A spatio-temporal model describing human behaviors for a population during a catastrophic event

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Risk and disaster prevention has become a major subject particularly in developed countries. More specifically, climatic changes, human demography and technological progress are still the principal reasons to different catastrophic events (natural or industrial) that threaten our planet. The prevention of human and financial damage has become a crucial concern. It is well-known that human behaviors are a main subject when we talk about catastrophic events. Observing human behaviors in a emergency situation lead to develop risk culture in order to predict the dynamics of the crowds in such events.

In this work we introduce a spatio-temporal mathematical model, called APC (Alert-Panic-Control) describing the evolution of various human behaviors such as alert, panic and control behaviors for a population during a catastrophic event using the theory of first-order macroscopic models. This is a system of diffusion-advection-reaction PDEs, with nonlinear Robin boundary conditions. Using semigroup theory of bounded linear operators and abstract evolution equations, we prove the well-posedness, a regularity result, the positivity and the boundedness of a solution of this model. Finally, we present several numerical simulations in order to investigate the spatio-temporal behavioral dynamics of a population during a disaster and their impact on different scenarios of evacuation.

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Références

[1] K. Khalil et al., *A spatio-temporal model describing human behaviors for a population during a catastrophic event* **(submitted, 2022)**.

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