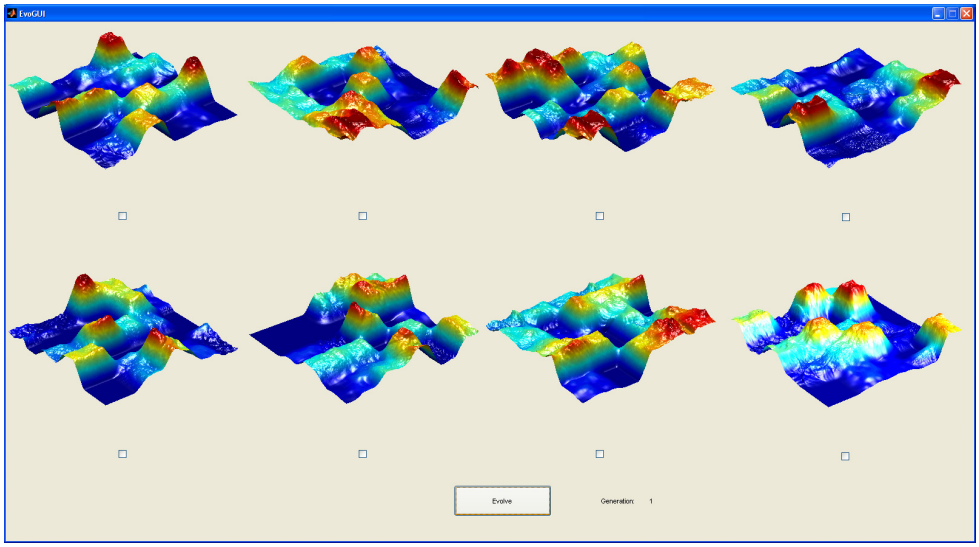
William Raffe
Started 06/12/2010

Interactive Evolution towards a User's Desired Goal

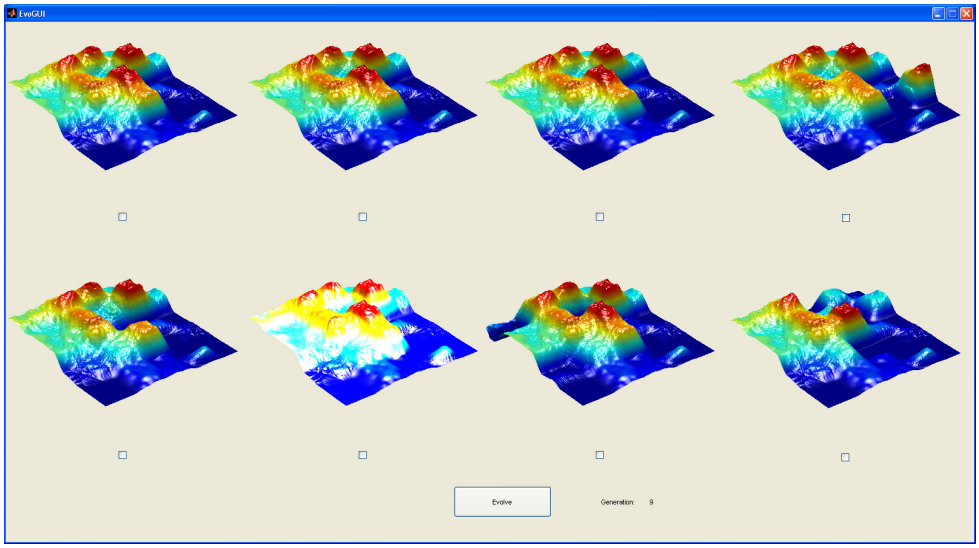
Target: Mountainous terrain on the "north" part (closer to top-left of window) of the terrain and flatter terrain on the "south" side (closer to bottom-right of window).

Run 1 (Control case):
Setup: Patches = 5x5, Overlap Amount = 0.6, Overlap Method = Spline, Crossover Rate = 0.5, Mutation Rate = 0.1

