THE CELLULAR AUTOMATA FOR MODELLING OF SPREADING OF LAVA FLOW ON THE EARTH SURFACE

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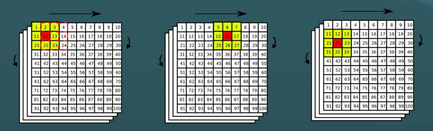
CELLULAR AUTOMATON

In cellular automata applications, space and time are discrete. Space is divided into cells (e.g. a grid/lattice if space is modelled in two dimensions) and each cell can have a finite number of states. A series of simple rules based on the states of neighbouring cells determine how the state of a cell changes from one time step to the next. In this most simple of applications only one dimensional space with two possible states (1/0) is considered. Because cellular automata result in a dynamic series of cell states (usually),it can be difficult to depict a cellular automata series in graphical form if space is treated as > 1D (Couthard, 2000).

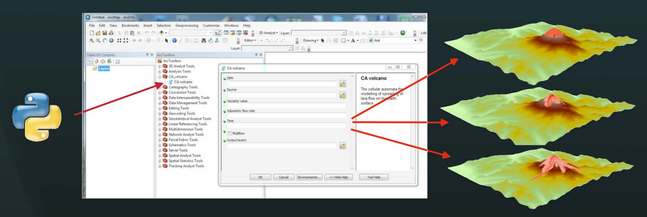


Moving of the roving window in the matrix has special rules for the movement from left corner to the right and from the top to the bottom of matrix Dimensions depend on size of the neighborhood. In case of designed cellular automaton model for spreading of lava flow on earth surface is used square-shaped Moore neighborhood in range r==1, what means 3x3 matrixes.

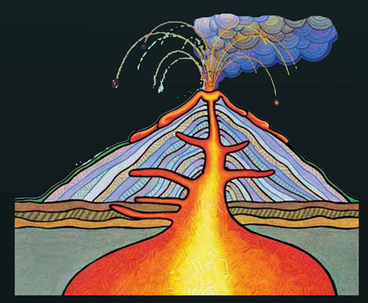
CONNECTION BETWEEN CA & ARCMAP

Python scripts for ArcGIS make use of the tools in ArcToolbox via a connection to ArcToolbox (the "Geoprocessor Object"). Once this relationship has been establisahed, any tool in the Toolbox can be used in a script.These scripts can be executed from with ArcMap or ArcCatalog (Adding a script to an existing Toolbox) or from outside of ArcGIS (GISGeek, 2012).Python can interact with ArcGIS and be used to repeat many types of analyses.

Python . . .
- Easy to read syntax
- Large user community
- Useful for scripts to control other programs
- Cross-platform



VOLCANO AS A COMPLEX



Volcanic eruptions are the most dramatic expressions of dynamic processes in the interior of planet Earth. Volcanoes are also the most visible proof that planet earth is alive, also volcanic eruptions were responsible for the creation of the first crust on our planet about 4.6 billion years ago (Schmincke, 2004).Each year, about 60 of the roughly 550 active volcanoes on the Earth erupt. The frequency, the type of eruption and magnitude of volcano are unlikely to change in the foreseeable future.

STUDY AREA

WA, USA

Mount Rainier

Mount Rainier is a potentially and recently active volcano about 20 miles southeast of the Seattle-Tacoma metropolitan area. Majestic Mount Rainier soars almost 4392m (14,410 feet) above sea level and looms over the expanding suburbs of Seattle and Tacoma, Washington. Each year almost two million visitors come to Mount Rainier National Park to admire the volcano and its glaciers, alpine meadows, and forested ridges. However, the volcano's beauty is deceptive.

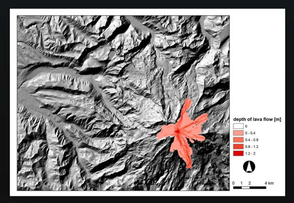
Mount Rainier is drained by eleven rivers leading to six lowland valleys containing two major shipping ports and a substantial portion of Washington's technological and industrial infrastructure

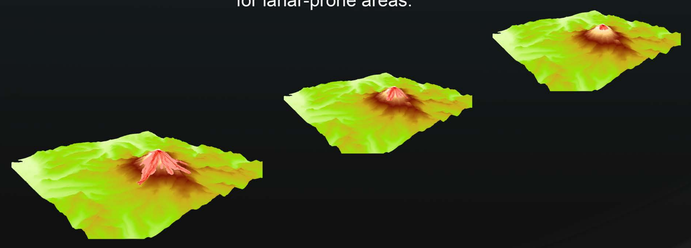
U.S. Geological Survey (USGS) research shows that Mount Rainier is one of the most dangerous volcanoes in USA. In last 9000 years it has been the source of 14 eruptions and also 4 large volcanic mudflows (lahars) that have surged down valleys on its flanks and buried broad areas now densely populated.

ACTUAL RESULTS

One of the main goals of volcanological research has always been to improve the ability to predict eruptions as much as possible. This is especially very important in densely populated areas as state Washington and Seattle clearly is. Because periods of quiescence between eruptions in many volcanoes last much longer than a generation, people are more willing to accept risk rather than evacuation (Schmidke, 2004).

I believe that the "CA volcano" disaster model can be very helpful guide for development of the lava and lahar hazard. Using this tool will help develop better emergency response, mitigation plans, and community preparation for lahar-prone areas.





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