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# Towards an Agenda for Sci-Fi Inspired HCI Research

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## ABSTRACT
Science fiction media has had a long lasting influence on the progression of interactive technology, however recently contradictions are emerging in the development of the two disciplines. Therefore, in this exploratory position paper we report on the insights attained through a day long workshop amongst scientists and researchers on how the collaboration between science fiction and Human Computer Interaction (HCI) can be advanced. Discussions in the workshop focused on detailing the relationship between HCI and science fiction. In conclusion, as our main contribution an action plan and agenda is presented for facilitating deeper influences amongst the two disciplines.

### ACM Classification Keywords
H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

### Author Keywords
HCI; science fiction; interaction design.

## INTRODUCTION
Design and human creativity is fuelled by inspiration [31], and different forms of human expression are known to be stimulated by environmental factors. Given that the design of interactive and entertainment systems is a key in Human-Computer Interaction (HCI) we can safely assume that HCI is strongly influenced by the external inspirations of designers and researchers [25]. Science Fiction (Sci-Fi), thought to be *"the literature of ideas"* [1], has been shown to provide key inspirations to research into HCI and interactive and entertaining technologies [10, 16] - in particular originating from science fiction media.



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There are many examples of interactive products, devices and systems in the real world and their origin can be traced back to science fiction. From the wristwatch used by fictional detective Dick Tracy to the communicators of Star Trek which predated today's mobile phones, to the video conferencing of 2001: A Space Odyssey and the video phone and robots of Fritz Lang's 1927 Metropolis.

The manner in which science fiction influences HCI has been investigated. Aaron Marcus has not only presented an overview detailing an HCI travelogue of Hollywood science fiction movies [17]; he has also coordinated two CHI conference plenaries on the topic [19, 18]. Schmitz et al. [27] surveyed various examples of HCI/design/science fiction convergence, on the one hand outlining a collaboration scheme between researchers and filmmakers in a continuous, inspirational dialogue wherein films (or filmmakers) are inspired by technology (or by scientists). Similarly, Kirby et. al. [12] has outlined how the collaboration of film-makers with scientists as movie consultants resulted in mutual benefits.

While science fiction has deeply affected HCI as a research field, recent contradictions between science fiction and HCI technology evolution have become apparent [21, 26, 15]. In some instances, novel and exciting technologies depicted in science fiction have been difficult for users to adopt or accept when they have been mirrored in the real world; wearables being one common example [5]. Nevertheless even though such technologies are not feasible or can be ill perceived (utopias versus dystopias), they increase awareness of the possibility of the depicted interaction and technologies for the overall technological change. Gradually an understanding is emerging [6] that the usability, requirements, needs, preferences and usage of products in the real world or the lab may differ from what is depicted in the fictional world.

In summary, while many of the afore-mentioned overview papers are detailed; in our opinion they are rather isolated works and not critical of the impact of science fiction on HCI and vice-versa. Neither do they present one agenda framing interaction between research progress and science fiction advancements. In addition, they are in some ways biased towards the utopian view of science fiction. For example, Kirby's research framework [12] links the general role of scientists as movie

consultants in film productions while Schmitz's framework associates synergy effects in terms of specific HCI depicted in science fiction moviies. Neither frameworks are critical - as to cultural bias of Western media for example - nor present an agenda ensuring an all-inclusive interaction between research progress and science fiction advancements in general.

Therefore in our research we attempt to not only critically evaluate the relationship between the two disciplines of HCI and science fiction but also to suggest a future road map to ensure an appropriate integration between the two in the overall quest for knowledge. We also aim to facilitate new and non-conventional mechanisms of cooperation between the two disciplines, thus allowing HCI innovations to be inspired by science fiction media. In order to address our afore-mentioned aims, we report results from a day long workshop session with fourteen international researchers (having research interests in HCI and science fiction) that conducted moderated discussion concerning the complex linkages between HCI and science fiction. We describe our method and results in the remaining part of the paper.