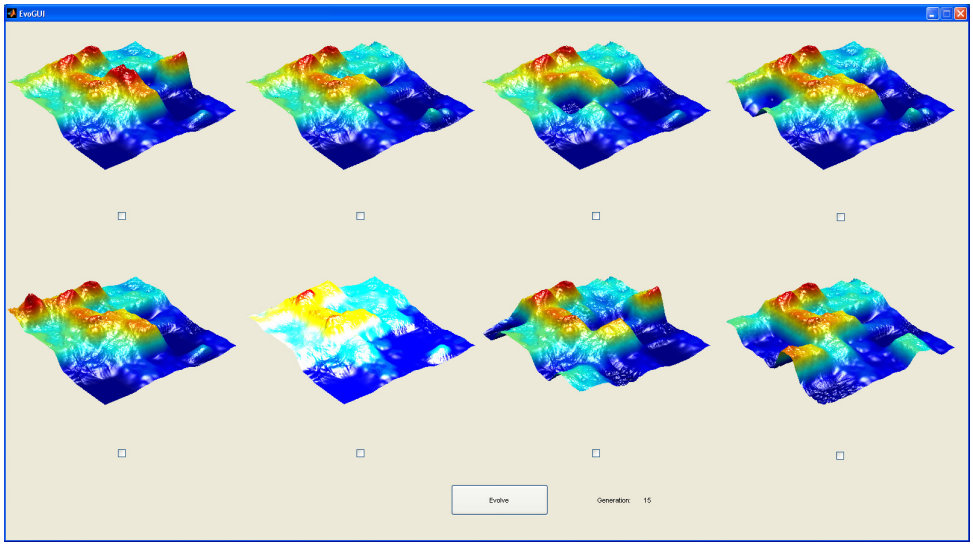
Generation: 1



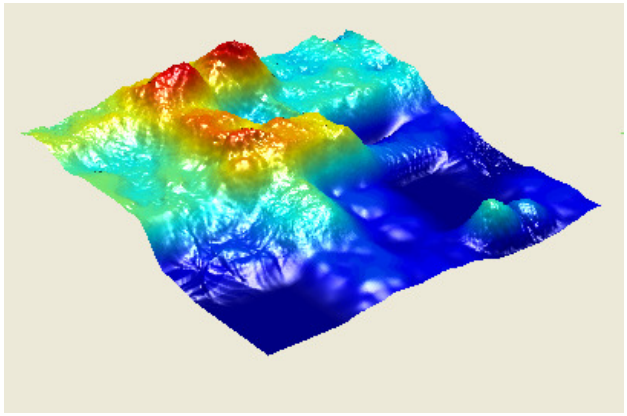
Generation: 9



Generation: 16

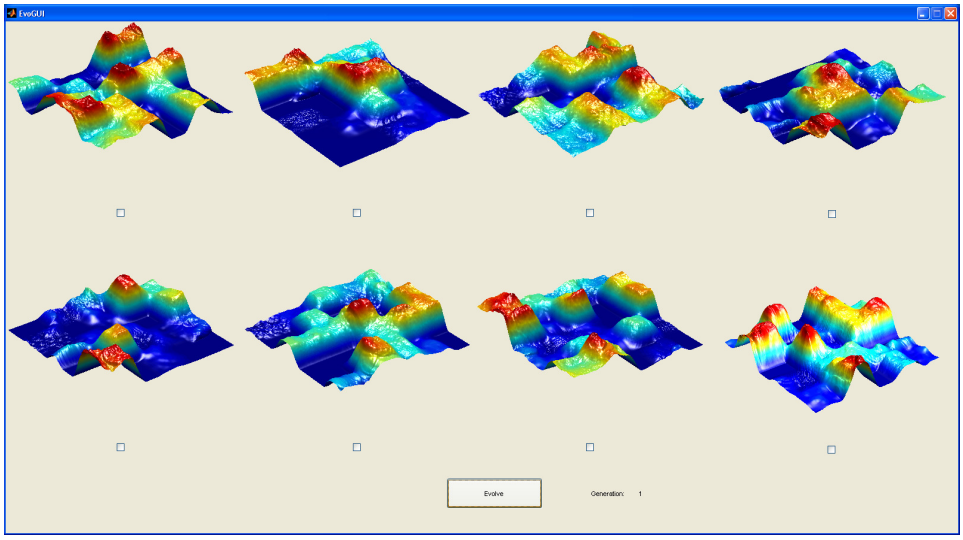


Final Selected Terrain:

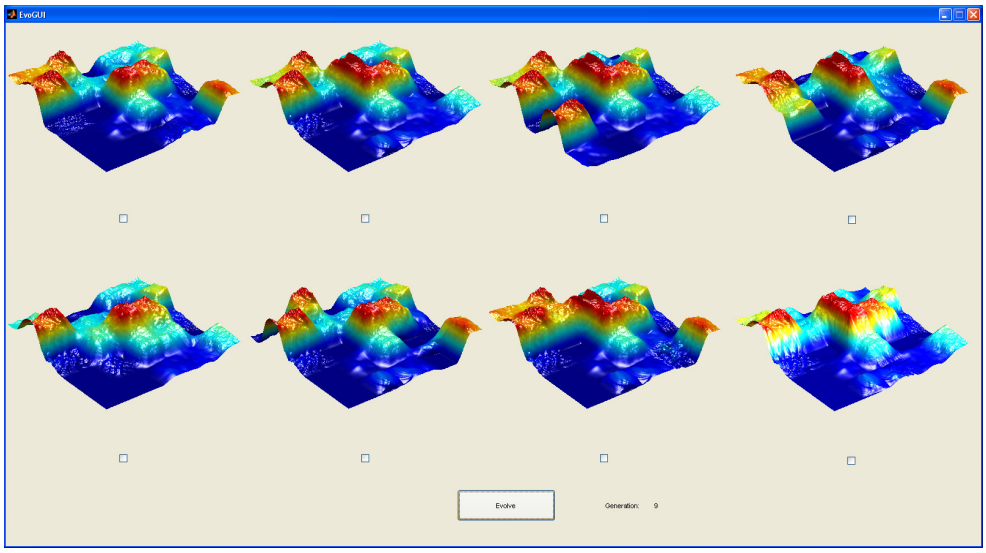


Run 2:
Setup: Patches = 5x5, Overlap Amount = 0.6, Overlap Method = Spline, Crossover Rate = 0.5, Mutation Rate = 0.2

