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Usage of ABM in the use case of CSL@Guadalajara

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Abstract

The CityScience lab in Guadalajara is pioneering urban planning tools through three innovative projects. The first one is CityScope [1], an interactive table that facilitates urban design by allowing stakeholders to visualize and explore various planning scenarios in real-time.

The second project is an agent-based model of safety in urban environments where the main objective is to identify solutions to the high number of assaults against university students. This work involves different theories (crime prevention through environmental design, routine activities theory as well as the broken windows theory) to identify motivators of criminals for committing a crime. We defined two main agents: students and criminals. Both perform daily routines, students attend to the university campus according to a given schedule, while criminals look for potential victims in a selected area. We simulate two scenarios: the first one involves a low presence of criminals, while there is shown a low punishment rate and a low presence of police on the streets. In the second scenario there is more punishment to the crimes and there is a higher number of police patrols in the public space. Figure 1 depicts both scenarios while we can observe a higher crime rate near the university campus in the first scenario, while in the second scenario it is shown a reduction in the assaults. We continue working on the second step of this model to enable simulating different schedules, transportation means, and more environmental variables.

The third project is a model to understand the impact of the soil impermeability caused by new developments in the 'El Bajío' area in Guadalajara. We first found in literature that, while there is a reduction in the quantity of water filtered to the aquifers, there is also an increase of the risk of flooding for the people living around the study area. The first stage of this model studies the risk of flooding, for which two scenarios have been prepared: the first scenario simulates rain and water runoff from 'La Primavera' forest using the current urbanization state of the study area, while the second scenario involves a high urbanization in the zone caused by urban development permitted by authorities. Both simulation scenarios are fed with elevation data as well as with information about current impermeable areas. In figure 2, the study area of 'El Bajío' is shown. We can see that the developing area is very close to a hill that is part of the 'la primavera' forest, increasing the risk of flood due to water runoff during rain and soil waterproofing.

References

- [1] Luis Alonso et al. "Cityscope: a data-driven interactive simulation tool for urban design. Use case volpe". In: *International conference on complex systems*. Springer. 2018, pp. 253–261.

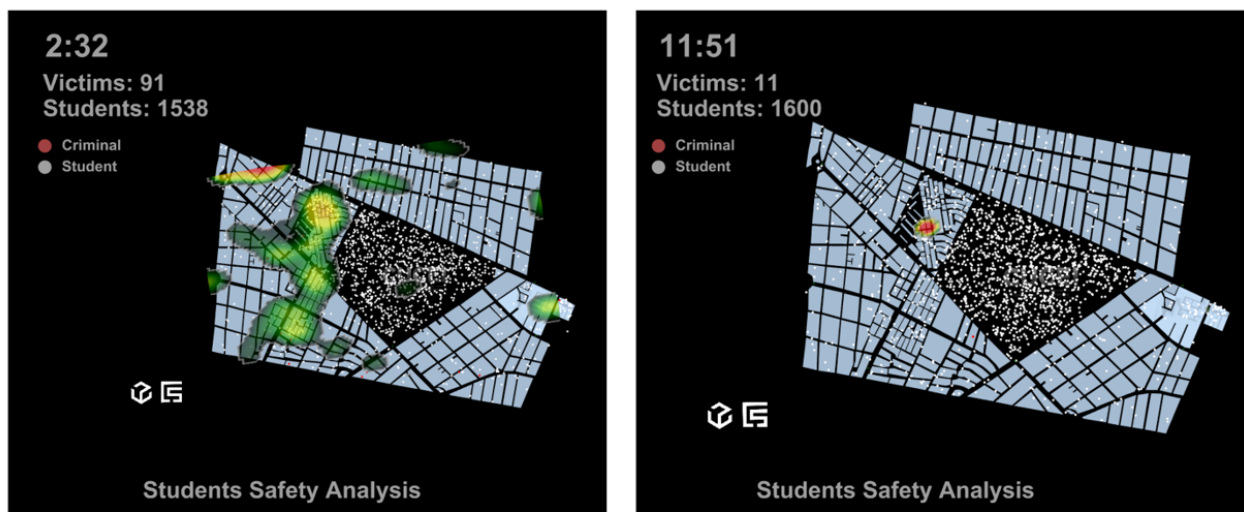


Figure 1: Scenario comparison. Scenario 1 considers a low presence of burglars, while authorities show a low punishment rate and maintains a low presence of police on the streets. On the other hand, scenario 2 considers authorities showing a high punishment rate, while maintaining a higher presence of police patrols on the streets.

