

Translating Virtual Reality Research into Practice as a Way to Combat Misinformation: The DOVE Website

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Abstract. There are several barriers to research translation from academia to the broader HCI/UX community and specifically for the design of virtual reality applications. Because of the inaccessibility of evidence-based VR research to industry practitioners, freely-available blog-style media on platforms like Medium, where there is no moderation, is more available, leading to the spread of misinformation. The Design of Virtual Environments (DOVE) website, attempts to address this challenge by offering peer reviewed unbiased VR research, translating it for the layperson, and opening it up to contribution, synthesis and discussion through forums. This paper describes the initial user centered design process for the DOVE website through informal expert interviews, competitive analysis and heuristic review to redesign the site navigation, translation content, and incentivized forms for submission of research. When completed, the DOVE website will aid the translation of AR/VR research to practice.

Keywords: research translation · virtual reality · misinformation.

1 Introduction

The challenge of translating academic research about VR to industry best practices is a part of the overall challenge of translating HCI research to the UX (User Experience) industry. The transfer of knowledge from theory to practice can be a tedious process that requires iteration and faces resistance because it requires collaboration from among stakeholders who may be required to adapt as context and tools change. A three-sided relationship between researchers, educators, and practitioners is the most critical requirement for knowledge translation [1]. In the medical field, this is a major challenge; the adoption of clinical practice guidelines (evidence-based medical techniques) into actual practice has been severely lacking [3].

There are several barriers to this translation. First, academic research often uses highly specialized language and formatting that may be unfamiliar to industry readers, even in the same work area. For example, only 7% of CHI 2011

papers were formatted to support design practice [2]. Second, the storyline or process of academic work often unfolds over multiple years, a much slower pace than in industry, making it difficult for industry practitioners to follow the academic story closely. This slower pace can be partially explained by challenges in university patent processes [6], but it nevertheless creates a gap. Third, academic research results often provide narrow, specific contributions to knowledge that may not be immediately generalizable to the practitioner’s problem being solved today. Without a large frame of reference over multiple years, it can be difficult for the practitioner to assemble the relevant contributions to knowledge into something usable. Lastly, academic research is often held behind paywalls that place barriers between practitioners and researchers. The open-access movement is helping reduce these barriers [4]. However, the large profit margins of the academic publishing industry [2] will continue to pose a challenge to knowledge translation. Academic journals have a high bar to entry. All papers must be peer-reviewed and edited and few papers will make it to publishing. These protocols, although necessary, create a challenge for the rapid dissemination of research results in the UX community. As a result, evidence-based research is pitted against a variety of freely written media articles on platforms like Medium where there is no moderation, raising the potential for the spread of misinformation. The challenge of misinformation is significant enough that researchers have offered specific cognitive tools to enhance people’s digital agency by boosting reasoning and resilience against manipulation by the media [8].

One example of successful research-to-practice translation is the user-centered design process and concept of usability. The user-centered design process, made famous by Don Norman and Stephen Draper in 1986 [9], has made its way into popular culture and is being adopted by the more extensive industry professionals and studied by those looking to join the craft [12]. But industry practitioners would like to find strong results sooner than waiting 30+ years. Research on the best practices for virtual environment (VE) design faces this translation challenge. While virtual reality (VR) work began in the 1960s, it has grown significantly since the introduction of the consumer grade Oculus headset in 2016 and VE freely available authoring tools such as Blender, Unity, and Unreal Engine. While the number of VEs and 3D games has grown, there is not a strong consensus of how best to design the VE experience. The “Locomotion Vault” [5], for example, documents over 100 user interface methods of simply moving within a VE. Whereas guidelines for 2D user interfaces such as mobile apps and websites are more mature, e.g., Google Material and Tidwell et al.’s design patterns [11], they do not translate easily into design guidelines for 3D virtual environments (VEs).

2 Translating VR Research into Practice: Goals for the DOVE website

The Design of Virtual Environments (DOVE) website was envisioned to fill this gap by being an open-source unified reference that describes how VR research re-

sults lead to practical VE design advice. DOVE was intended to be a Wikipedia-style moderated site for evidence-based results of VR research contributed by the broader R&D community. The authors will create the initial structure for the DOVE site and populate it with content based on an initial literature review of VE research and the results of the proposed studies, including available code and 3D assets. One particular goal is to offer benchmarks for assessing the usability of VEs. The Oculus Developer Guide, a website for consumers and developers of VR software, provides similar design advice to what DOVE aspires to, but Oculus does not ground the advice in research. In the DOVE website we hope to extend the research gatekeeper model by offering peer reviewed unbiased VR research, translating it for the layperson, and opening it up to contribution, synthesis and discussion through forums. Eventually, the authors hope to attract broad industry and academic interest that will sustain such a site and eventually provide industry partnership.

3 Approach

The tool’s software development process follows the interaction design method [7]. First, an effort was made to understand where industry VR practitioners currently get design information. By speaking initially with VR stakeholders we learned about popular self-help guides from conferences, podcasts, YouTube videos, Medium articles and UX organizational websites demonstrating how to design virtual environments. These serve as competing sources of design advice, which may or may not be grounded in rigorous research.

