Work Report 08.09.2017

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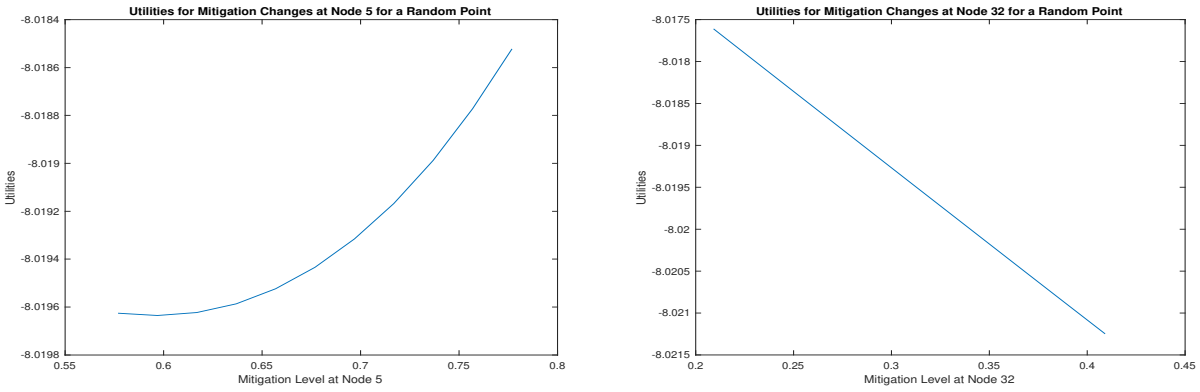
1 Curvature Plots for a Random Mitigation Vector

This time we would like to investigate the curvatures for points other than the optimal one. In this case, we fix an arbitrary point, a 63×1 vector, whose entries are randomly picked from (0,1]. Like what we did for the optimal point, we do mitigation changes of size 0.02 in 1 and 2 dimensions and generate the plots for utilities.

When we do 1-dimensional change, the plots typically look like the 2 shapes below. What we see in Figure 1b is more like a straight line.

Figure 1: Utilities with 1-dimension Mitigation Change

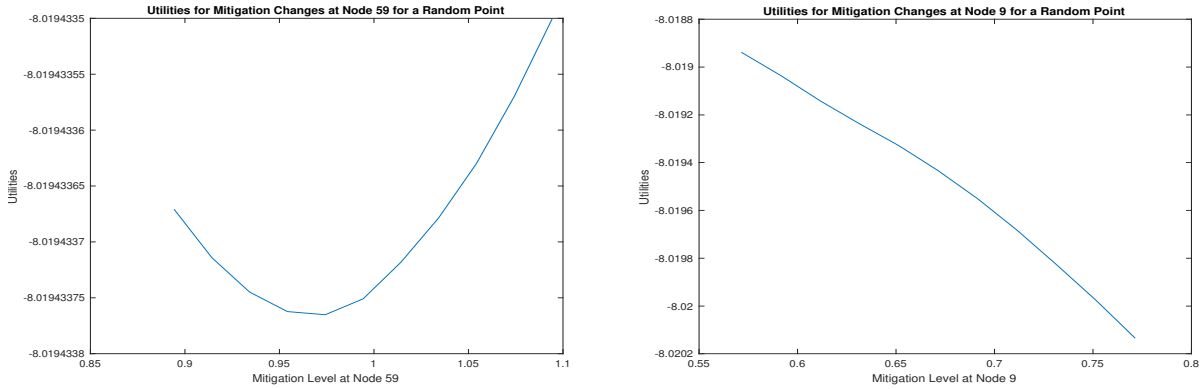


(a) Node 5

(b) Node 32

We get some convex curves, but we also observe a few concave ones. See Figure 2a and 2b.