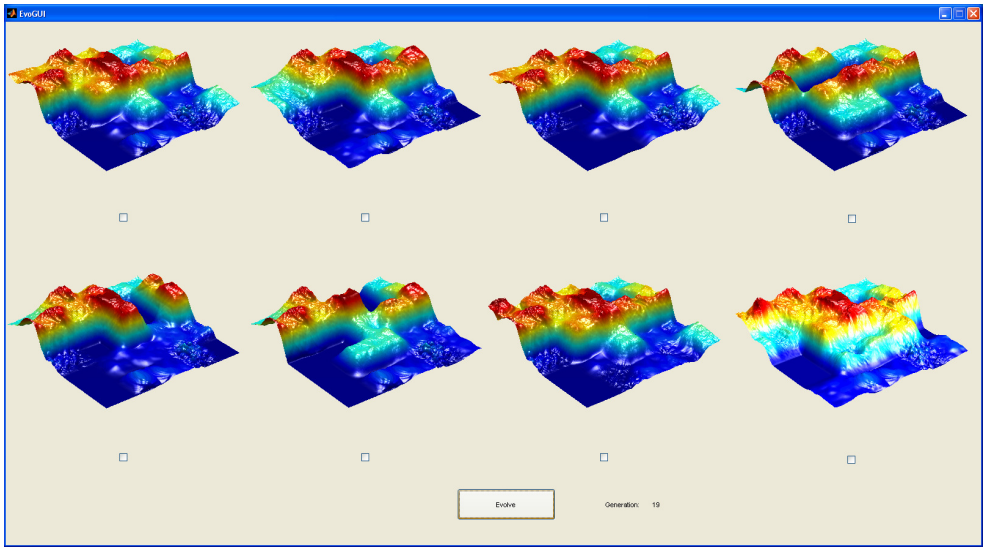
Generation: 1



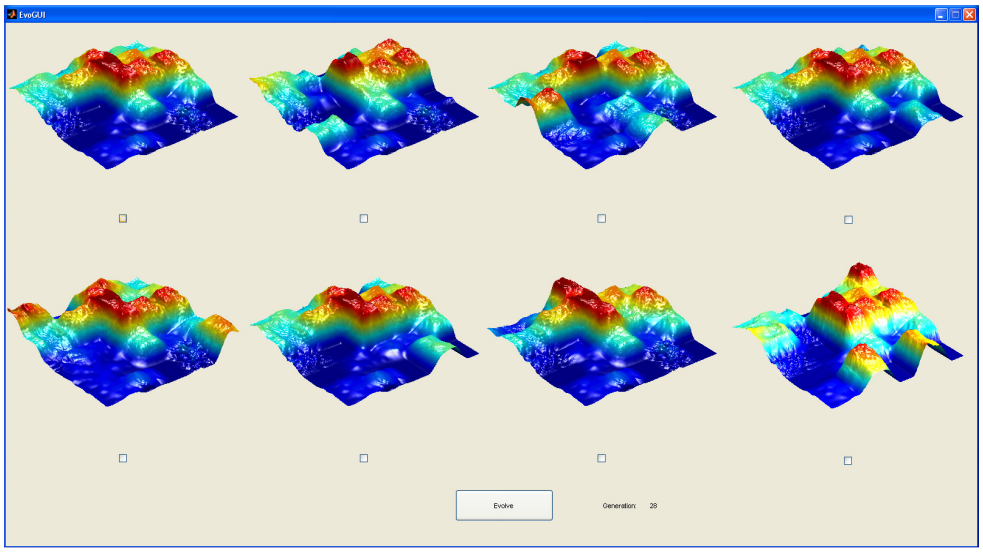
Generation: 9



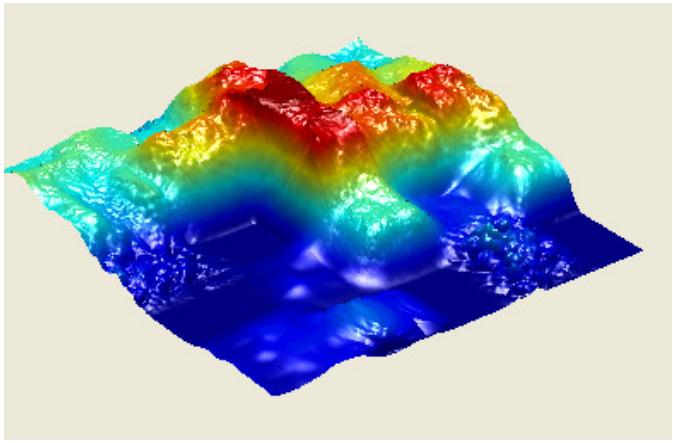
Generation: 19



Generation: 29

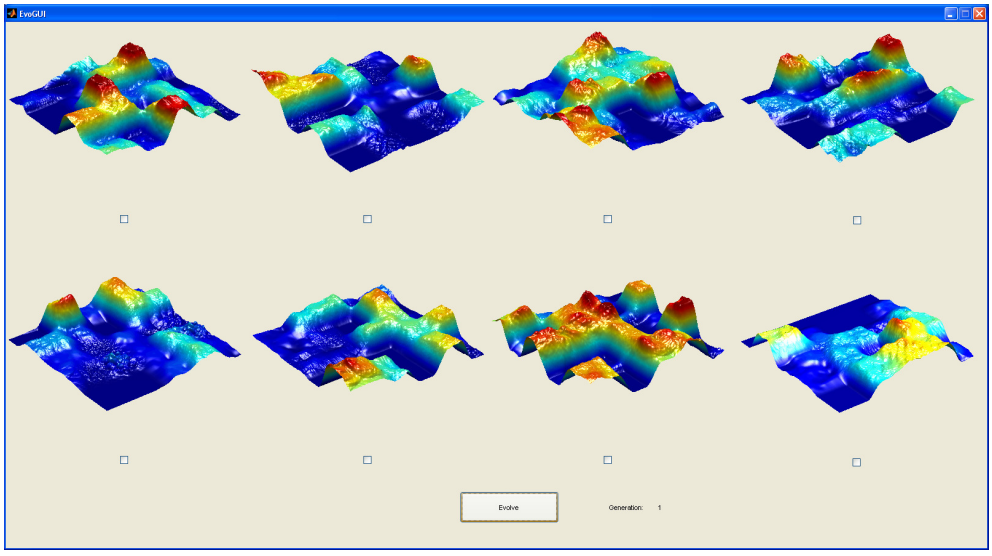


Final Chosen Terrain:

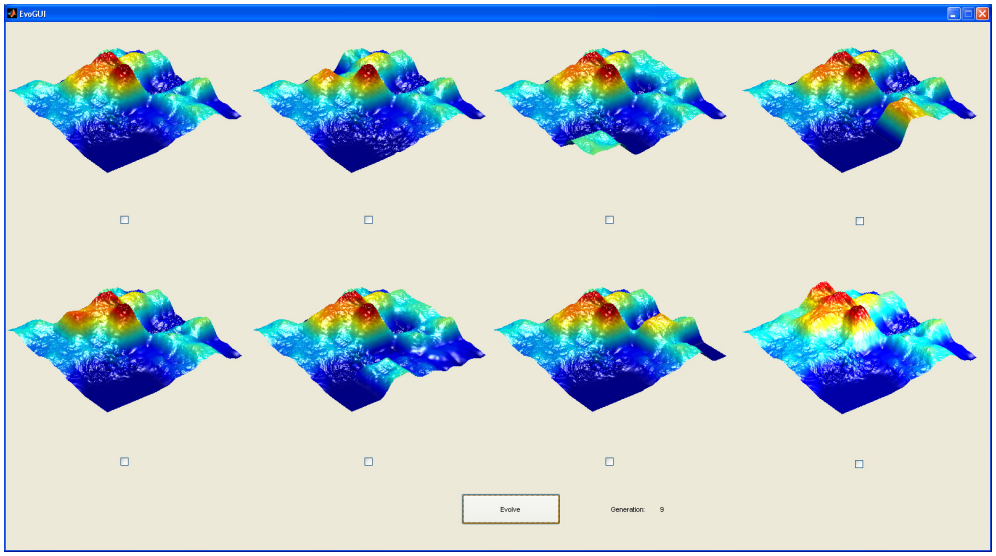


Run 3:
Setup: Patches = 5X5, Overlap Amount = 0.6, Overlap Method = Spline, Crossover Rate = 0.2, Mutation Rate = 0.1

