



NEWSLETTER

VR for Rehabilitation



WHAT IS PRIME-VR2?

WELCOME TO OUR QUARTERLY NEWSLETTER

It's our first newsletter and we are excited to tell you all about the work that has been going on in the first few months since the project has started.

PRIME-VR2 is an ambitious project which has potential for considerable impact improving the rehabilitation of people recovering from sports injuries, strokes and movement disorders.

This EU H2020 project involves the creation of an end-to-end integrated digital development platform to facilitate collaboration across stakeholders in the VR ecosystem, and to produce effective VR rehabilitation environments.

We are eager to share our progress and achievements. We hope you enjoy reading about our fantastic project. Please follow us on LinkedIn or Twitter and keep up to date with our news items and downloadable content at prime-vr2.eu.

pg.2 **Project's Objectives**

Learn about the scope of the project and the objectives being set out by the team

All objectives are meant to be accomplished through three main milestones.

pg.3 **Work Done So Far**

Read about the progress that the team is doing in each of the seven technical work packages which brings us closer to our objectives.

Our work involves a multidisciplinary team









pg.5 **Meet the team**

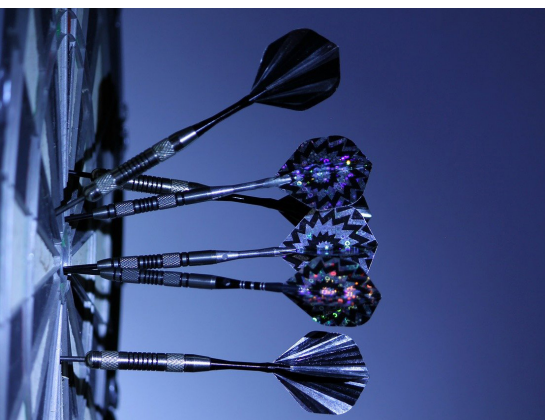
In this first newsletter we are meeting with the team members from the University of Pisa (UOP), one of the academic partners of the project.

UOP is the coordinator of the project.

THE OBJECTIVES OF PRIME-VR2

The overall aim of this project is to deliver a development platform that integrates VR hardware and physically- and socially-optimised gaming in order to deliver enhanced VR experiences. This will be developed for the area of rehabilitation through three use cases, and will demonstrate new standards of accessibility, control, feedback and engagement for users. **In order to achieve this, the specific project objectives are to:**

-  Generate a VR environment for rehabilitation exercises that allows users to socialise, play and compare progress to aid motivation in rehabilitation.
-  Develop new approaches for non-invasive, accurate anatomical and mobility data collection that retains user dignity.
-  Use a variety of advanced methods to build a biomechanical profile of patient injury in order to develop VR controllers aligned with specialised rehabilitation approaches.
-  Create new additive controller housing structures that blend external physical requirements with internal actuation properties.
-  Use advanced Human-Centred Design techniques to generate and evaluate emotional, cognitive, aesthetic and social requirements.
-  Extend the principles of design for manufacture for additive structures to deliver practical and viable controller housings.
-  Develop a detailed commercialisation and exploitation plan to take the VRHAB-IT platform to the market.
-  Implement and test the proposed platform through three distinct case studies involving different participants.



OUR MILESTONES

Human Centred Design methods will be employed in the development of assistive devices, allowing for appropriate consideration of the experience of individual product users. The implementation of software and hardware demonstrators will also allow for the validation of the overarching delivery platform and illustrate the route to mass customisation using advanced and integrated digital manufacturing techniques.

To provide an appropriate path to integration across these elements, and to allow for appropriate points of reflection, the project methodology comprises three critical milestones at 12 month intervals:



MILESTONE 1

Technological review, review of state-of-the-art and key stakeholders, and initial experimentation.



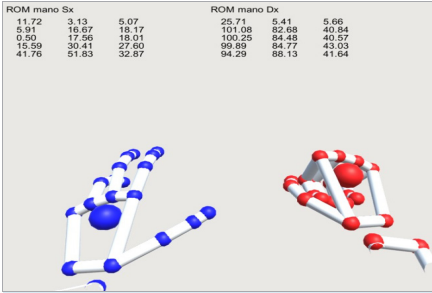
MILESTONE 2

Development of the proposed VR environment and refinement of assistive controller designs based on biomechanical profiles.



