

I. Research Overview and Outcome

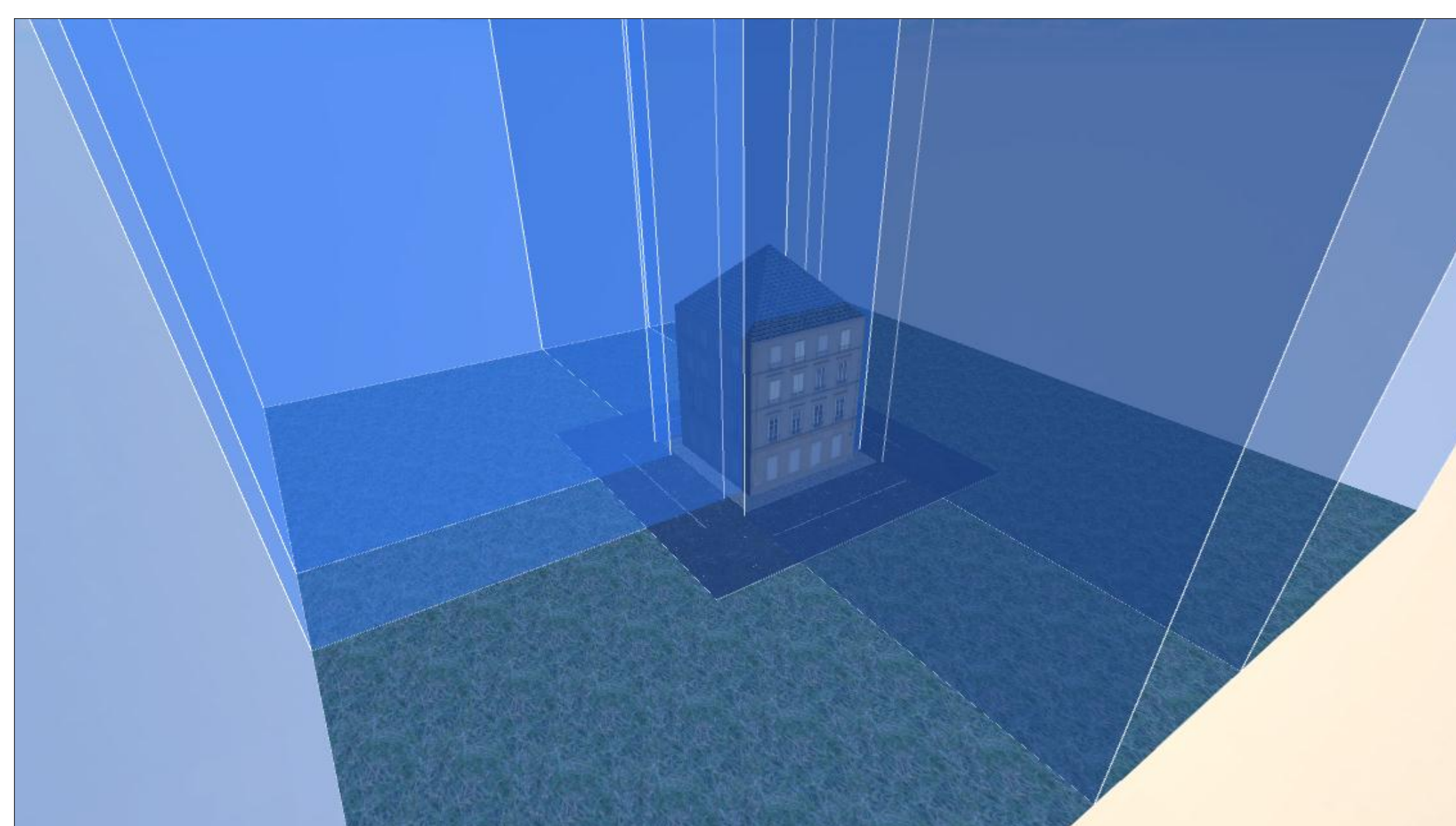
