Mac Robertson PGR Travel Scholarship Report

About me

I am Amy Grech, from Malta, and a PhD candidate at the University of Strathclyde. It is an honour for me to form part of the Design Research group in the department of Design, Manufacturing and Engineering Management. My research is in collaboration with the National Manufacturing Institute Scotland (NMIS). I am profoundly grateful for being awarded the Mac Roberston PGR Travel Scholarship in 2023, during my first year of studies with an award value of £4000.

My research area tackles a critical and timely issue in the product design and engineering design fields: the necessity of empathetically understand users' needs and incorporating this understanding into the design process. My research explores Virtual Reality (VR) as a transformative tool that empowers designers to experience empathy towards their users. Therefore, my research combines empathic design with human-computer interaction leading to a new generation of human-oriented solutions targeting inclusivity and social value.

Often, the effectiveness of design solutions hinges on designers' ability to gain insight into users' perspectives. Empathy is therefore pivotal for designers in the design phases of creative conceptualisation and ideation. However, its multi-dimensional nature can hinder the design process by designers fixating on a singular user perspective that prevents radical thinking. Technology was often limited to creating empathic social interactions, highlighting the need for a more structured approach. Inspired by the perspective-taking and embodiment capabilities of Virtual Reality (VR) technology, this research explores how designers can experience the optimal level of empathy towards their users in a virtual environment. A literature review integrating multidisciplinary literature from psychology, empathic design, and empathy in VR combined with a qualitative study consisting of interviews with professional designers were conducted to understand current challenges and identify how VR can support the transformation of empathic design. Outcomes from the literature review and the qualitative study led to the creation of a unique specification entitled, The Digital Empathy Design Voyage that proposes design considerations for a fully immersive VR environment aimed to facilitate the optimal level of designer empathy towards their users and enhance designers' empathic skills. The outcomes of the interviews were presented at the IASDR 2023 conference in Milan (https://doi.org/10.21606/iasdr.2023.380).

The next step of the research involved applying the specification to a specific user experience and perform empirical analysis on an operational virtual environment that determines the impact of the Digital Empathic Design Voyage. A user experience was designed aligning with the Digital Empathic Design Voyage specification, which and was prototyped for a physical setting, before transforming it into a virtual experience using VR. The scenario was tested through multiple workshops held with students from product design and engineering design fields. The empathy outcomes from participants were qualitatively analysed through a novel evaluation system developed for this research, entitled the Empathic Empowerment scale. The outcomes of this study were presented during the DESIGN2024 conference in Dubrovnik (https://doi.org/10.1017/pds.2024.240). This led to the design and development a virtual interactive experience that embodies the holistic lived experience of users and replicates the experience analysed during the workshops to a virtual setting.

Why did I apply for the Travel Scholarship

I applied for the Mac Roberston PGR Travel Scholarship because I wanted to push further the boundaries of my research by working with experts in the fields of virtual reality and human-computer interaction, which are highly relevant for my research. Coming from an engineering design background, working with people from such fields was highly beneficial and necessary for me to design, develop and evaluate the virtual experience with the highest level of excellence. Working with the Centre for Ubiquitous Computing (UBICOMP) at the University of Oulu gave me the opportunity to gain knowledge on technical aspects of my research including VR design and development whilst also designing and conducting a VR experiment. This was vital for me to reach my research goal of creating a virtual environment that bridges my own expertise in empathic design and facilitates designer empathy in VR through multidisciplinary knowledge. Another reason I applied for the scholarship was also to create opportunities for engagement, networking and collaboration between the University of Oulu and the University of Strathclyde and strengthen the relationship between both universities.

Details of my visit

The Centre for Ubiquitous Computing (UBICOMP) is one of the research units in the Faculty of Information Technology and Electrical Engineering (ITEE) at the University of Oulu. I worked with the Design Creativity Group, a research group within UBICOMP, which is led by Professor Georgi Georgiev. The focus of the Design Creativity Group lies in supporting and enhancing core human abilities and behaviours in the innovative design of interactive artifacts and environments. The research placement lasted three months, between April and June 2024. I was warmly welcomed to the department of UBICOMP, and during the initial period of my visit, I was invited to showcase my research with the department during a departmental meeting held on campus. During this opportunity I got to showcase and discuss my research with peers from a wide range of backgrounds which helped me gain fresh perspectives.

