory systems or provide entirely new immersive experiences [9]. Second, the use of world-building techniques and characters from science fiction in prototyping has led to the development of a subfield of HTI called design fiction [12], which allows one to consider specific details and ramifications of technologies without actually building them [6]. The diegetic nature of fictional narratives makes prototype-use scenarios much deeper since they take into account the conventions of the world in which the technology is used and do not constrain the context to instrumental functionality [5]. In addition, popular science fiction narratives can be an equally valuable source of powerful scenarios, settings, and characters [7], contextualising the interaction of new types of technologies with users. They depict in a deeper and more detailed way what is happening in the user’s mind and in the surrounding settings, giving the reader several perspectives on technology use. Popular science fiction provides a context in which new technological developments are understood by the general public using a language that can be used for interdisciplinary communication. Moreover, it already has a vast stock of more diverse examples of sensory augmentation integrated into human life.

3 Methods

Qualitative content analysis [4] was conducted on a corpus of 12 science fiction novels (see Table 1) that featured instances of DIAL and sensorium-modifying technologies. Books were collected through crowdsourced recommendations from the users of Goodreads and Reddit online platforms. As the settings of the books varied, providing different contexts, authors considered one book as the unit of analysis, while the minimal meaning unit was one sentence. The original reading, extracting meaning units, and initial coding were done by the first author. Consequent categorisations and theme creation were an iterative process conducted by all four authors. Final themes were created following an inductive categorisation strategy.

4 Findings

Analysis and comparison of various coded examples of interaction between technologies and human sensorium not being limited by the current level of technological development made it possible to identify four distinct patterns of working with it: substituting natural senses with cybernetic ones (replacement), the emergence of new ways to perceive (expanding), reproducing one’s sensorium in the brain of another (sharing) and complete or partial blocking of sensations (suppression). Many of these manipulations are also accompanied by cognitive shifts in information processing, which can be mitigated through various types of altered states of consciousness. The grey area in Figure 1 represents situations where an altered state of consciousness either enables adaptation to sensorium manipulation or, in some way, modifies it.

Table 1: List of analysed novels

#	Title	Year	Author
N1	Altered Carbon	2002	Richard K. Morgan
N2	Aristoi	1992	Walter Jon Williams
N3	Blindsight	2006	Peter Watts
N4	Echopraxia	2014	Peter Watts
N5	Glasshouse	2006	Charles Stross
N6	Neuromancer	1984	William Gibson
N7	Pandora’s Star	2006	Peter F. Hamilton
N8	Permutation City	1994	Greg Egan
N9	Quarantine	1992	Greg Egan
N10	Revelation Space	2000	Alastair Reynolds
N11	Synners	1992	Pat Cadigan
N12	Vast	1998	Linda Nagata

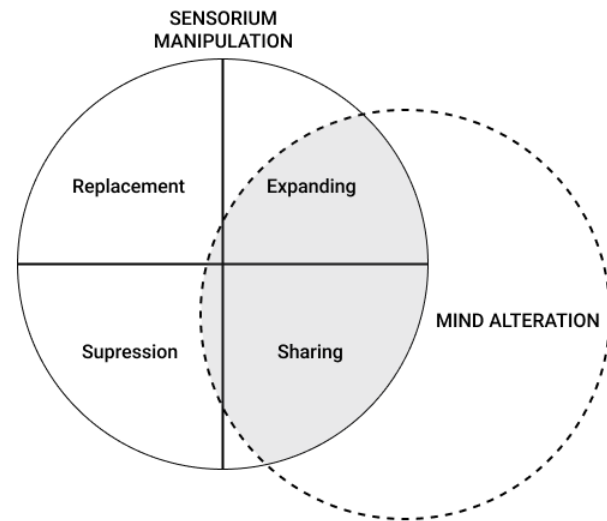


Figure 1: Overlapping between sensorium manipulation and mind-altering technologies

4.1 Replacement

The most straightforward and understandable type is the **replacement** of sensory organs with digital alternatives. Prostheses that replace conventional sensory organs are one of the most common examples of manipulations with the sensorium, which already have current functioning prototypes, such as bionic eyes [10]. Even when these technologies create some improvements, such as night vision [N6], thermal vision [N7], or the ability to see magnetic waves [N4], they do not change the principles of sensory information processing and work more like glasses, which help eyes “see” more. This type of sensorium manipulation rarely intersects with altered states of consciousness.

4.2 Expanding

A completely different matter is the **expansion** of the sensorium when new external devices work either as new sensory organs or as an extension of existing ones, meaning that the way they process the signals is different. An example of the former is connecting a sensory system to research equipment, which allows users to feel cosmic radiation or see gravity in a completely new way [N10, N12]. An example of the latter can be connecting vision to several cameras in a room [N9, N11], making a user have multiple fields of view simultaneously. Many authors emphasise that this may cause complications due to the substantial differences between the received signals and those the brain is accustomed to, as in [N3]:

The whole BioMed subdrum was but a part of the Szpindel prosthesis: an extended body with dozens of different sensory modes, forced to talk to a brain that knew only five.