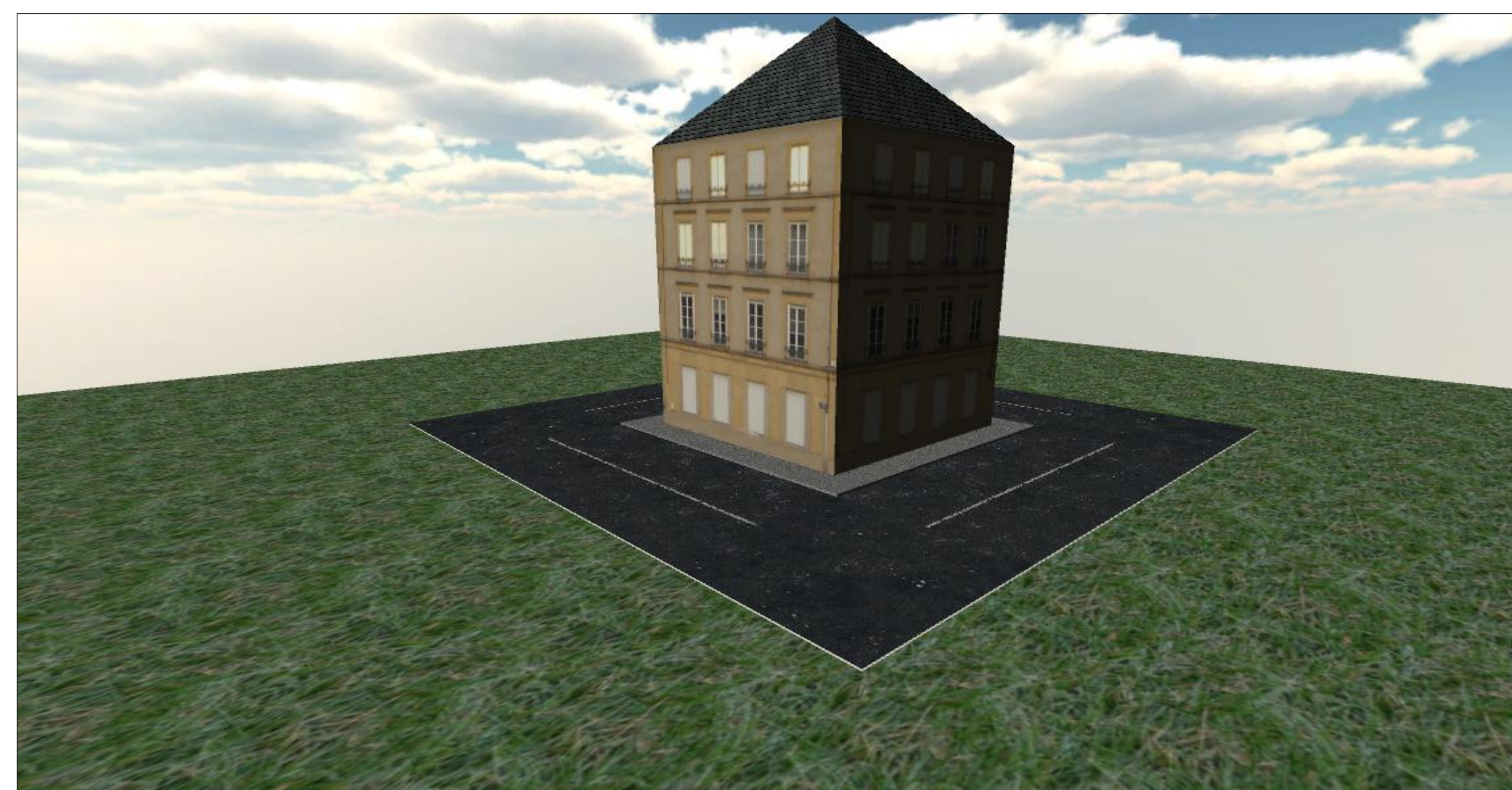
Introduction