MILESTONE 3

Implementation and testing of the VRR platform with the assistive controllers



PRIME-VR2 platform requirements and data capture

The main work in this task is to determine a biomechanical profile of the patients, in order to guide the therapist in determining the treatments and to set up the gaming environment. We have been investigating 3D scanning, motion capture and force assessment.

The partners selected some promising technologies which are available on the market at sustainable costs. The devices were tested by the partners, and some interesting preliminary results are available. At the same time, we are also investigating the main exercises which are commonly used in the project field. These exercises will provide precious guidelines for the controller design



Requirements for the design for manufacture and assembly of the PRIME-VR2 controller devices

The main work in this stage will start after the controller design is conceptualised. However, in order to prepare for the big step, PRIME-VR2 has started identifying manufacturing and assembly requirements by reviewing state-of-the-art controllers. This knowledge will be used to make informed decisions during the design of our controller to ensure that parts are easy to manufacture and ultimately, easy to assemble at the lowest possible costs.

Furthermore, a list of consumer and medical standards are being reviewed since these controllers need to meet the design requirements and relevant regulations. Based on these standards, in parallel, the team started looking at an appropriate number of tests that could be part of the testing matrix for the controllers.

THE WORK DONE SO FAR

Five months have passed since the project has started and the team is working at full steam to achieve the project's objectives. Read more in Pages 3 and 4.

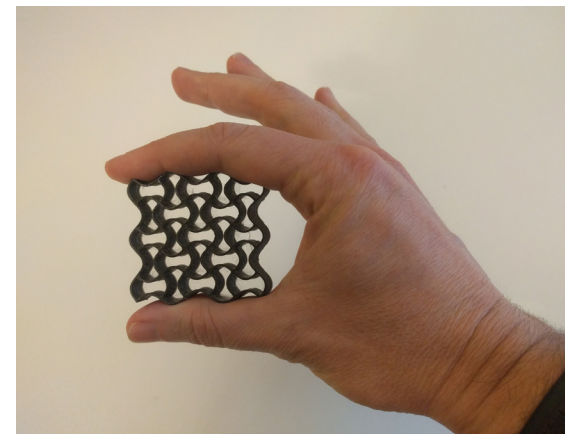
Design and development of the controller housings using additive manufacturing techniques

PRIME-VR2 will be working on bringing VR controllers to life using new additive manufacturing techniques, algorithmic form generation, and surface treatments.

In order to define design requirements, we are currently liaising with colleagues in the profiling of the three use cases. This information will be used to generate appropriate controller configurations.

A key differentiator of the work will be deformable structures that provide functionality, and to this end we are currently conducting a state-of-the-art review in auxetic structures, exploring different additive manufacturing technologies and experimenting with trial prints of existing deformable lattices.

As the three controller configurations become more defined, our target space envelopes will integrate with control mappings and design for manufacture in order to deliver prototypes that allow users to effectively access the virtual environment.



Development of the software, control and interaction aspects of the VR devices



Our main tasks are the design of control interface and software, along with the design and manufacture of the electronic circuitry. We are close to establishing controller electronics hardware and software specifications.

The partners collaborating in this area are progressing towards making an informed decision on the selection of the platform, tracking setup, and hardware/software implementation priorities, which are some of the essential aspects of the PRIME-VR2 project.

We are also reviewing the state-of-the-art commercial and experimental controllers with a focus on technologies, hardware and software implementations.

Moreover, we started to experiment with early prototypes that help identify interactions and corresponding control mappings.



WE BELIEVE IN POSSIBILITIES



PRIME-VR2 evaluation and validation

The three Living Labs in London, Cyprus and Malta are contributing to identify what should be the requirements for the controllers and of the VRHAB-IT platform, based on the necessities of each user groups within the aforementioned labs. As mentioned in page 1, these are children with dystonia, post-stroke patients and sports injured patients.

We will be specifically engaging with people with hyperkinetic movement disorders (HMDs) who experience involuntary movements throughout their body. HMDs like dystonia can affect people's ability to carry out everyday functions like pouring a glass of water.

We are beginning work with our partners to develop virtual environments for games where, for example, people with dystonia can practice pouring water without spilling a drop of real water anywhere.

