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Immersive environment for a tsunami evacuation simulation model

Starting date / Duration: To be determined in 2026 / 6 months
Gratification: 700€ / month full time
Localisation: Remote Sensing House and/or LAGAM, Montpellier, France
Keywords: Virtual reality, simulation modeling, software engineering, game design

Context:

PC Risques sismo-volcaniques, tsunamis et hydro-climatiques en Outre-Mer et zones intertropicales (ROM)

The internship is part of the PEPR IRIMA ROM research project (Seismic-volcanic risks, tsunamis and hydro-climatic risks in Overseas and intertropical zones), specifically in WP2 (tsunamis, Indian Ocean), and whose challenge is to build a chain of tools and methods linking state-of-the-art mathematical and numerical models with geophysical, geological, civil engineering, geographical and economic data to carry out an analysis of hazards, risks and socio-economic impacts (including buildings and infrastructure) related to tsunamis generated by landslides in a seismic-volcanic context (including cascade effects).

Agent-based simulation work allows us to represent*in silico*The human and decision-making challenges of the crisis were addressed without having to implement costly, if not practically impossible, evacuation drills. With this in mind, an evacuation model was developed as part of Noé Carles' doctoral thesis and applied to tsunami risk management in the French

Mediterranean. Various alert and crisis scenarios were simulated, allowing for the identification of critical points of vigilance in the event of a failure of the alert system or a surge in beach attendance in the municipality of Cannes.

By extension, this model, applied to tsunami risk in an island context (Mayotte), aims to enrich the approach by focusing more specifically on behaviors in crisis situations. In this context, virtual reality opens up numerous avenues: improving communication about simulation results, allowing citizens and institutional decision-makers to experience the challenges of evacuation in an immersive way, and collecting behavioral data in crisis situations (information seeking, movement, recognition of warning signs, etc.).

GoalsGraphic design (3D assets) of the immersive environment to be integrated into the Unity game engine, consistent with the crisis management challenges established with the researchers, experts and the computer constraints defined by the interaction with the numerical simulation (Gama platform -https://gama-platform.org/) Integration of the Unity/Gama coupling tools developed within the framework of the European SIMPLE project (https://project-simple.eu/) and setting up a POC using a VR headset.

Required skills: Skills in 3D computer graphics, illustration and/or concept art are required, as well as*complete autonomy on Unity* (particularly graphic design skills) and proficiency in 3D modeling software (such as Blender). Candidates will be expected to interact with researchers from the IRIMA ROM project, particularly regarding the development of the digital evacuation model and understanding the specific context of the study site (Mayotte).

Supervision:
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References:
Carles N. et al., An Agent-Based Model to Simulate the Effects of Tsunami Warnings on Pedestrian Evacuation: Sensitivity Analysis and Early Findings. *International Conference on Principles and Practice of Multi-Agent Systems*, Nov 2024, Kyoto, Japan. pp.369-384,⟨10.1007/978-3-031-77367-9_28⟩. ⟨hal-04794796⟩

Frédéric Leone, Monique Gherardi, Matthieu Péroche, Émilie Lagahé, Pierre Aumond, Jonathan Siliezar Montoya, Fahad Idaroussi Tsima, Pablo Poulain, Anne Le Friant, Anne Mangeney, Said Hachim Mogne and Valentin Roudier, “Mayotte prepares for the tsunami risk: modelling, alert, evacuation, awareness”,*EchoGéo*[Online], 64 | 2023, DOI:https://doi.org/10.4000/echogeo.25078