- We propose to assist with the development of urban simulation and testing environments for use in disaster mitigation planning
- Using the UrbanPAD procedural city generator from Gamr7 it is possible to rapidly generate urban environments.
- By combining these urban environments and a generated spatial representation (navigation mesh) of the environment, characters can freely traverse an urban simulation.
- To complete this goal we needed to produce *metrics* with which to evaluate generated navigation meshes and navigation meshes with more *complete terrain representation*



Metrics for Navigation Meshes

- One of the problems with using navigation meshes for procedural content is that there is no easy way to evaluate the quality of the navigation mesh.
- Generally, a developer chooses the navigation mesh that is going to be used for a level from a selection of possible navigation meshes.
- In a runtime procedurally generated environment there is no human in the involved in the mesh selection process, so some other method must be used.
- We have produced a series of advanced metrics to evaluate navigation meshes based on how well they represent the environment
- Finally, several of these metrics can be used to evaluate the environment itself and locate potential bottlenecks, which would constrict mass evacuations or other large movements of people

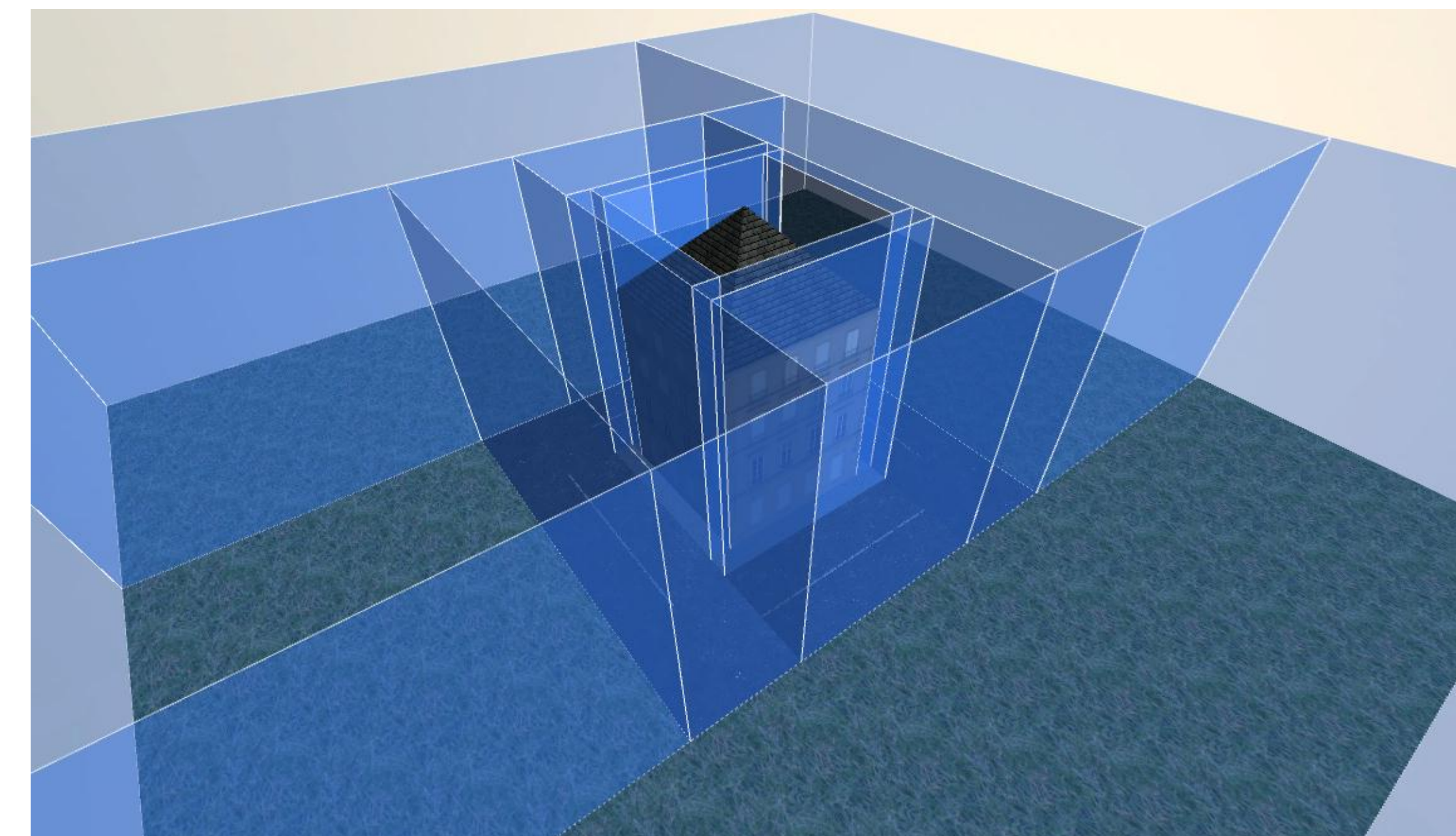


Texture Aware Navigation Mesh Generation

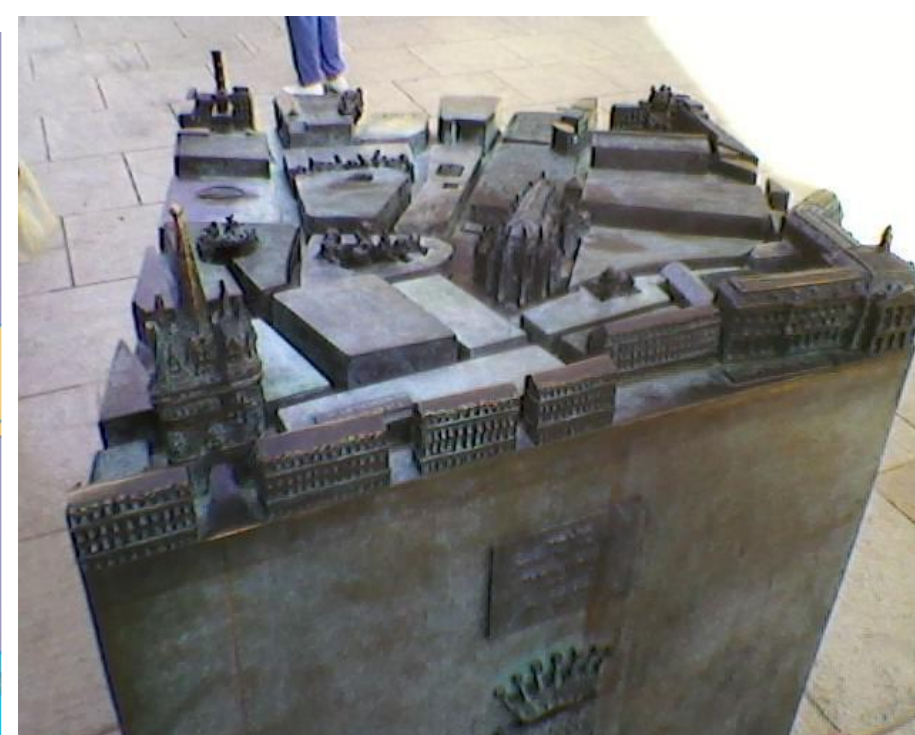
- Current navigation mesh generation techniques do not account for the different terrains that characters might move across
- The environment shown on the upper left would usually be decomposed into four regions regardless of the terrain (lower left)
- Our algorithms consider the actual urban terrain and create a navigation mesh that better fits the mobility considerations of these terrains (e.g., roads, grass, sidewalks, crosswalks, etc.)