## RESEARCH WORKSHOP

In order to understand the relationship between science fiction and HCI we organised an international research workshop at the 27th Australian Conference on Human-Computer Interaction (HCI) (OZCHI2015) conference in Melbourne, Australia. The main aim was not only to investigate the impact of science fiction on current and past interactive technologies, HCI in general and its associated modalities (touch, vision, speech, etc), but also to provide a motivational agenda moving the integration of science fiction and HCI forward to create visionary innovative interfaces of the future. Fourteen international researchers participated in the workshop who were experts in various domain areas such as HCI, Fictional writing/story telling, Robotics or Human robot interaction (HRI), Game Design, AI, Virtual Reality and Speech Interaction - see Table 1). We realised that the profile of our workshop cohort was weighted in favour of HCI researchers despite most of them having a strong and keen interest in science fiction. In addition the growing trend of scientists functioning as movie consultants (for example Jim Green from NASA as in the movie Martian) led us to believe that both sides of the coin so to speak would be well represented in this workshop. The workshop schedule comprised of a series of presentations and demos on science fiction related topics, which preceded a 90 minutes discussion session at the end of the workshop. Thus, in this paper we focus on the insights obtained from the discussion session during the workshop and reflections exchanged post workshop through email. Similar case studies of utilising research workshops or a pool of expert scientists to advance the state of art or present an agenda for the facilitation of future opportunities in a particular research field can be found in HCI literature [13, 2].

In order to drive and motivate the debate in our workshop a series of popular science fiction movies and image snippets were shown to the participants at the beginning of the 90 minute session. These snippets were from movies such as the World Builder visionary animation [1], Space Odyssey, Back to the Future and the movie Star Trek. We attempted to showcase a diverse range of movie snippets; not only in terms of date of release but also the type of interactive technology depicted. After the movies were shown, the order of discussion transitioned from 1) explaining the current relationship between HCI and science fiction through past and present influences through a meta level overview to 2) detailing specifically on a micro level which aspects of HCI and interaction design are inspired by science fiction and lastly 3) the future road map of the two disciplines as envisioned by the discussion panel. Two researchers from the group took on the roles of facilitator and minute taker.

**Table 1. Details of Participants in our workshop**

| Rank | Country of Affiliation | Research Domain |
|---|---|---|
| Assistant Prof | Australia | HRI/HCI |
| Post-Doc | Sweden | HRI/HCI |
| Post-Doc | Australia | Game Design and Technology |
| Senior Researcher | Australia | Machine Learning |
| Senior Researcher | USA | Web Design and Usability |
| Associate Prof | Denmark | Speech Interaction |
| PhD Student | Sweden | Virtual Reality and Science Fiction |
| Professor | Australia | Virtual Reality and Augmented Reality |
| Professor | Australia | HCI, Virtual Reality and Augmented Reality |
| PhD Student | Australia | Game Design and Technology |
| PhD Student | USA | HCI and Science Fiction |
| Assistant Prof | Sweden | Machine Learning and Virtual Reality |
| PhD Student | Portugal | HRI |
| Professor | Australia | Science Fiction |

## RESULTS

In this section, we summarise the main findings and common themes that we synthesized from the discussion during the workshop and from the post workshop recollection of thoughts and insights.

### Describing the relationship between HCI and science fiction

All of our workshop participants agreed that science fiction has had a profound impact on the development of HCI. The inspirational effect of science fiction on HCI, Interaction Design and Multimodal interaction was discussed through various Hollywood blockbusters and shows, such as Star Trek, Minority Report and X-men. However, through the facilitation of the

[1] https://www.youtube.com/watch?v=VzFpg271sm8

participants from the fictional domain area we saw a transition in the discussion towards an implication that referred to the relationship as bidirectional or cyclic (as also indicated in [24, 7]) and not unidirectional. From the insights acquired from the researchers it was evident that both science fiction and HCI technology have the capacity to learn from and inspire each other. Science fiction is not only a showcase, it has actually driven scientists to be innovative and to elaborate, implement and apply concepts from shows and movies into the real world. As a consequence, HCI researchers naturally benefit from science fiction more than from any other genres, as the ideas presented usually combine facts and fiction.

