Forest fire spread simulation

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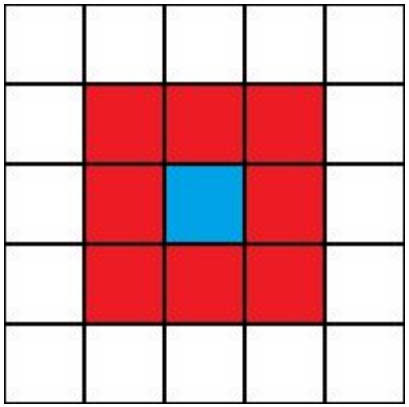
Theory

Forest fire spread is a Cellular automation with fixed boundaries on edge cells rendering them as unchangeable during the simulation



Theory

The rules applied during the changes of cell types are based on probability of events happening making it a stochastic cellular automata.

Added features to ‘baseline’ model: wind influence

based on applying mask concept over neighbours of burning cell with multiplied strength of fire spread

2	1.75	1.5
1.75	source	0.25
1.5	0.25	0

example: NW wind mask

Added features to ‘baseline’ model: rocks

do nothing

Added features to ‘baseline’ model: water

reduces probability of catching fire in neighbourhood of water cell

Added features to ‘baseline’ model: time of burning

fire is not single time step event in this simulation but lasting 3 frames producing burned cell as output which cannot be populated with trees afterwards

Added features to ‘baseline’ model: tree maturity type

similar to fire but change of tree type is stochastic

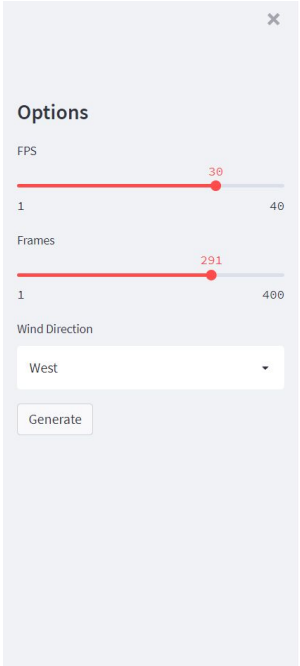
additionally on non burned cell sapling might be created

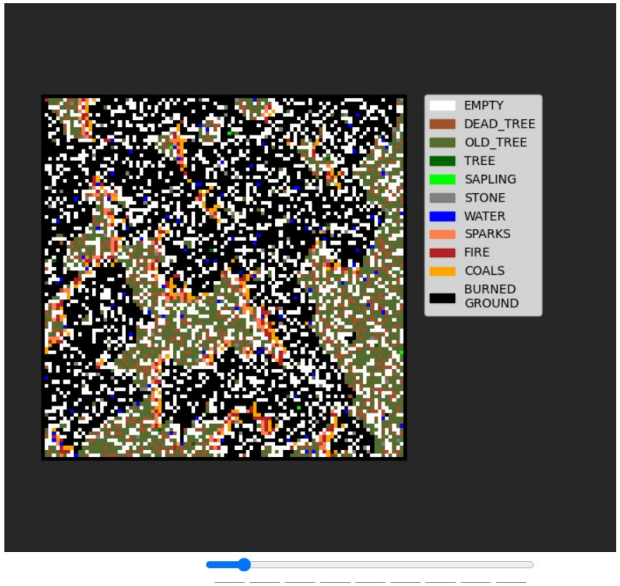
Usage and running

requirements:

- Numpy - calculations
- Matplotlib - visualization + animations
- Streamlit - web app

running the web app:
>streamlit run app.py





Thank You

Base project we took inspiration from for simulation:
https://scipython.com/blog/the-forest-fire-model/?fbclid=IwAR1Zw-Sw90MGI2fn5PV8zil93T0bqFG4IcAK2HAvjn8vPreIHMh8ZK6jAPM