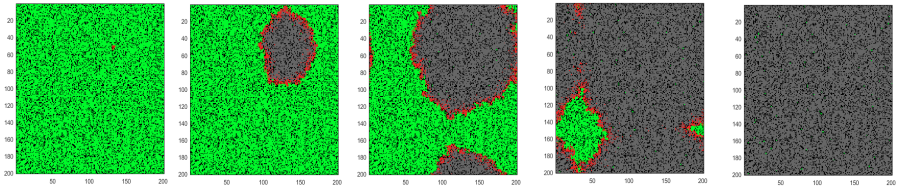# Fire spreading model with cellular automata
Homework # 3.b

Javier Lobato
Modeling Complex Systems - Spring 2018

What is the question?

Question and motivation

How do the number of fire focus affect the speed of the fire front and the forest total burning?

Figure: Different fire focus
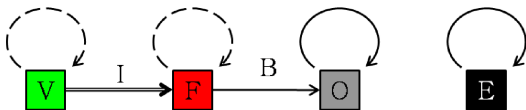

Figure: Fire front

How does the model work?

- Possible states:
  - Empty (E = 0)
  - Vegetation (V = 1)
  - Fire (F = 2)
  - Burnt (O = 3)
- Boundaries: absorbing → toroidal
- Neighborhood: Moore
- Updates: asynchronous

Figure: Schematics of the rules [1]

- Rules:
  - $E \rightarrow E$
  - if rand()<1-(1-I)^{fN} : V→ F; else V → V
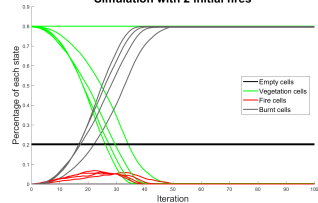 - if rand()<B: F → O; else F → F
  - $O \rightarrow O$

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[1] Almeida, R. M., Macau, E. E. (2011). *Stochastic cellular automata model for wildland fire spread dynamics*
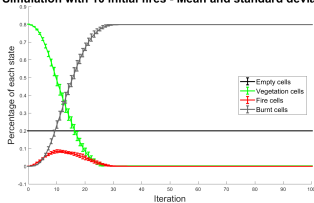
Results and discussion
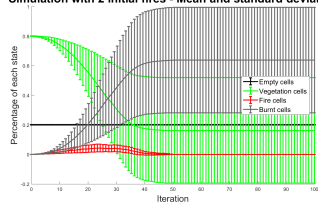

Simulation with 10 initial fires
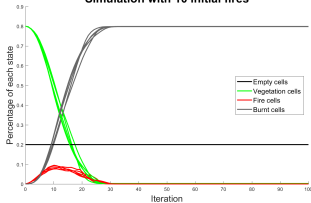
Simulation with 2 initial fires

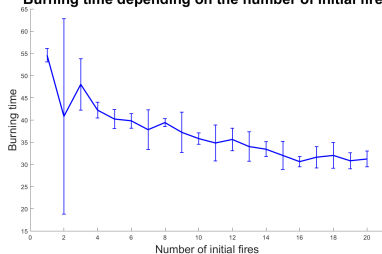Simulation with 10 initial fires - Mean and standard deviation

Simulation with 2 initial fires - Mean and standard deviation

Results and discussion

Burning time depending on the number of initial fires

Normalized burning profiles