Numerous examples pointing towards the increased involvement of scientists and technology experts in movie production teams were brought up. For example, John Underkoffler's well-known engagement as science advisor [20] for the movie Minority Report [29] was mentioned. Other examples included The National Academy of Sciences which sponsors the Science & Entertainment Exchange Program which sole purpose is to connect "entertainment industry professionals with top scientists and engineers to create synergies between accurate science and engaging storylines in film and TV" [28]. The program started in late 2008 and recently celebrated one thousand consultations. During the session we partook search for additional examples and located a more recent example of a real world scientist involved with a science fiction production: Jim Green, director of NASA's planetary science division, role as a science adviser to director Ridley Scott in The Martian, helping to realistically depict an astronaut mission and search and rescue scenario on Mars. Other examples include the animated movie Big Hero 6; where the main character Baymax (a robot) is inspired by various existing robotic technologies [3], such as the soft robots at Carnegie Mellon University (CMU) or Honda's ASIMO. Such examples clearly indicate that both research and science fiction draw on each other as examples and inspirations. Most of our workshop participants agreed that science fiction has the ability to promote innovation in HCI whereas HCI provides consistency and believability to fictional content. Consequently this complimentary relation enables both fields to find a balance between being either too technical, boring and unattractive or too superficial, unrealistic and unbelievable.

In the panel discussion there was an extensive debate on the stereotypical utopian or dystopian relationship of technology and society in shown in science fiction narratives and movies. Our pool of workshop participants agreed that novel interfaces depicted in science fiction have the potential to both, provide conceptual ideas yet to come for future HCI scenarios and contexts as well as portray failures, shortcomings and tensions of said relationship. A number of examples were discussed that elaborated the notion of negative science fiction actually being influential towards the development of HCI and interface design; such as robots. From HRI literature it can be observed that Anthropomorphic robots are accepted in science fiction but in real life there is gradual realisation that a robot's function should have priority over form [21]. Similarly, incidents such such as the recent burning of a house due to a malfunctioning hoverboard in Melbourne, Australia

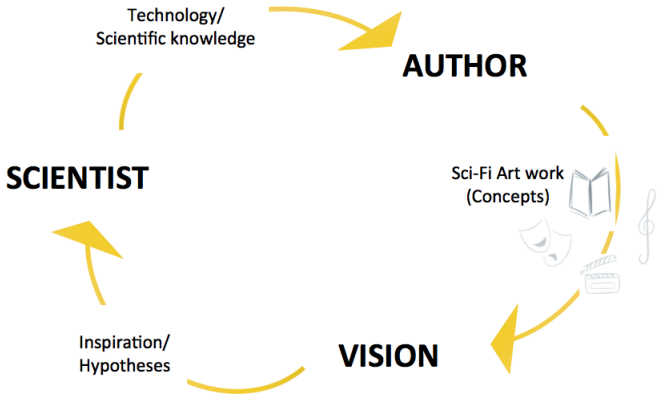


**Figure 1. Virtuous Cycle between HCI and Science Fiction Media**

[22] were quoted as unfortunate but providing an underlying lesson regarding the social consequences of certain science fiction technologies. In sum, the panel agreed that research investigations conducted in HCI have an opportunity to be inspired from social critique and HCI researchers can learn what not to design or how not to design based on negative content (or dystopian views) portrayed in science fiction.

At the conclusion of this first phase of panel discussion, we attempted to visualise the relationship between HCI and science fiction. The participants agreed upon the following picture which summarises the crossover of HCI and science fiction (see Figure 1). Fictional media generates a conceptual vision that takes the form of an inspiration for research. New research is generated which in turn not only feeds back depictions and representations of technology to authors but also localises the technology in society as knowledge which in turn can be highly inspiring for not only researchers but also other fictional authors and movie directors.

### Science Fiction for Interaction Design

In the second part of our session, the participants explored the micro level impact of science fiction on HCI. In consequence, particular aspects of the discussion in this phase aimed at delineating what stages of HCI research process are most informed, relevant and inspired through science fiction. All our participants agreed that science fiction scenarios can play an integral role in all stages of the interaction design cycle (requirements engineering, prototyping and evaluation). The participants then focused the discussion on each phase of the cycle individually.

