



PhD in BIOINGEGNERIA / BIOENGINEERING - 39th cycle

PNRR 118 TDA Research Field: SMART INFRASTRUCTURE, AUGMENTED REALITY, HOSPITAL OF THE FUTURE, HEALTHCARE DESIGN

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>The proposal is combining augmented reality with the needs of hospital construction in the information age, and in view of the inconvenience of navigation indexing in large general hospitals. Patients, especially in the case of fragile patients, would need a system which would provide more convenient navigation and guidance services. Augmented reality indoor navigation has recently being applied, also to hospital settings.</p> <p>The aim of the PhD scholarship is to guarantee a smooth navigation tool for patients, which would consider human factors and information technology opportunities for robustly show the path within the hospital.</p> <p>The developed application will start analyzing the user needs for information about the treatment plan and the need medical exams to be performed. Based on the hospital map and of the hospital services and the virtual information, the system will offer the plan of action routes for users.</p>
Methods and techniques that will be developed and used to carry out the research	<p>The PhD scholarship’s supervision will be jointly implemented by a Professor in Bioengineering and a Professor from the Architecture and Public Health fields, who are currently offering a MSc course “Smart Hospital” at Politecnico di Milano (3i School).</p> <p>Methods and techniques that will be developed and used to carry out the research:</p> <ol style="list-style-type: none"> 1) General knowledge on healthcare design and layout analysis of healthcare settings



	<p>analysis of healthcare settings</p> <p>2) Digital 3D reconstruction of the hospital map based on 2D projections</p> <p>3) Indoor localization using digital markers and computer vision techniques</p> <p>4) Augmented reality-based guidance (considering the human factor for fragile users)</p> <p>5) Knowledge management systems and path planning techniques in a 2D dynamic environment</p> <p>6) User-tests and evaluation in a real setting.</p>
Educational objectives	<p>The student will be able to conduct a technological analysis on a medical device and understand the clinical needs to bring technological innovation to the market.</p> <p>The student will be able to analyze technical aspects and integrate the new technological solution into existing devices.</p> <p>The student will be able to work with 3D design tools, computer vision and artificial intelligence.</p> <p>The student will be able to analyze functional layouts of a healthcare facility.</p>
Job opportunities	<p>Clinical engineering units</p> <p>Medical devices companies</p> <p>Architecture/Engineering firms</p>
Composition of the research group	<p>1 Full Professors</p> <p>1 Associated Professors</p> <p>3 Assistant Professors</p> <p>12 PhD Students</p>
Name of the research directors	PROF. ELENA DE MOMI

Contacts	
<p>elena.demomi@polimi.it, TEL 02.2399.9017, https://nearlab.polimi.it/medical/</p>	

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

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Humanitas Research Hospital
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	Karlsruhe Institute of Technology
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

The PhD student will be involved in educational activities along with teaching assistantship. A shared desk and computer will be given to the student for the time needed to carry out the research.