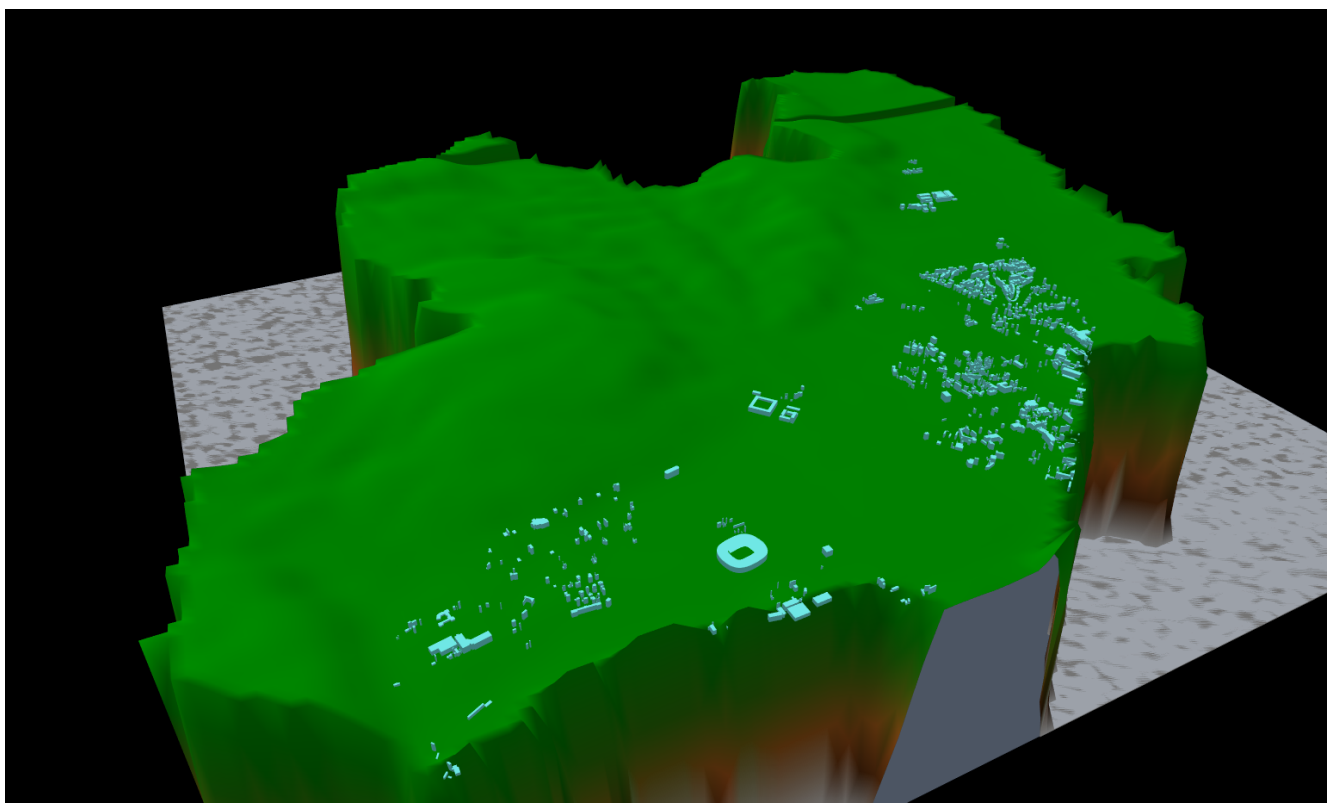


Figure 2: El Bajío area. A set of DEM data as well as impermeable zones data is used to create a simulation scenario to understand the risk of flooding and the reduction of the aquifers recharge.