Evolutionary Computation

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Project Pitch : Agent Based Model of Fire Spreading with GA Driven Spread Factors

1. Problem Description

   For the Evolutionary Computation final project, I propose to model surface spreading of wildfires within a agent based spreading framework. I have previously developed a sandbox environment to build spreading simulations on different landscapes according to different spreading rules and mechanisms. I propose the use of a symbolic regression analysis to uncover a set of optimal relationships between adjacent neighbor and environmental states. In the model, the agents represent discretized chucks of space that change state depending on the states of their neighbors.

   This problem is well suited for Genetic Algorithms as there are (1) clearly defined building blocks, (2) a suitable fitness function, (3) selection mechanism choose which agents are considered for future evolution, (4) a data set to validate model utility.

   The genome is represented by a tree of terminals and functions that could possibly describe fire dynamics. The function will be predicting the probability that a given cell will catch fire in the next time step. The agent based model is written in python and I imagine I will use the DEEP framework to implement the symbolic regression. The fire we will be simulating occurred in May of 2016 in Fort McMurray, Alberta. The data is a timeseries of satellite images that capture the progression of the boundary at a 12 hour time resolution with a 375 m space resolution.