Many authors point out that the brain is not used to processing such large amounts of information at the same time and offer various solutions. For example, together with an expanded field of view, the characters of [N9] used an altered perception of time to keep up with information processing, and in [N11], artificial memories helped the user get used to a large number of new cybernetic sensory organs. Working with memory turned out to be convenient with completely new senses, for example, selective amnesia in [N5]. It equated the new senses with the natural ones and thus overcame resistance to the expansion of the sensorium. It was easier for characters to adapt to a new cybernetic body when they did not remember how to control a biological one. In [N2] and [N10], depersonalization and dissolution of ego and body were also used so that the brain, instead of rejecting the equipment, simply felt like a part of the equipment, and the user temporarily did not feel tied to a meat body. In cases where the brain is simply unable to process newly expanded sensations, science fiction depicts some altered states of consciousness, such as synesthesia, as an alternative to that expansion. For example, in [N2], people achieved an expansion of their taste palette through a combination of visual hallucinations and taste sensations caused by specific dishes. Simultaneous work with a large amount of visual information in [N7] was possible due to a special device that distributed text by topic and stimulated the sensation of specific smells when the user read them to facilitate orientation between topics. [N10] describes adaptation to data channels inaccessible to the ordinary senses as follows:

Feeling his way into the sensorium - it was like slipping on an unfamiliar glove - Sylveste found the neural commands which accessed different data channels.

4.3 Sharing

The following, no less complex than "sensorium expansion" technologies, also having a broad representation in science fiction, are technologies of **sharing** sensorium. Sharing is the stimulation of the sensory systems of one person to recreate the sensations of another. It can be a live translation of the sensations of a connected person [N6] or broadcasting recordings of someone else's sensations [N1, N7]. This type of manipulation of the sensorium is unique in that it transmits sensations of actions from a first-person perspective to a person who may be passive. This gives rise to a unique issue for this type of manipulation, namely, reactions to perceived

actions as their own. [N11] described the most striking example of the problem of body movement in response to stimulation of the brain areas responsible for the sensation of movement. The solution to this problem also lies in altered states of consciousness, such as dreams. Although not going into detail, the author draws the reader's attention to the fact that the same mechanisms that suppress body movement (even when people experience movement in their dreams) during sleep, combined with "ghost limb" phenomena, can trick the brain and create the illusion of movement without stimulating actual body muscle reactions. This type of sensorium manipulation is most closely related to DIAL because it almost always involves the alteration of one's own body schema. Some narratives describe this property as an "antidote" to some socio-technological trends. When transhumanism or cyborgization has gone too far, people existing as digitalised personalities [N8] or having a machine body [N5, N12] can download sensoriums of biological people and temporarily forget about their own modified bodies, feeling alive again. Some books describe intentionally inducing ego dissolution, partial amnesia, or altered memories [N7] to enhance the sensation of being someone else for a variety of applications, from highly immersive first-person journalism to immersive pornography.

4.4 Suppression

Finally, the last type of manipulation of the sensorium, namely **suppression**, partially overlaps with DIAL. Suppression is typically associated with temporarily switching off certain sensations to help a person focus, which occurs without the involvement of DIAL. However, the presence of DIAL takes this manipulation to a completely different level, where banal blindness turns into selective agnosia [N4] or complex ignoring of contextual stimuli [N9]. In both cases, a person's perception uses all its capabilities to focus on the task, but at the same time, any irrelevant distractor (or information that the user is not supposed to know) simply cannot break through into consciousness. In a similar way, DIAL modifies pain blocking. In [N9], a person can fall into a special state of consciousness, where pain turns into pure information, thus preserving all its useful properties but eliminating the negative effects.

5 Discussion and Conclusion

Extrapolating from current development in sensorium-augmenting technologies, we can consider different trajectories of their evolution. Science fiction, which already describes many of these technologies, is a valuable source of scenarios and contexts, the analysis of which can suggest proactive approaches to working with their emergent precursors. In our work, we considered scenarios for using digitally induced altered states of consciousness (DIAL) to adapt to these complications and derived a framework that consists of two components. First, we examine the type of manipulation of sensorium, and second, the types of shifts in cognitive functioning that accompany this manipulation. Whereas cognitive shifts rarely occur with the replacement of sensory organs, the situation is different for the other three types of manipulation. In the case of such a complex process as sensorium expansion, fictional narratives predict the rejection of new sense organs due to their unusualness

or the increased amount of processed information. They connect overcoming the former with memory alteration and habituation to the latter with such ASC as altered time perception. For the successful use of shared sensorium, mechanisms for distinguishing one's own sensorium from someone else's are needed, and this is where ego dissolution comes to the rescue. To complicate the technology of blocking sensorium, the authors draw attention to complex disorders of neurological perception, such as agnosia. Fictional narratives describe taking control and simulating many seemingly maladaptive states today as means that enable the use of new technologies, such as augmented sensorium. Thus, fiction demonstrates that the development of sensorium manipulation technologies can proceed in tandem with research into altered states of consciousness. The latter are described as means that, at the right moment, ensure a smooth transition to new types of world perception provided by new types of sensory augmentations.

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Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

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