- Using such texture aware navigation meshes, characters in games and simulations are innately aware of the proper way to move through urban environments

Results

Using our work, we can now generate more accurate spatial navigation meshes for use in agent based simulations of large urban environments. Such simulations when combined with dynamic navigation mesh technology allow for the rapid modeling of evacuations of urban environments (bottom left) and a better understanding of the terrain present in the environment (bottom right). When used in conjunction with a procedural city generator, simulations of the effects of disasters on future versions of the city can be performed.



II. International Experience



Life in Roanne

- Forget the stereotypes, the French are actually very nice and welcoming to Americans.
- The food is mixed—some is very good, some is quite bad.
- All businesses close at 7pm sharp except for sit down restaurants. Store hours aside from closing times are more a guideline than a firm rule.
- After getting on a plane to spend 3 months in foreign country where I knew maybe 10 words of the language, I have a new outlook on what is and is not “reasonable” or “possible”.

Working at Gamr7

- By being on site at the Gamr7 development office I was able to interact with their source code and talk on a daily basis with their developers. This provided me with an unprecedented level of access to how they represent and store the cities they build.
- My hosts practice an agile development process focusing on always having a working product, while picking up new features every day. I learned a lot about how to manage a project in such an environment by being there.

III. Acknowledgement

The material presented in this poster is based upon the work supported by the National Science Foundation under Grant No. OISE-0730065. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.