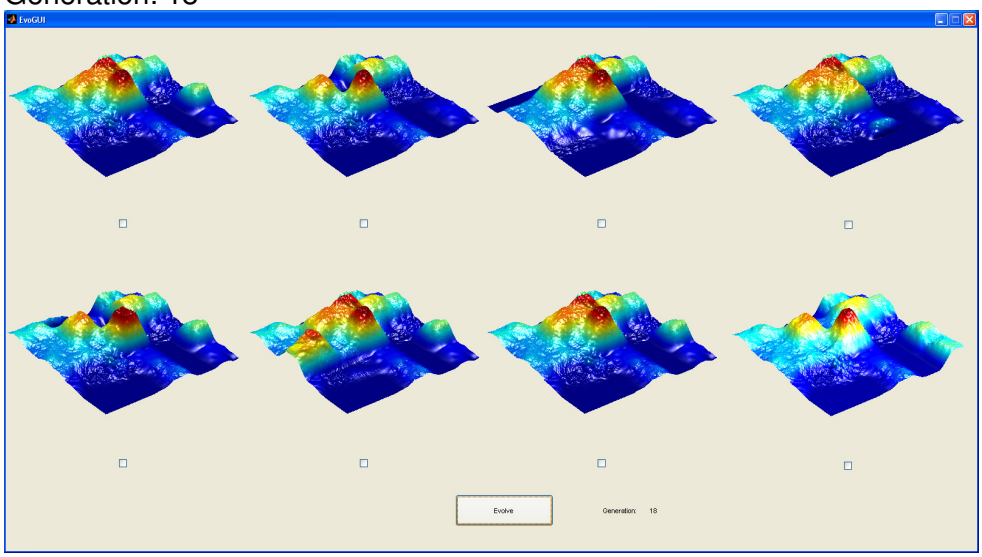
Generation: 1



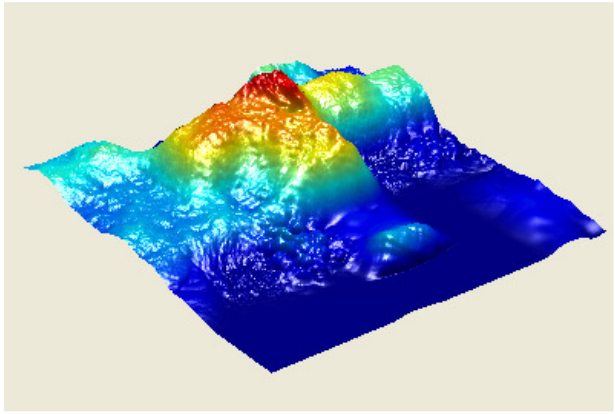
Generation: 9



Generation: 18

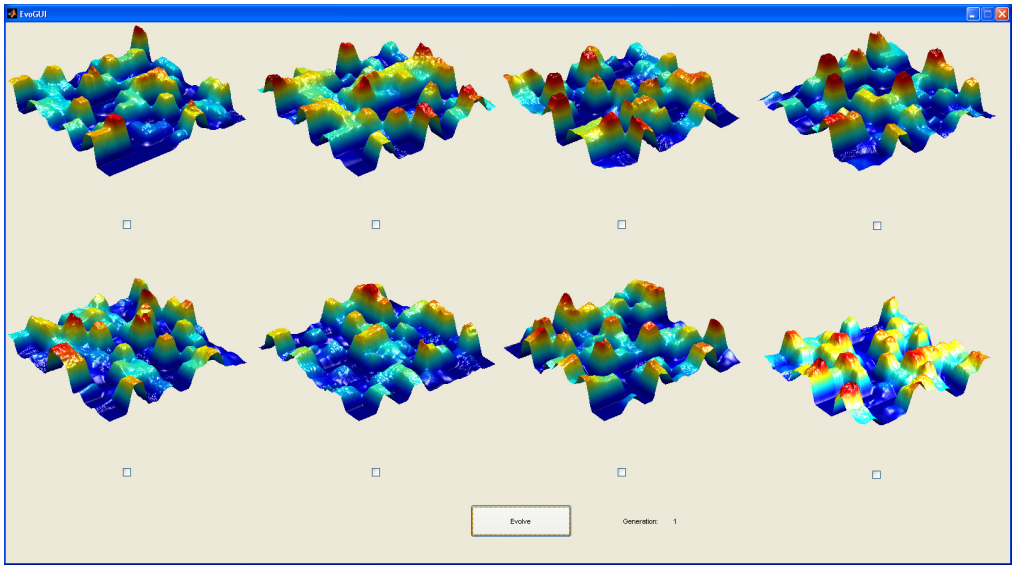


Final Selected Terrain:

