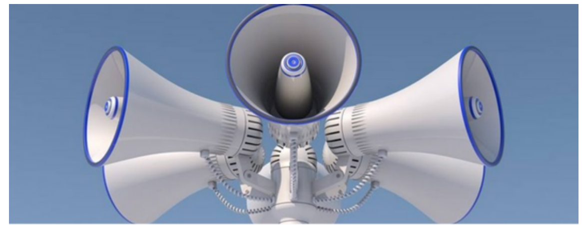
USTH 2024 – Project 4
Evacuation



How to better manage the pedestrian evacuation of a population on a beach in a tsunami context?

Populations are increasingly vulnerable to disastrous natural or technological events, as demographic and urban growth lead to greater exposures of goods and people. Hanoi, for example, is particularly hard hit by flooding. Some districts on the banks of the Red River are also threatened by potential dike breaching. In the event of a levee failure, it is important to be able to evacuate the population living in these areas before the water arrives.

The goal of this project is to build an agent-based model of people evacuation. In this model, flooding will not be modeled by itself, just the behavior of residents in the face of the threat. People will only evacuate if they have been informed of the imminent risk of flooding. At the start of the simulation, we assume that all residents are located in their own homes and only 10% of the population (randomly chosen) will be aware of this information. Once informed, people will evacuate to the shelter (the largest building in the area). A person observing someone evacuating (at a distance of less than 10m) will have a probability of 0.1 of evacuating in turn. The simulation finished when all people had evacuated (the ones who got the information).

For building and road data, you can use the shapefiles used in previous exercises, or download new data as discussed in class.

Extension 1: not all residents know where to evacuate and only 10% will go directly to the shelter. The rest will move to random buildings trying to search for the shelter - if the resident is less than 20 m from the shelter, he/she goes straight to it.

Extension 2: We consider different types of mobility: car, motorcycle, walking. A person is 20% likely to have a car, 70% likely to have a motorcycle. A car can go faster on an open road, but will be more affected by traffic jams. Motorcycles will travel slightly slower than cars (0.85 factor), but will be half as affected by traffic jams. Pedestrians will be 10 times slower than cars, but will be 5 times less affected by traffic jams.

Extension 3: the 10% of the population who are aware of the situation at the start of the simulation are no longer chosen randomly, but according to different strategies: those furthest from the shelter, those closest to the shelter. Compare the 3 strategies (random, furthest, closest) in terms of number of evacuees and evacuation time. Create a batch exploration to examine which strategy is the most efficient (time for the total evacuation/time spent on the roads), depending on the number of initial people and the alert time before the river flooding.