With regards to the initial design and conceptualisation of interfaces, the importance of science fiction scenarios was recognised. For instance, the designer can use the storytelling capabilities of science fiction, as an informative tool to extract user requirements for future technologies through various mechanisms such as storyboards, storytelling, scenarios and even participatory design/co-design. A common example is that of Blythe et al. [4], who have developed pastiche scenarios extending from science fiction as a tool that can be used in participatory design. Rather than attempt to write character-based scenarios from scratch (e.g., vignettes) to engage the user, characters are re-used from existing fictional content and

then participants share their thoughts on how particular characters would behave in new situations, making it possible to gather assumptions around the design and use of technology. For example, Blythe et al. [4] have chosen the Clockwork Orange and Nineteen Eighty-four to explore how a surveillance device might be experienced not only by users, but by those who are against it. Ultimately viewers can contribute to the development of technology by evaluating fictional content, for instance using techniques of virtual ethnography [9]. Such speculative applications of fiction refer to an area commonly called design fiction [30] which aids designers and users to suspend disbelief about change [14] and acts as a catalyst to their creativity, however, the panel did not explicitly draw themselves into the distinction between design fiction and science fiction. The workshop panel agreed that repositories of science fiction based popular media can be very effective in finding future interface and interaction design guidelines. The gesture database from [8] was demoed during the workshop and it reinforced the usefulness of such taxonomies.

Furthermore, the workshop participants also acknowledged that the primary influence of science fiction content was to inform the implementation and prototyping of novel interfaces in HCI. It was asserted by them that fictional media based portrayals can be used to entertain, elicit feedback and inform the common audience, but in addition, they can also be passed on as visual representations of design ideas to other researchers; allowing for the development of reflective and critical design. The concept of diegetic prototypes from Kirby [11] were referred to as an opportunity for a technical consultant to speculate and extend their ideas within the fictional reality of a film and creating a video prototype. Furthermore placing a diegetic prototype into a narrative and social context creates the environment for the fictional technologies and prototypes to be eventually realisable in the near future. Most of the sample fictional content showcased during the session generated a common response from the researchers. Most of our workshop participants (in particular those with a technical background) agreed that although science fictional content portrays a vision of how technology should behave from an utopian point of view, technical details (such as how is data sensing, monitoring or input taking place, etc) are left open for interpretation by the reader and/or viewer.

Lastly, the discussion focused on how science fiction can also play an influential role towards the evaluation of both current and future interactive technologies. For example, interaction design methods can be used to evaluate fictional content in order to predict the success of science fiction technologies when deployed in the real world. Gesture based interfaces from the Minority Report or Iron Man may look highly innovative, but may most likely be impractical in real life due to an expected physical exhaustion of the user over long periods of time or accuracy and targeting limitations of the gestural interface. We noticed that while watching the movie snippets, most of our participants unknowingly and implicitly began to evaluate the interfaces and interaction depicted, such as by listing the different interaction techniques, the human factor aspects involved and usability issues. In summary, by considering science fiction media as a prototype of future technology, it is evident that science fiction can play an integral role throughout the entire design process of a particular technology.

