



PhD in BIOINGEGNERIA / BIOENGINEERING - 40th cycle

THEMATIC Research Field: DEVELOPMENT AND TESTING OF VIRTUAL REALITY ENVIRONMENTS FOR IMPROVING PERFORMANCE AND PSYCHOPHYSICAL WELL-BEING IN PAEDIATRIC AND ADULT SUBJECTS

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	<p>Recently, digital technologies have increasingly spread in the health and rehabilitation sectors for both cognitive and motor training. The reasons behind this phenomenon are different. First of all, many of the devices that allow eXtended Reality (XR) experiences have good quality and are lowering in costs, which allow their use even outside research laboratories. Secondly, digital technologies are able to recreate ecological and safe scenarios, in which to test participant's skills, without the potential risks present in the real world. Furthermore, thanks to the possibility of involving the user in the immersive experience and generating the so-called "sense of presence", these technologies promote motivation and adherence to treatment, also improving results from a clinical point of view. Particularly, embodiment is crucial during rehabilitation, and it can be obtained with different methods according to the literature. However, there is a lack of clear understanding of the factors influencing engagement and embodiment particularly in people with disabilities and in the developmental age. The aim of this PhD project will be</p> <ol style="list-style-type: none"> 1) To design and test virtual environments to support engagement in the rehabilitation context posing particular attention to different techniques to improve embodiment and engagement 2) To assess engagement and embodiment in trials involving participants with disabilities (both minors and



	adults) with objective parameters (e.g. physiological signals) and subjective variables (questionnaires).
Methods and techniques that will be developed and used to carry out the research	The virtual environments will be designed by means of Unity 3D and different viewer will be used to deliver the visual stimulation (e.g. oculus Quest and HTC VIVE pro eye). Haptic data gloves will also be used for haptic feedback. Particular attention in the design and trials will be paid on improving the subject's engagement and embodiment, which will be studied considering factors such as the immersiveness of the simulation, the presence of haptic stimuli, the interaction mode, the realism and the characteristics of the avatar. Engagement assessment will be performed with both objective parameters (e.g. physiological signals) and subjective variables (engagement, sense of presence, emotions, cognitive workload, usability and acceptability of the system, etc.). The research will be performed at ASTROLab (IRCCS Eugenio Medea) in collaboration with CNR-STIIMA under a grant funded by INAIL (Rientr@Returns-PR23-SV-P2).
Educational objectives	Study and development of gamification strategies and methodologies to support engagement in rehabilitation. Study and analysis of physiological parameters for the evaluation of the psycho-emotional state during neurorehabilitation exercises in VR, with and without haptic stimulation.
Job opportunities	The opportunities of professional careers are in research structures and scientific institutes like IRCCS E. Medea where the combination of professional (clinical/biomedical) activity and research is needed. Other relevant opportunities are in the R&D dept. of biomedical companies, as previous candidate exploited their careers.
Composition of the research group	1 Full Professors 1 Associated Professors 4 Assistant Professors 0 PhD Students
Name of the research directors	PROFF. GIUSEPPE ANDREONI - EMILIA BIFFI



Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>At E.Medea, the research team is composed as follows 3 senior researchers 4 researchers 3 PhD students https://emedea.it/medea/it/per-i-pazienti-it/attivita-e-servizi/27-istituto/polo-di-bosisio-parini/astrolab</p> <p>Educational activity: The student will be encouraged to attend to courses at POLIMI or abroad 2 / 3 in International Schools. Teaching assistantship: There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations. Computer and desk availability: the student will be allowed to access facilities of the DEIB.</p>