Department	School of Computing
Supervisors	Dr Balandino Di Donato (1st) and Dr Iain McGregor (2nd)
Project Title	Sound design for VR/AR hill and mountain navigation training and safety

PROJECT DESCRIPTION

This project explores how Virtual Reality (VR) and Augmented Audio (AA) can support hill and mountain navigation training, along with improving safety in the mountains for experienced climbers.

Navigating hills and mountains can pose multiple challenges, sometimes causing stress and eliciting fear. Sound plays an important part in retaining a hiker's sense of confidence, reducing stress, and increasing the level of enjoyment (Coble et al., 2017). Sound maps and virtual sound walks have been previously realised to enhance the map use experience in hill walking and parks (Laakso and Tiina, 2010) in order to prepare people for what they might experience. Audio GPS devices have been successfully developed in order to facilitate other tasks whilst navigating (Holland et al., 2008). Voice-based descriptive map content in a hiking context has been developed to guide hikers towards specific locations via audio descriptions (Laasko et al., 2018). Sound has been exploited in multiple ways to aid navigation in the mountains. However, technology can fail and leave hikers with their pre-existing knowledge of the territory and senses to reach the desired location. Hikers' senses and experience become vital when navigating in the dark or adverse weather conditions. Interpreting sound can provide information about a surrounding's characteristics, the surface being walked on, the distance of an incoming storm, or an alert for a rockfall. Recognising and distinguishing sounds when hiking and mountaineering can help walkers safely return to their starting point. Making sense of the soundscape can be difficult, and certain sounds' learnability can be an issue (Dingler et al., 2008).

Auditory feedback has been shown to be successful in guiding hikers through the mountains; however, many other factors need to be considered for safe navigation. This project also investigates the modelling of a multimodal data set to inform auditory feedback for hikers. For example, the mapping of location, health, surface type, weather conditions, access to emergency services, encouragement, wildlife, habitat, shelter and other potential danger (i.e. rockfalls or avalanches) to auditory feedback to increase the hikers' sense of awareness and inform the decision-making process when hiking.

Academic qualifications

A first degree (at least a 2.1) ideally in Sound Design or Music Technology with a good fundamental knowledge of sound design and virtual environments (AR/VR).

English language requirement

IELTS score must be at least 6.5 (with not less than 6.0 in each of the four components). Other, equivalent qualifications will be accepted. Full details of the University's policy are available online.

Essential attributes:

- Experience of fundamental sound design, field recording and virtual environments (AR/VR)
- Competent in programming (C# and Python), sound recording and analysis
- Knowledge of acoustic, psychoacoustics, audio middleware (Wwise) and game engines (Unity), wearable technology, AI and machine learning.
- Good written and oral communication skills

- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

Desirable attributes:
Knowledge of version control (GitHub) and Agile workflow.

Indicative Bibliography	Coble, T. G., Selin, S. W., & Erickson, B. B. (2017). Hiking Alone: Understanding Fear, Negotiation Strategies and Leisure Experience. *Https://Doi-Org.Napier.Idm.Oclc.Org/10.18666/Jlr-2003-V35-I1-608*, *35*(1), 1–22. https://doi.org/10.18666/JLR-2003-V35-I1-608 Dingler, T., Lindsay, J., & Walker, B. N. (2008, June 24). Learnabiltiy of Sound Cues for Environmental Features: Auditory Icons, Earcons, Spearcons, and Speech. *Proceedings of the 14th International Conference on Auditory Display*. Holland, S., Morse, D. R., & Gedenryd, H. (2002). AudioGPS: Spatial audio navigation with a minimal attention interface. *Personal and Ubiquitous Computing*, *6*(4), 253–259. https://doi.org/10.1007/S007790200025/METRICS Laakso, M., & Tiina Sarjakoski, L. (2010). Sonic Maps for Hiking—Use of Sound in Enhancing the Map Use Experience. *The Cartographic Journal*, *47*(4), 300–307. https://doi.org/10.1179/000870410X12911298276237 Laakso, M., Halkosaari, H.-M., Sarjakoski, T., & Sarjakoski, L. T. (2013). User Experiences with Voice-Based Descriptive Map Content in a Hiking Context. *GI_Forum 2013 – Creating the GISociety*, 49–58. https://doi.org/10.1553/giscience2013s49 Malvar, R. (2018, February 18). *Soundscape app empowers people who are Blind or have Low Vision to explore the world*. Microsoft Accessibility Blog. https://blogs.microsoft.com/accessibility/soundscape/
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