We then discussed the vision for DOVE with several researchers. It seems that convincing researchers to submit a layperson-translation of their research could prove to be a challenge. Based on the standard academic publishing model (which is admittedly evolving through a growing use of preprints [10]), researchers may be wary of publishing their research in layperson form. As a result, one challenge of the DOVE website was to look and feel like a credible source of evidence-based information. The second challenge was motivating and guiding the researcher in converting their academic writing into simple, easy-to-read, and applied language. To measure our team’s success in addressing these challenges, the authors are establishing benchmarks based on the style of writing, and the ease of use of the DOVE website for its key stakeholders.

Initially, undergraduate colleagues implemented a framework and foundation for the DOVE website using UX techniques such as wire-framing, heuristic analysis, and user journey mapping (see Figure 1) and the Wordpress content management system. The DOVE website aims to cover VR topics such as locomotion, 3D object interaction, presence, and VR menu design. Although the undergraduate researchers had laid the foundations for the knowledge translation for the DOVE website, it was still missing actual content contributed by researchers. It did contain one page of content regarding VR location to facilitate further feedback.

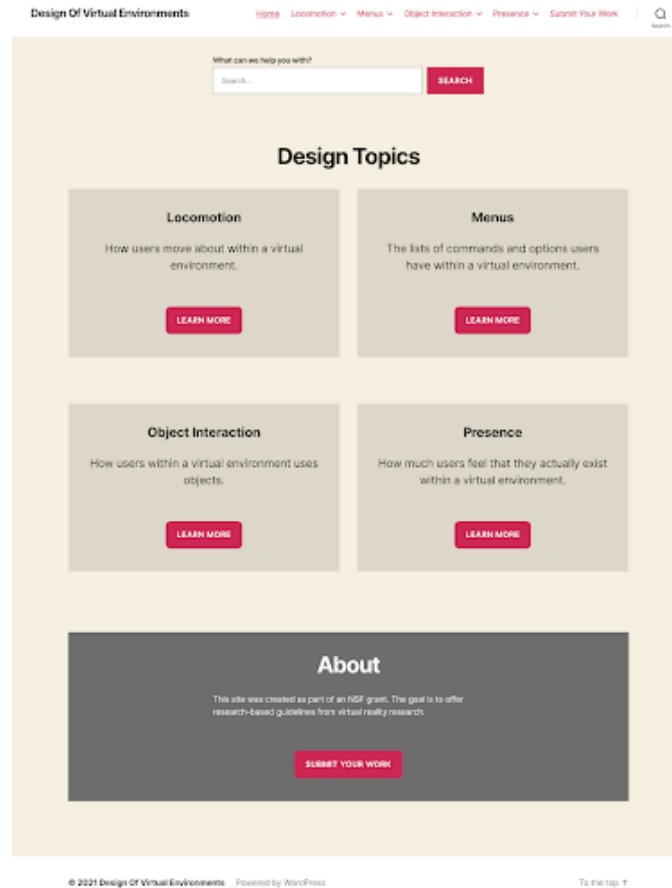


Fig. 1. First prototype of the DOVE website.

The first prototype was then reviewed with the authors and their students using a heuristic analysis. While this initial feedback was useful, it was imperative to broaden the participant pool to include a diverse group of stakeholders including website consumers and contributors. The assumption was that there are three kinds of stakeholders with three main tasks flows on the website:

- The designer: The designer will use the DOVE website as a guideline to determine the appropriate way to develop VE interactions. The designer builds 3D models, characters, and user interfaces to create an appropriate virtual environment.
- The developer: The developers will also use DOVE best practices to collaborate with designers, as well as the development platform (e.g., Unity or Unreal Engine) to build the functionality of VEs.

- The researcher: Academic researchers will use DOVE as a preliminary research source to understand topics and concepts surrounding the virtual environment. Also, expert researchers will be contributing their peer-reviewed academic research to be easily applicable for the prospective designer and researcher.