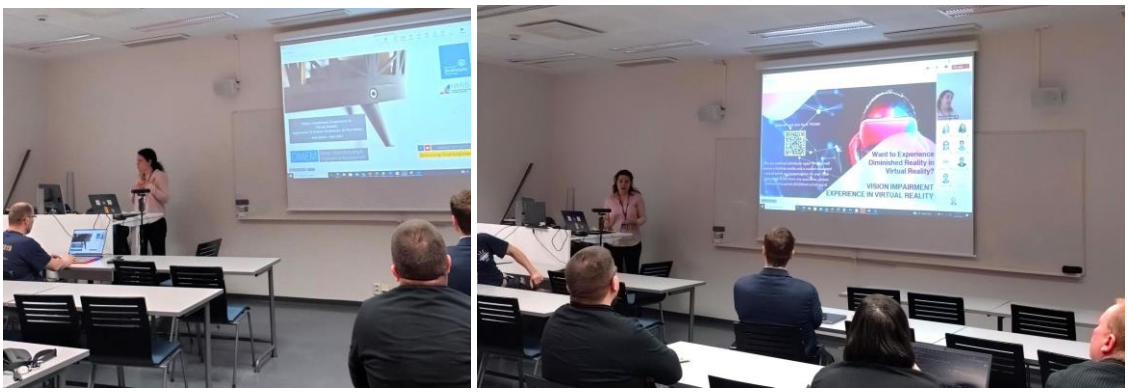

Figure 1: Research Showcase at the UBICOMP department, University of Oulu, Finland

The main research activities planned for my visit were completing the development of the virtual environment that aligns with the Digital Empathic Design Voyage, the experimental design of the empirical analysis performed on the virtual environment and conducting the study with participants recruited by the University of Oulu. The first two activities were performed during my first month of the visit and the study was conducted during the subsequent two months. During and prior my research experience, I was mentored by the lead of the Design Creativity Group, Professor Georgi Georgiev and I worked with a fellow member of the group and PhD candidate, Ummi Latif. Multiple meetings were held in the months leading the visit to discuss logistics and to plan all research activities ahead of my arrival. Regular meetings also took place during the visit to ensure frequent communication and to plan out the next steps. During my stay, I was provided with full dedicated access to a VR experiment room equipped with state-of-the-art equipment and resources that met all the requirements of my study. Prior to commencing the study, I conducted a pilot run with members

of the Design Creativity research group acting as participants to obtain feedback on the experiment design and structure and perform any final tweaks. The experiment far exceeded the target number of participants, leading to a highly successful major study. It attracted significant interest from people with diverse backgrounds, including students, researchers, and top experts in the field. Following the analysis of the results, the study's outcomes are planned to be published in international conferences and journal publications.

During my visit, I also got the opportunity to attend the international Nordic Conference on Digital Health and Wireless Solutions (NCDHWS) organised 6GESS and DigiHealth research programmes from the University of Oulu. At the conference, I presented my research entitled Digital Empathic Healthcare: Designing Virtual Interaction for Human-Centred Experiences which revealed important design considerations for designing empathy in VR (https://doi.org/10.1007/978-3-031-59080-1_14). During the conference, I was given the unique opportunity to visit the Oulu University of Applied Sciences (OAMK) where I got to experience a simulation environment used for occupational therapy students and professionals. The simulation environment was designed to be an accessible home, consisting of multiple simulation devices and accessible furniture. Besides getting to know more about the research activities taking place at the accessible home, I also got the chance to test the simulation devices which allowed me to gain a holistic perspective of how current physical simulations are performed for health and wellbeing applications. This was highly relevant to my research, which aims not only to facilitate designer empathy but also to transform other professions such as those in healthcare, education and any other field where empathy is vital. This conference was a fantastic learning opportunity which allowed me to network with international researchers and business partners in the field of digital healthcare.