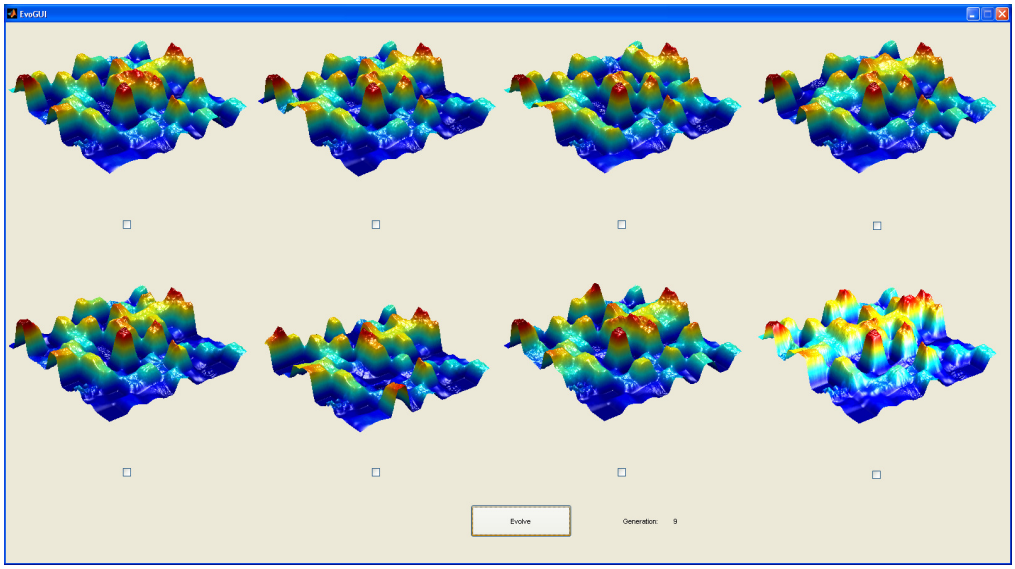


Run 4:
Setup: Patches = 9X9, Overlap Amount = 0.6, Overlap Method = Spline, Crossover Rate = 0.5, Mutation Rate = 0.1