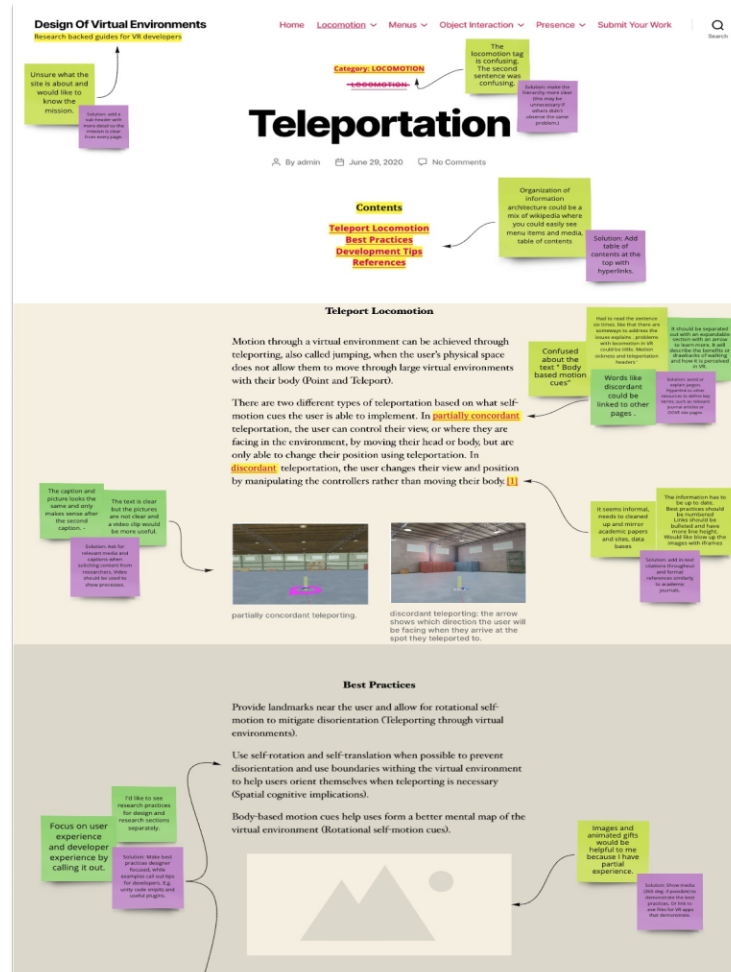


Fig. 2. A screenshot of using Miro to explore the process of gathering initial feedback on the contents page's interface design.

Using affinity mapping software called Miro, we could gather some initial pilot feedback on the first DOVE prototype's web page regarding best design practices on teleport locomotion (Figure 2).

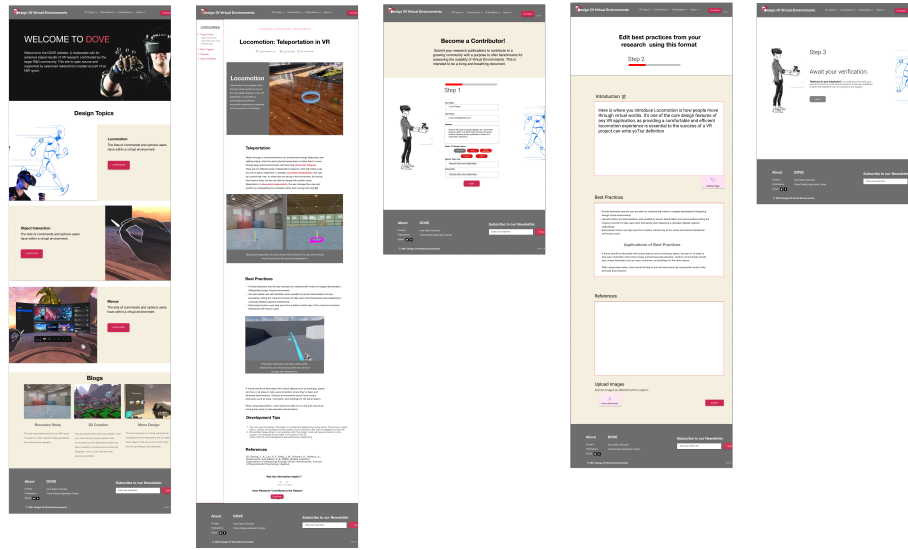


Fig. 3. A screenshot of the DOVE interface redesign based on feedback.

Initial informal pilot interviews with several stakeholders of each type suggested that the following themes will be important in future design iterations.

- Create a better way to submit research articles.
- Link the best practices into different pages.
- Improve discoverability - How will DOVE be found? What search terms will be used?
- Create a template with an improved information architecture to break research synthesis into digestible pieces.
- Identify VR usability testing results from the past.
- Make it clear how researchers can submit their work and rate the information they find.

The interviews also suggested that the list of stakeholder users for DOVE might differ from what was assumed. Rather than designer, developer, and researcher, a better list of stakeholders might be expert researchers, novice researchers (e.g., students), artifact designers, VR developers/designers, and product managers. In a future investigation, detailed feedback will be categorized into focus areas around navigation, content, and forms. The broader feedback will be prioritized into critical, medium, and low priority areas.

Based on the initial feedback, we were able to create an initial redesign (Figure 3). We will focus on collecting research articles to populate and eventually publish DOVE v1.0. Therefore, we will design the submission process in a way that encourages expert researchers to submit their work and minimizes the burden of ownership for the moderators of the site.

4 Conclusion

Our solution could be a great first step in the direction of translating research into practice. The literature review has provided some more examples of ways to adequately transform VR research into best practices. We hope to implement these changes and discover a way to test if the existence of such a site would help curtail misinformation. We conclude that translating research, although tedious, is achievable and relevant for the Design of Virtual Environments. The literature review has shown that the steps we have taken thus far are valid and could use some more iterative human-centered design methods. It also solidifies the need for collaboration of the broader HCI community, including industrial designers and usability engineering teams in fast-paced and competitive industries, to start adopting evidence-based research.

5 Future work

After the full iteration and launching of the new DOVE website, the content format will be tested again for clarity. The DOVE initiative will also be promoted at academic conferences like IEEEVR, ACM and CHI to boost further collaboration. Once we have a good start at covering design-research translation in VR, the site could expand to encompass research for the design of augmented reality interfaces.

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