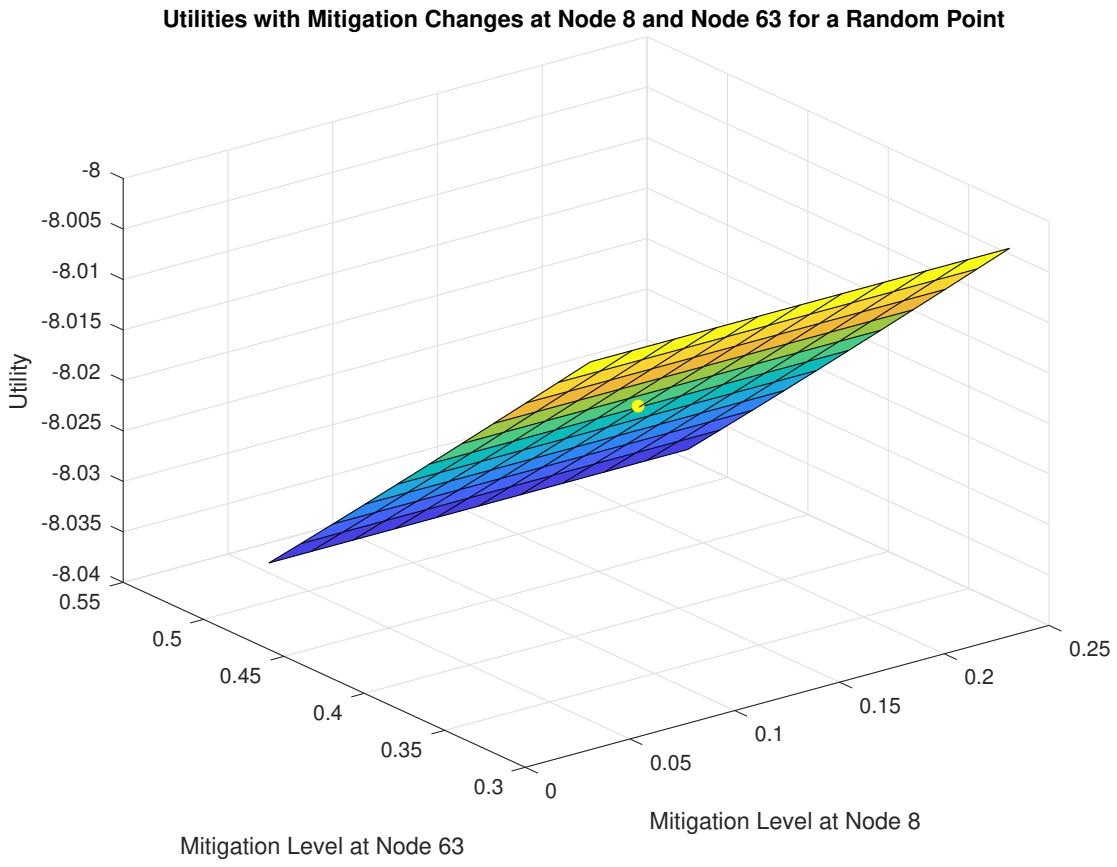
Figure 2: Utilities with 1-dimension Mitigation Change



(a) Node 59 (b) Node 9

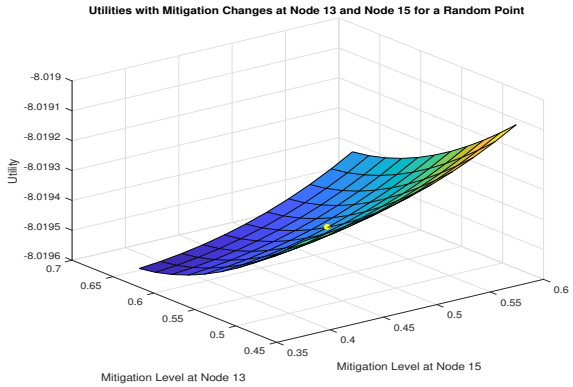
When it comes to the 2-dimensional changes, the resulted figures also look quite different from those at the optimal point. Most of the plots have a flat plane like Figure 3 below.

