



NEWSLETTER

VR for Rehabilitation

WELCOME TO OUR NEWSLETTER



PRIME-VR2 Virtually and physically there!

Partners have been very active in participating in events this quarter. Our virtual participation in VR Days was a success. Finally, after months of restrictions, we were able to participate in a face-to-face event in Sweden.

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2nd Helix Event

at TechConnect Europe in Malmö, Sweden, from 15th-17th Novembre, 2021.

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VR Days 2021

PRIME-VR2 at the internationally well-known event from 15th-17th November, 2021.

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Dissemination

See five of our conference papers

pg.6

Young researchers

Meet Craig from University of Strathclyde.

The PRIME-VR2 Consortium is pleased to disclose that the second Virtual Reality Helix event that took place in Malmö, Sweden between the 15th and 17th of November 2021 was successful in its execution. This event was also part of the first edition of the TechConnect Europe Innovation Conference & Exhibition, at which there were many attendees present with expertise in a variety of research and technology areas. TechConnect is a worldwide technology prospecting organisation that has established many programs, experience and networks in the industry of innovation commercialization, investments, marketing and events that will be used to support and accelerate regional and national innovation initiatives. This year, the company made the perilous decision to extend their scope from the United States and organise their first high-level research and innovation event in Europe.



In addition to this, PRIME-VR2 partner CrowdHelix held their annual Research and Technology Organisation (RTO) members networking event within the same venue as TechConnect. The conjunction of both events gave the PRIME-VR2 project an abundance of great exposure. Attendees from both events showed great interest in the technical aspects of PRIME-VR2 and were intrigued by the detail and illustrations provided in the project poster displayed within the CrowdHelix pavilion. The Virtual Reality Helix Manager, Marine Desoche, also attended the event, and gave further details regarding the VR environment & gaming, customised controllers and medical rehabilitation to visitors interested in learning about PRIME-VR2 and the Helix. We were also delighted to have Mark Bennett, a member of INLECOM, our partner organisation leading WP8 Communication, Dissemination and Exploitation visit the booth and showcase the project poster.

The TechConnect Europe Innovation Conference & Exhibition was designed to forge connections between top applied research and early-stage technologies from universities, labs and start-ups with industry and investors, end-users and prospectors. This business model aligns particularly well with our partner organisation, CrowdHelix, who deemed the experience of hosting a joint event with TechConnect to be highly beneficial and rewarding. Preceding TechConnect events were renowned for their excellent number of attendees by the Tech Transfer & Commercialization Office, Universities & Research Centers, Government & Private Research Labs, as well as Regional Economic Tech Hubs and Accelerators & Incubators. Furthermore, TechConnect is considered the world's largest innovation pipeline with approximately 450,000 active contacts, and several hundreds attendees at their last event.



In conclusion, The Virtual Reality Helix event prospered within the atmosphere present at TechConnect Europe. As PRIME-VR2 has a large focus on Additive Manufacturing, Digital, Medical & Biotechnology this conference was undoubtedly a great opportunity for the PRIME-VR2 project to showcase our technology and the excellent work that the Consortium has done and will continue to do. PRIME-VR2 also aims to bring our work closer to the public and we believe that TechConnect Europe has given this objective some great leverage towards making our technology more available and making a difference in the upper body limb rehabilitation process.

The PRIME-VR2 Consortium is pleased to announce our very successful attendance at this year's VR Days Europe 2021 event that took place on 15-17 of November in the Laval Virtual World, as part of the Immersive Tech Week Europe 2021. For the 7th edition, VRDays Europe introduced a sustainable, decentralized event model: Immersive Tech Week, November 13-17 presenting both online and live in person from Amsterdam. Immersive Tech Week resulted in five days of inspiration, discussions, co-creation, experiences and networking. Since 2015 VR Days Europe has been an event focusing on the impact and transformative power of immersive technologies in business, science and the arts.



With a focus on Immersive Technology this conference represented a fantastic opportunity for the PRIME-VR2 project to highlight our technology and the excellent work that the Consortium has done and will continue to do. Over the course of 3 days, PRIME-VR2 hosted a total of 14 presentations ranging from a project overview, through controller useability and dynamics right up to game design aspects. On the Horizon project stage, Prof. Armando Razionale overviewed the project and Dr. Andrew Wodehouse discussing personalized VR controllers. At our dedicated PRIME-VR2 space, presenters from University of Malta, Kinisiforo, UCL, Kerubiel, Flying Squirrel Games, University of Strathclyde, University of Pisa, Inlecom and Crowdhelix all discussed a range of great project outcomes and updates over 12 talks & presentations.