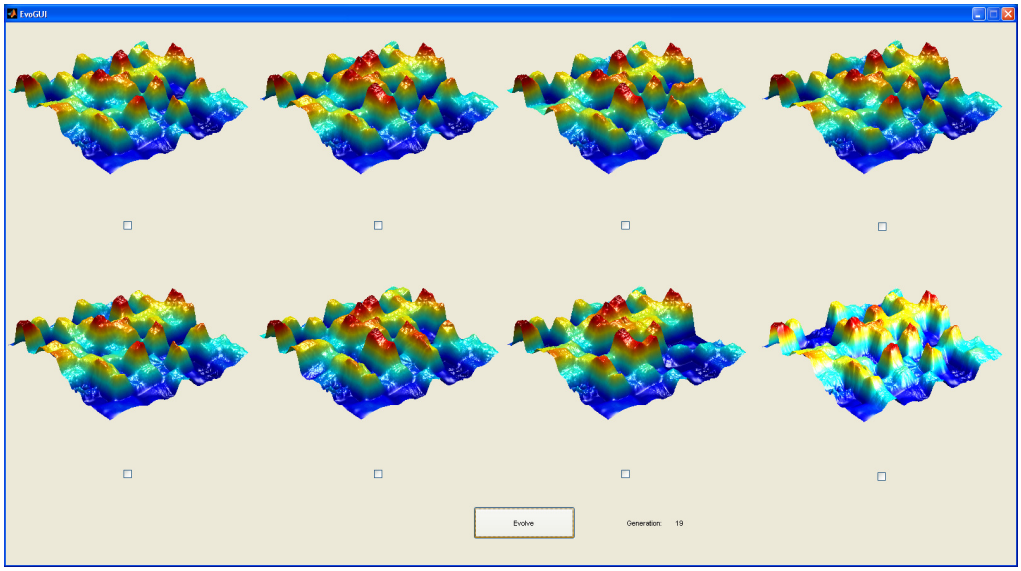
Generation: 1



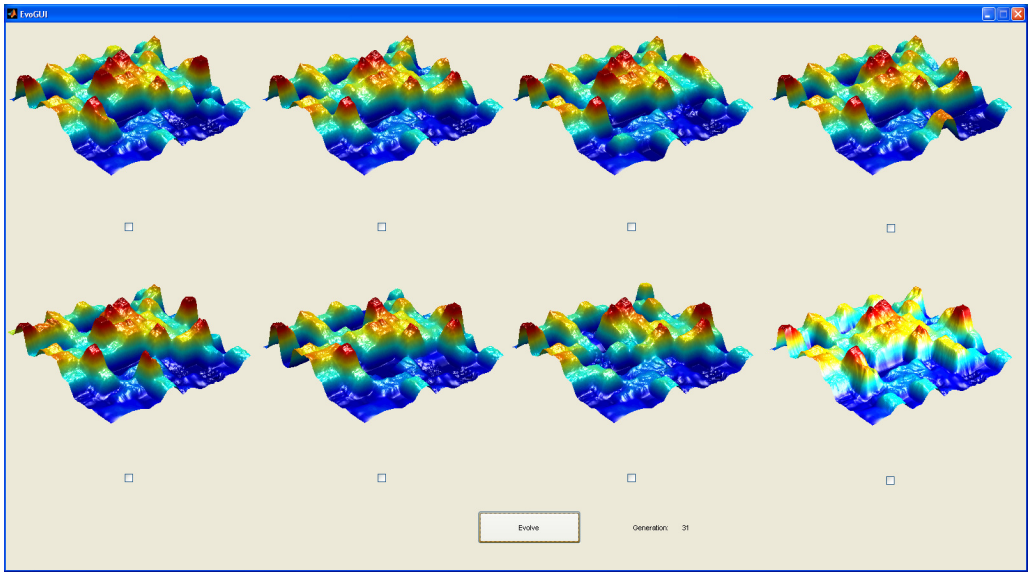
Generation: 9



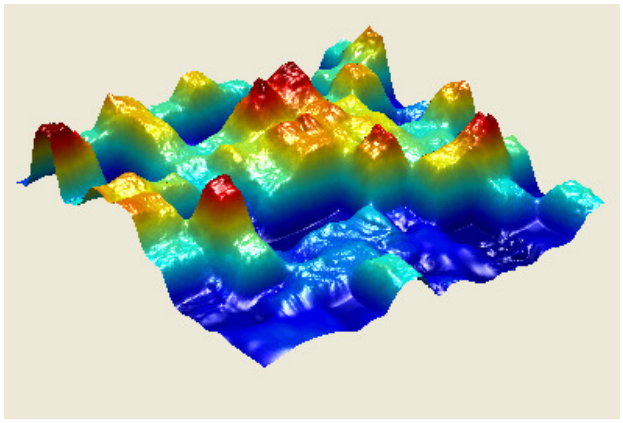
Generation: 19



Generation: 31