Figure 3: Utilities with 2-dimension Mitigation Change

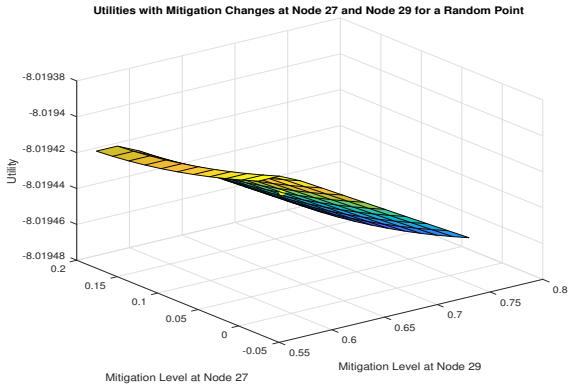


There are more typical shapes that we can take a look at.

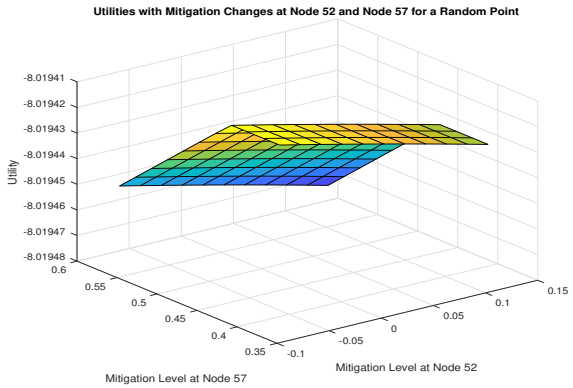
Figure 4: Utilities with 1-dimension Mitigation Change



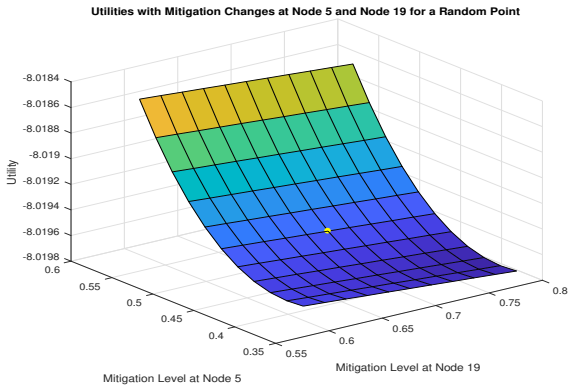
(a) Node 13 and 15



(b) Node 27 and 29



(c) Node 52 and 57



(d) Node 5 and 19

2 Plots for Norm of Gradients During Optimization

We draw graphs of the number of function (utility and gradient) evaluations v.s. norm of gradient to see whether the algorithm struggles far from the solution or in the neighbourhood of the solution.

Table 1: Iteration and Function Evaluation for Each Test

ID of test	1	2	3	4	5
Number of iterations	249	218	263	247	212
Number of Function Evaluation	615	594	288	670	557