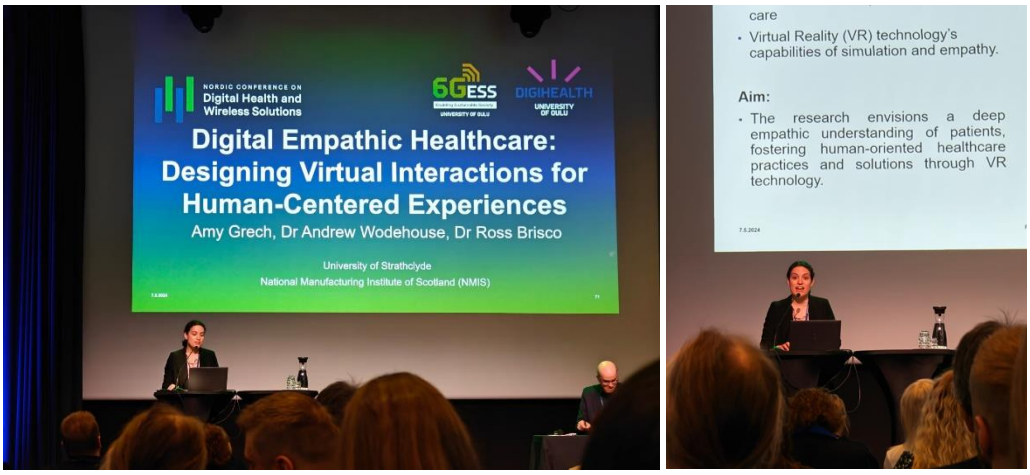

Figure 2: Presenting my Paper: Digital Empathic Healthcare: Designing Virtual Interactions for Human-Centered Experiences at the NCDHWS international conference, Oulu

Towards the end of my visit, I was thrilled to participate at UBISS2024, the 12th international summer school event hosted by UBICOMP. I participated in an intensive 1-week long workshop entitled "Virtually Real? The Art and Science of Designing Impactful (or Even Transformative?) Virtual Experiences," led by Dr Bernhard Riecke from Simon Fraser University, Canada, together with Dr Matti Pouke and Dr Paula Alavesa from the University of Oulu. The workshop aimed to explore VR as a tool for creating psychologically impactful and emotionally resonant experiences, aligning closely with my research. Together with four international participants from diverse disciplines, I designed and developed a VR experience, entitled "I am a Tree." The experience consisted of an immersive multi-sensory experience aimed to evoke compassion and connection towards nature. We created a website to showcase our project (https://sites.google.com/view/iamatree/home?authuser=0). UBISS2024 consisted of multiple workshops in the fields of design, computer science and human-computer interaction and all teams were given the opportunity to present their project to everyone at the end

of the week. Multiple social events took place throughout the week which enriched the experience and allowed me to meet global like-minded peers who have a passion for their field. During the final social event, our team was presented with the Distinguished Project Award for our workshop. I am truly humbled and honoured to have been part of this experience which allowed me to freely express myself and advance my skillset on both a professional and on a personal level.

Figure 3: Post-VR experience of "I am a Tree" at UBISS 2024, Oulu. Photo credit: Julian Rasch

Impact of the Travel Scholarship

The Mac Robertson scholarship significantly impacted my research. I received advice from top experts in the field of VR and human-computer interaction which enabled me to design a VR experiment that maximised the theoretical potential of my research. The pilot study conducted prior to the empirical analysis ensured that the experiment design and procedure effectively utilised all resources and supported my research goals. My mentorship with Professor Georgi Georgiev was exceptional, consistent and highly dedicated. I am highly appreciative of the quality of feedback provided to support my research. Under the recommendation of Professor Georgi Georgiev, attending the UBISS2024 offered me a fresh perspective on designing impactful and meaningful VR experiences. I learned valuable lessons in analysing such experiences, which I will implement whilst evaluating my results in my own study. I will also carry these lessons forward in my follow-up studies planned for my PhD research. My time at Oulu created multiple opportunities for engagement with members of the department and with international researchers I met during the NCDHWS conference and UBISS2024. Through my knowledge in design engineering and empathic design, I have created opportunities for collaboration that will support my future studies.

This experience has profoundly influenced me both personally and professionally. I was given the opportunity to share my own perspective with individuals from various fields and work collaboratively to create a solution that transcended a mere VR experiment. The study aimed to foster empathy towards others, and with the support of VR technology, the entire experiment provided a meaningful and personal experience for each participant. Witnessing this journey brought me immense satisfaction, beyond what words can describe. Through multiple social events that I have actively participated with the department and with the external activities I was involved in, I have also met people from all over the globe that allowed to gain exposure towards new cultures and perspectives and have left a lasting influence. During this journey, I have met a few special individuals whom I am fortunate to call lifelong friends.

Acknowledgments

I would like to extend my heartfelt thanks to Professor Georgi Georgiev for his excellent mentorship, and to all the staff and members of the Design Creativity Group for their unwavering support. My gratitude also goes to Professor Timo Ojala, the head of the department, for his kind support during my visit. Additionally, I am deeply thankful to my PhD supervisors, Dr Andrew Wodehouse and Dr Ross Brisco, for their outstanding supervision and guidance throughout my PhD experience. Lastly, I express

my sincere appreciation to the Mac Robertson Scholarship for making this unique opportunity possible, an experience I will treasure for many years to come.