As PRIME-VR2's aim is to bring our work closer to the public and with VR Days being a great step towards making our technology more available and making a difference in the upper body limb rehabilitation process. In total we had more than 135 unique visitors to our event space & talks, results in 200 more video views of our project outputs, supported the completion of 77 new training elements with attendees, and a large number of additional social media posts, followers and external interest.

We look forward to utilizing the online space created for VR Days 2021 Conference for the next year as a dedicated online training & dissemination venue, and hope that you will join us at our PRIME-VR2 Workshop space for more great training & dissemination events into the future.

For more information about VR Days Europe visit: <https://vrdays.co/>

PRIME-VR2 Papers presented at International Conferences

Empathy and Idea Generation: Exploring the Design of a Virtual Reality Controller for Rehabilitation Purposes

Yazan Barhoush, Georgi V. Georgiev and Brian Loudon

The paper explores the ideation and design of a Virtual Reality (VR) proof-of-concept controller for rehabilitation of users with limited physical mobility (upper-limb disability). An existing tracker solution is used to map input (actions and movements) in VR. The main challenge was integrating some of the default functionalities existing in current commercial VR controllers, while providing an empathic setup and a use-case for disability rehabilitation, as well as keeping the controller compact, lightweight, and handheld. The prototyping process followed a human-centred explorative design idea generation. Only limited functionality of existing commercial controllers was maintained, with the feasibility and readiness for implementing additional functionalities to use the controller with existing applications and future use cases. An experiment was performed to investigate the usability of the system and the effectiveness and reliability of the controller in empathic re-mapping of real-life disability to VR.

The Sixth International Conference on Design Creativity (ICDC2020)

<https://doi.org/10.35199/ICDC.2020.36>

DESIGN AND DEVELOPMENT OF A NOVEL TESTING RIG FOR THE EXAMINATION OF ADDITIVELY MANUFACTURED AUXETIC COMPONENTS

Urquhart, Lewis; Fingland, Craig; Wodehouse, Andrew; Loudon, Brian

This paper reports upon the design and development of a novel testing rig for the examination of additively manufactured auxetic componentry. By firstly reviewing the key challenges for practical researchers and exploring the range of approaches used to examine auxetic structures, we subsequently introduce a new testing configuration seeking to enhance the existing methods found within the literature. The developed testing configuration includes a novel mechanical design with a new method for component mounting offering advanced control of the boundary condition and a fully developed control interface which facilitates real-time analytics, a range of data acquisitions and integration with a CAD environment. This paper describes both the development of the mechanical design and the development of the control interface by exploring the key design features and documentation of the manufacturing and assembly process. Finally, we discuss how the presented testing configuration offers a new and flexible way of testing auxetic componentry with additional insights offered for future researchers who wish to recreate or adapt the testing setup for their own examinations of additively manufactured componentry.

INTERNATIONAL CONFERENCE ON ENGINEERING DESIGN, ICED21

<https://www.cambridge.org/core/journals/proceedings-of-the-design-society/article/design-and-development-of-a-novel-testing-rig-for-the-examination-of-additively-manufactured-auxetic-components/0C241792A18F4CD3A36F08C500B3482B>

A NOVEL EXPERIMENTAL DESIGN OF A REAL-TIME VR TRACKING DEVICE

Barhoush, Yazan A M; Nanjappan, Vijayakumar; Thiel, Felix;

Georgiev, Georgi V.; Swapp, David; Loudon, Brian

Virtual Reality (VR) is progressively adopted at different stages of design and product development. Consequently, evolving interaction requirements in engineering design and development for VR are essential for technology adoption. One of these requirements is real-time positional tracking. This Virtual Reality (VR) is progressively adopted at different stages of design and product development.

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INTERNATIONAL CONFERENCE ON ENGINEERING DESIGN, ICED21

<https://www.cambridge.org/core/journals/proceedings-of-the-design-society/article/novel-experimental-design-of-a-realtime-vr-tracking-device/6B1C167E7ADE9E00A6DF1FDC84D6E19E>

THE PERSPECTIVES OF CLINICIANS ON ENRICHING PATIENT EXPERIENCES IN A CLINICAL CONTEXT: A QUALITATIVE STUDY

*Abela, Edward; Farrugia, Philip; Gauci, Maria Victoria;
Balzan, Emanuel; Vella, Pierre; Cassar, Glenn*

Virtual Reality (VR) is progressively adopted at different stages of design and product development. Consequently, evolving interaction requirements in engineering design and development for VR are essential for technology adoption. One of these requirements is real-time positional tracking. This paper aims to present an experimental design of a new real-time positional tracking device (tracker), that is more compact than the existing solution, while addressing factors such as wearability and connectivity. We compare the simulation of the proposed device and the existing solution, discuss the results, and the limitations. The new experimental shape of the device is tailored towards research, allowing the engineering designer to take advantage of a new tracker alternative in new ways, and opens the door to new VR applications in research and product development.