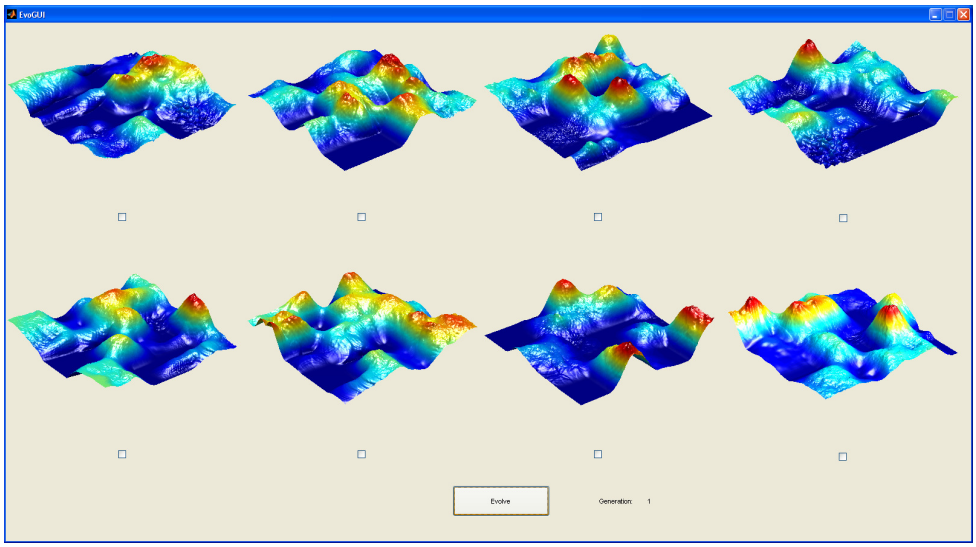


Final Selected Patch:

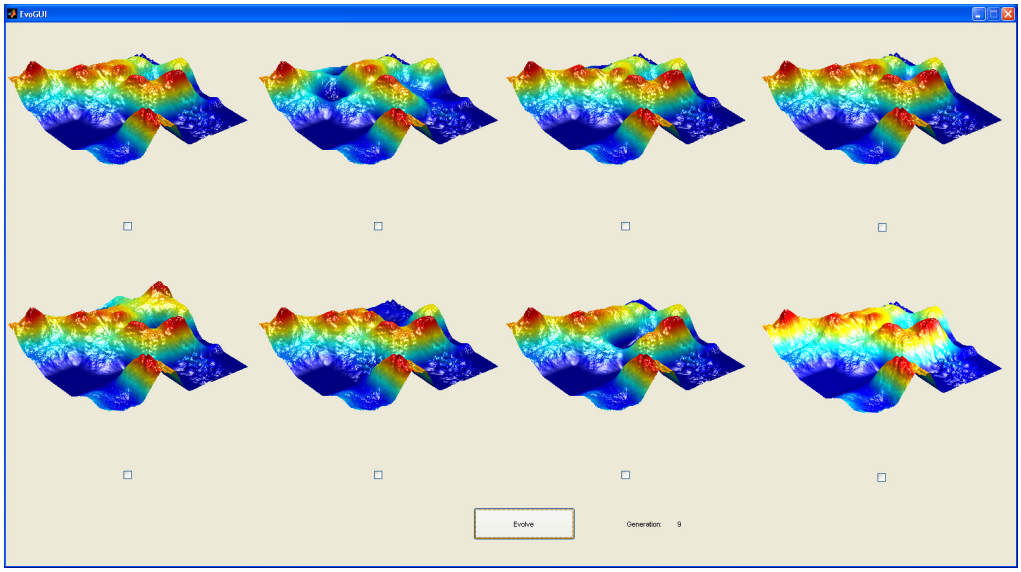


Run 5:
Setup: Patches = 5X5, Overlap Amount = 0.9, Overlap Method = Spline, Crossover Rate = 0.5, Mutation Rate = 0.1

