Simulated Annealing

Current Progress

Currently my simulated annealing algorithm is based off simulated annealing as described in the following video: <https://www.youtube.com/watch?v=AEeYp5VtI08&t=1073s>

The main problem at the moment is trying to figure out the correct annealing schedule and also solve why the annealer is not converging upon a solution.

Annealing Schedules tried so far are:

Where CR is the cooldown ratio and k is the current iteration. Using this annealing schedule and attempting to solve the graph coloring problem ( specifically the problem described on page 25 of <https://arxiv.org/ftp/arxiv/papers/1811/1811.11538.pdf>)

The results from the first annealing schedule are:

|  |  |
| --- | --- |
| Cooldown Ratio (CR) | 0.9995 |
| Number of Iterations (K) | 10000 |
| Initial Temperature | 1000 |

For the first test **(Test 1)**

A picture containing square

Description automatically generated

As can be seen in the diagram above the temperature dropped far too quickly which would stop the annealer from being able to properly traverse the landscape of solutions.

|  |  |
| --- | --- |
| Cooldown Ratio (CR) | 0.9999995 |
| Number of Iterations (K) | 10000 |
| Initial Temperature | 1000 |

For the second test **(Test 2)**

Chart

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Using this CR provides a better annealing schedule as it give the algorithm longer to explore the search space. I still think that it spends too much time at 0 temperature so further improvements are needed.

For the third test **(Test 3)**

|  |  |
| --- | --- |
| Cooldown Ratio (CR) | 0.9999999 |
| Number of Iterations (K) | 10000 |
| Initial Temperature | 1000 |

Chart

Description automatically generatedThe results of this test show a more uniform drop in temperature. This will explore the search space really well and tends to 0 temp at a rate which will allow for good convergence to an optimal solution.