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<https://www.cambridge.org/core/journals/proceedings-of-the-design-society/article/novel-experimental-design-of-a-realtime-vr-tracking-device/6B1C167E7ADE9E00A6DF1FDC84D6E19E>

TOWARDS A VERIFICATION AND VALIDATING TESTING FRAMEWORK TO DEVELOP BESPOKE MEDICAL PRODUCTS IN RESEARCH-FUNDED PROJECTS

*Abela, Edward; Farrugia, Philip; Gauci, Maria Victoria;
Balzan, Emanuel; Vella, Pierre; Cassar, Glenn*

Research funded projects are often concerned with the development of proof-of-concept products. Consequently, activities related to verification and validation testing (VVT) are often not considered in depth, even though various design iterations are carried out to refine an idea. Furthermore, the introduction of additive manufacturing (AM) has facilitated, in particular, the development of bespoke medical products. End bespoke products, which will be used by relevant stakeholders (e.g. patients and clinicians) are fabricated with the same manufacturing technologies used during prototyping. As a result, the detailed design stage of products fabricated by AM is much shorter. Therefore, to improve the market-readiness of bespoke medical devices, testing must be integrated within the development from an early stage, allowing better planning of resources. To address these issues, in this paper, a comprehensive VVT framework is proposed for research projects, which lack a VVT infrastructure. The framework builds up on previous studies and methods utilised in industry to enable project key experts to capture risks as early as the concept design stage.

INTERNATIONAL CONFERENCE ON ENGINEERING DESIGN, ICED21

<https://www.cambridge.org/core/journals/proceedings-of-the-design-society/article/towards-a-verification-and-validating-testing-framework-to-develop-bespoke-medical-products-in-researchfunded-projects/4B3EC9B8240D21C6CB6E2EEBE402CADD>

PRIME-VR2 presenting young researchers

Craig Finland - University of Strathclyde

Hello, I am Craig and I have been working on the PRIME-VR2 project since May 2020. Initially, I joined Work Package 3 for twelve weeks as a research intern and was tasked with the design and development of a novel sample testing rig. Following the production of the rig, I then used the system to analyse a range of auxetic structures and gather data which was subsequently used to educate future design decisions. After graduating from the University of Strathclyde, I re-joined Work Package 3 in May 2021 as a Research Assistant. Since then, I have been supporting the development of controllers and other corresponding design elements.



My time has been typically divided between generating design concepts, producing CAD models and 3D printing/ Laser cutting prototypes. More specifically, my recent focus has been primarily on the detail design of several different mechanisms within the design. Some of these were traditional multi-part assemblies which operate using pin joints, sliding cams and slots. However, I also considered compliant mechanisms where possible as they are well suited to 3D printing, offer freedom of scalability and reduce assembly time.

To produce functional mechanisms which could be integrated into the controller housings, design considerations had to be made regarding the bespoke nature of the final product. As numerous areas of the design were subject to change, some mechanisms required to be tailored to each individual user. By using Grasshopper (a Rhino3D plugin) to construct the CAD models of each mechanism, the script could be added into the general workflow and therefore automatically generate the bespoke mechanism from user scan data.



Overall, PRIME-VR2 has allowed me to work alongside some very talented people and further my abilities as a design engineer. For example, I was fortunate enough to travel to Malta and participate in a design workshop with members of Work Packages 3 and 4. It was very interesting to visit their faculty and work through design iterations as a team. I look forward to seeing the project progress in the coming months!

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PRIME-VR2
Personalised recovery
through a multi-user
environment
VR for Rehabilitation

NEXT ISSUE:

In the next issue, we will discuss about creativity of the controller design, report the Malta workshop and share our progress.

SAVE THE DATE



March 17-18 2022

WORKSHOP

March 2022: The Workshop 'Design for Additive Manufacturing (DfAM): Future Interactive Devices (DEFINED)', will be held on the 17th and 18th of March, 2022. We have a number of keynote invited speakers and a special session during which participants can disseminate their research interests and network to potentially form consortia for Horizon Europe proposals. Registration is free of charge. Further details are available [here](#).

CHECK THE WEBSITE REGULARLY FOR MORE NEWS, DOWNLOADABLE CONTENT AND INFORMATION!

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PRIME-VR2 is on the [Virtual Reality Helix](#)



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