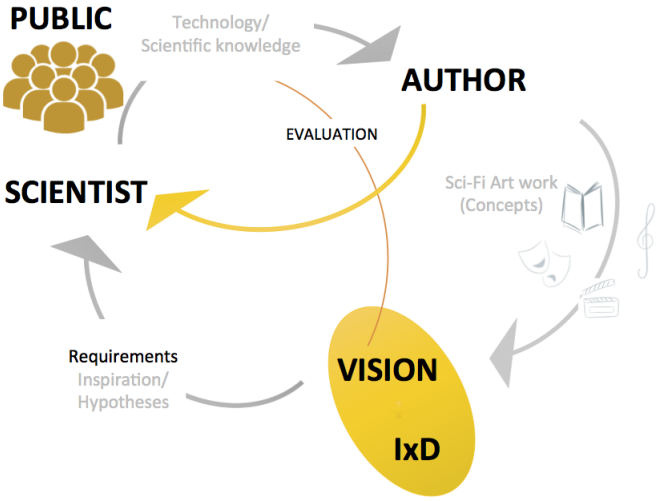


**Figure 2. The proposed Virtuous Cycle to allow for Science Fiction inspired HCI research**

### Science Fiction and HCI: An agenda

In conclusion to the session, our participants attempted to derive an agenda advocating for a deeper inspirational relationship between HCI research and science fiction. As a first step in establishing this agenda, the cyclic diagram representing the relationship between HCI and science fiction in Figure 1 was revised and updated based on the discussions held. Figure 2 showcases the new diagram as a virtuous cycle representing the relation between HCI, science fiction and the public.

This adapted diagram indicates how science fiction provides interaction guidelines and user requirements to a scientist based in the HCI domain. In turn the scientist delivers evaluation methodologies to judge fictional material. The scientist also delivers technological reality for new science fiction developments. Furthermore we introduced the general public/common user/common media viewer as one integral part of this cyclic relationship both from the perspective of absorbing and disseminating new knowledge.

The pattern of thought then transitioned to what concrete steps were required to be taken to facilitate an appropriate interaction between HCI and science fiction. An imminent result of the discussion was that in order to promote science fiction as a communication tool, the research community needs to encourage discourse and discussion on the topic as science and not fiction. One possible recommendation suggested was to encourage researchers to describe visions of their planned work that is essentially science fiction (for example the Future Scenarios Track at NordiCHI 2016 [23] was mentioned); and to argue for an acceptance and tolerance/appreciation for such visionary descriptions in research papers. Referring to one of our earlier findings of the workshop discussion, it was ascertained that discussion of science fiction as a research topic will ultimately improve the technological climate of our society. A formal action plan was then manifested as a checklist to guide

and enhance future collaborations between HCI and science fiction:

1. Establish a multi-disciplinary regular forum where science fiction authors and producers meet HCI researchers. We find sprinklings of science fiction discourse in HCI academic venues but they are definitely not a regular occurrence. Ideally this could be accomplished as a fixed session or track at an annual flagship HCI conference; where both HCI researchers and science fiction authors will be invited to present fictional visions of their work from both domains.
2. Develop a research agenda/protocol to advance:
   (a) the analysis of science fiction sources and related outcomes in Human-Computer Interaction/Human Machine Interaction, in order to develop a methods for reliable implementation of SciFi ideas;
   (b) the detection of implementable novel ideas in science fiction for the betterment of HCI (through for instance existing archives or databases of fictional content; such as [8] which is a graphical interface allowing HCI practitioners to navigate through a taxonomy of gesture interactions);
3. Establish mechanisms for creation of novel interdisciplinary creative educational programs (across Computing, Engineering, Design and HCI), which extensively use science fiction in their curriculum.

## CONCLUSION AND FUTURE WORK

In this paper we have presented the qualitative outcomes of a research workshop on science fiction and HCI. We report on the insights attained during and in conclusion of the workshop on the relationship between the two disciplines, and formulate an action plan together with an agenda to facilitate a deeper influence amongst the two disciplines. We have also presented a visual representation of the linkages between HCI and science fiction where we argue that society has an integral role to play.

In our future work we would like to address some of shortcomings inherent in our proposed agenda. Firstly, we acknowledge that our proposed description of the relationship between HCI and science fiction is theoretical. In order to measure the impact objectively we aim to utilise numeric methodologies such as scientometric analysis. Secondly, we recognise that the discussion around our workshop and its participants were biased towards science fiction content from the West. In addition we did not have any participants from countries in East Asia. There is a long lasting tradition of fictional content in countries such as Japan (Manga, etc) which will be extremely worthy of consideration in the future. Thirdly, we also acknowledge that our focus of attention in our reflections was primarily on media based science fiction. In the future, closely analysing literature based fictional content may reveal interesting trends towards its impact on interactive technology. Fourthly, we aim to extensively involve science fiction or media based experts in our future investigation on the topic as the goals of academics and media personnel may differ. Lastly, we aim to validate the presented plan and agenda through further analysis and discussions.


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