Furthermore, with the PRIME-VR2 technical partners, we are developing a framework to gather data from people with the above conditions about their priorities for the project, and to measure and describe the shape, movements and capabilities of their hands.

We are also providing ongoing advice and guidance on the initial design of accessible controllers and the game environments. We are looking forward to testing early prototypes with our disabled participants later in the year.

PRIME-VR2 communication, dissemination and exploitation programme

In this project we have developed a strategy to identify our stakeholders which include:

- Those providing, receiving and involved in research for rehabilitation healthcare.
- Companies that develop VR gaming hardware and software
- Standardisation bodies, regulators and policy makers.

We will be developing a capacity building programme which will highlight the experiences of the Living Labs and communicate best practice to other healthcare providers.

We will also develop training materials and tutorials for others who wish to learn and utilise the VRHAB-IT platform themselves. We have already created an area devoted to VR, named [Virtual Reality](#), on the open innovation platform [Crowdhelix](#), which connects universities, research organisations & companies.

Furthermore, we will be organising an event alongside [VR Days 2020](#) in Amsterdam in November. Additional information on the event will be posted soon.



MEMBERS OF THE CONSORTIUM



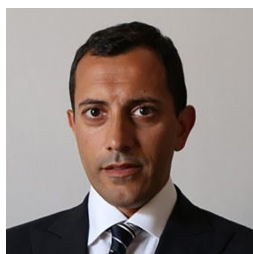
MEET THE TEAM: UNIVERSITY OF PISA

The University of Pisa (UOP) is a public institution with twenty departments, and high-level research centres in the agriculture, astrophysics, computer science, engineering, medicine and veterinary medicine sectors. The Department of Civil and Industrial Engineering (DICI) is one of the 20 departments, and is the one involved in the PRIME-VR2 project. It consists of about 70 Faculty members doing research in areas such as mechanical engineering, machine design, and computational mechanics. UOP has extensive experience in managing EC projects under FP7 and H2020. It is involved in 157 FP7 projects, of which 27 coordinated, and in around 100 H2020 projects, of which 15 coordinated. Their role in this project is (1) to coordinate the project, (2) to coordinate activities on the platform requirements and user data acquisition (3) to provide expertise in Additive Manufacturing and (4) to contribute on the dissemination and communication activities



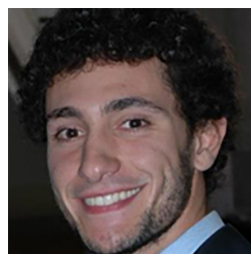
Sandro Barone

Prof. Sandro Barone is the coordinator of the PRIME-VR2 Project and is a Full Professor of Design and Methods of Industrial Engineering at the Faculty of Engineering of the UOP.



Armando Razionale

Prof. Armando Razionale is Associate Professor of Industrial Design Methods at the Faculty of Engineering of the UOP.



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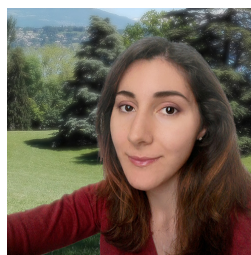
Alessandro Paoli

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Francesco Tamburrino

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

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NEXT ISSUE: JUNE'20

In our next issue, get insights on the latest developments in the PRIME-VR project where we will reveal the deliverables completed and the progress so far. We will also introduce two members of the consortium and provide more details about the Amsterdam workshop that we will be hosting in the beginning of November.



NEXT EVENTS

March'20: Apart from the many weekly meetings that the team holds, the consortium will meet in Malta between 17th and 18th of March to discuss the work carried out during the first 6 months of the project and that to be done in the upcoming 6 months.

November'20: The PRIME-VR2 team will be meeting again in the beginning of November where we will be organising an event in Amsterdam, focusing on Virtual Reality for Rehabilitation. This event, which will take place between the 4th and 6th of November, is composed of a number of workshops and whether you are new to Virtual Reality or already familiar to the technologies, these workshops will get the participants motivated to live and experience the latest innovations in field of VR for Health/Rehabilitation. The event will be taking place during the popular annual event VRDays. Make sure to check our website, prime-vr2.eu, where more information will be available soon. We hope to see you there!

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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