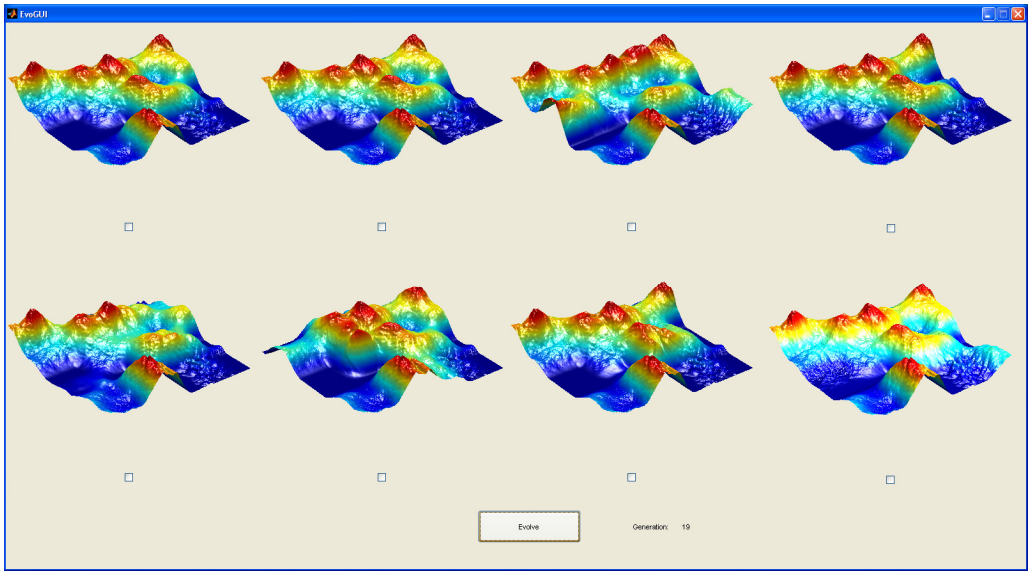
Generation: 1



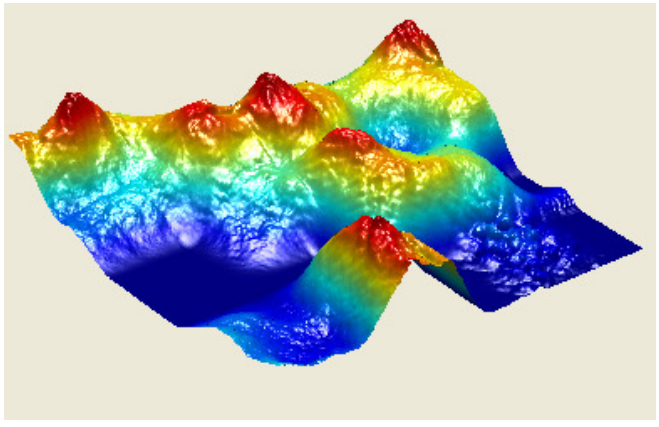
Generation: 9



Generation: 19



Final Selected Terrain:



Observations:

- Can get frustrating when there are only a handful of patches that are stopping the overall terrain from being perfect. Fitness needs to be judged per patch, either interactively (user

selects which patches to crossover/mutate) or through a function. Also, constraints on patch layout should help with this.

- Usually, once a “better” terrain is found, it is re-selected as one of the parents for multiple generations after that. This is because the chance of two new desirable terrains being created in one generation is very low due to the crossover and mutation.
- With a Mutation Rate of 0.1, typically between zero and two patches will be changed per candidate (on 5x5 patch-maps). With a Mutation Rate of even 0.2 too many patches will change per candidate, this may give good exploration but usually results in difficulty in controlling feature propagation from one generation to the next and thus results in much more randomised terrains in the next generation.
- Reducing or increasing the crossover results in the features of one parent being carried through more than those of the other parent. If the user is mindful of which parent they select first, this can possibly increase the rate of convergence.
- Convergence is hard when there is only one or too patches that the user would want to change. Typically requires the same parents to be selected for multiple generations until that one undesirable patch has changed without other significant mutation occurring to other patches.
- With terrains being constructed of smaller patches, it becomes quite difficult to evolve desirable terrains. In these experiments, even after 31 generations we are still a long way off having the required features and a smooth transition from the high terrain to the low terrain. The result is very irregular. Increased number of patches leads to an increased chance of undesirable mutations.
- Increasing the overlap smooths out the terrain. Thus, when doing interactive evolution, the user doesn’t need to be concerned too much about the intermediate patches between the high terrain and the low terrain as there is a higher chance of smoother terrain being generated anyway. However, the result for the experiment involving changing the overlap size shows the need for a per patch fitness as I was not able to get rid of the peak at the bottom of the terrain even after 10 generations of hoping that mutation would eliminate it.