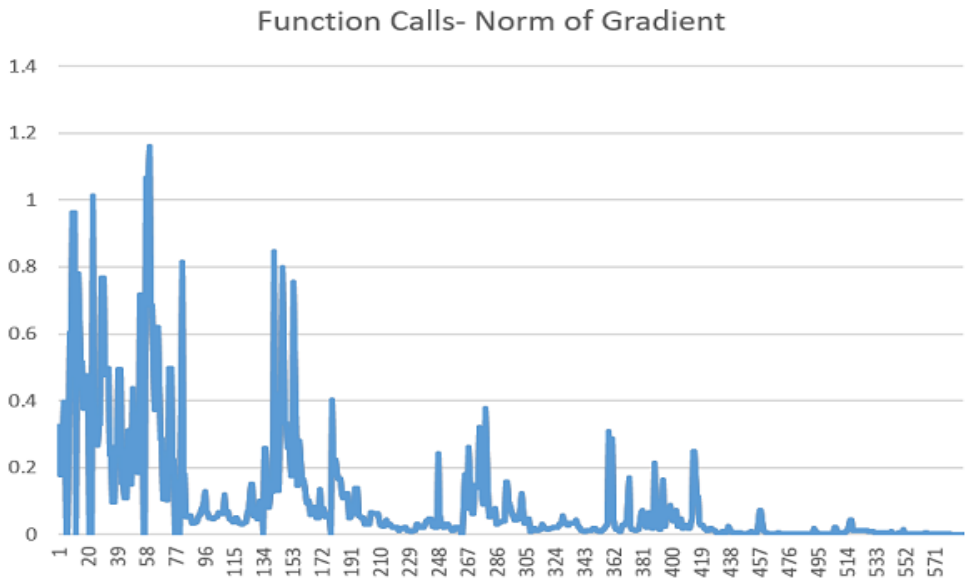


Figure 5: test1

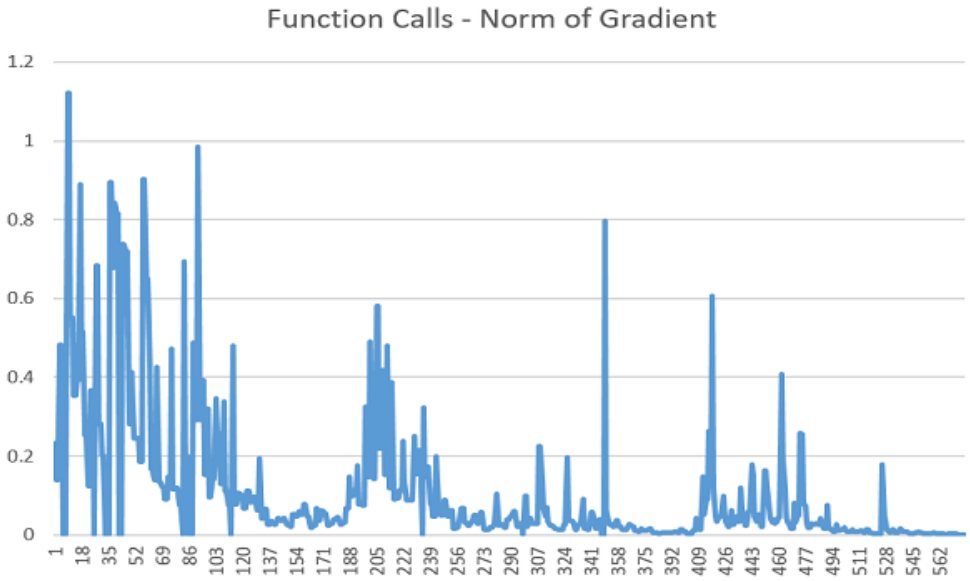


Figure 6: test2

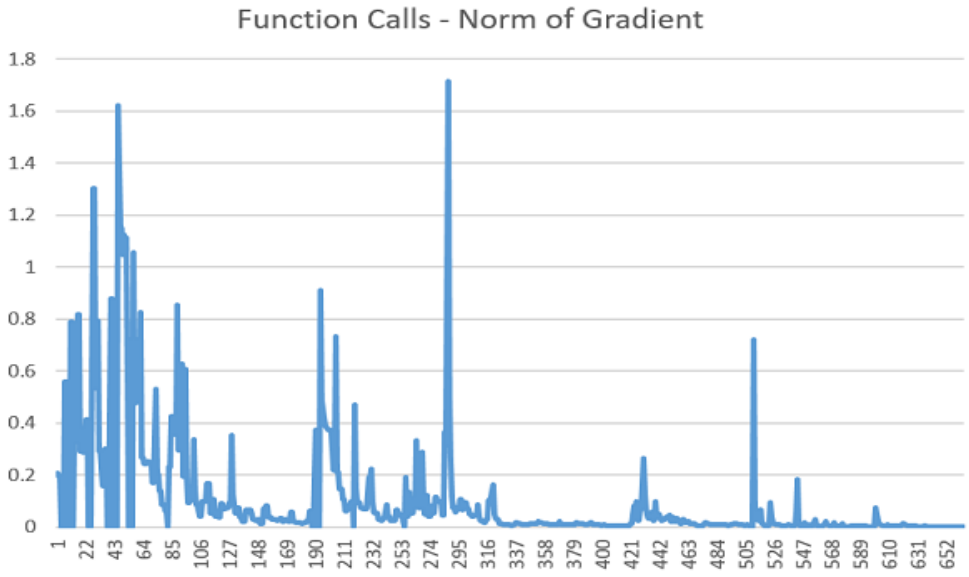


Figure 7: test3

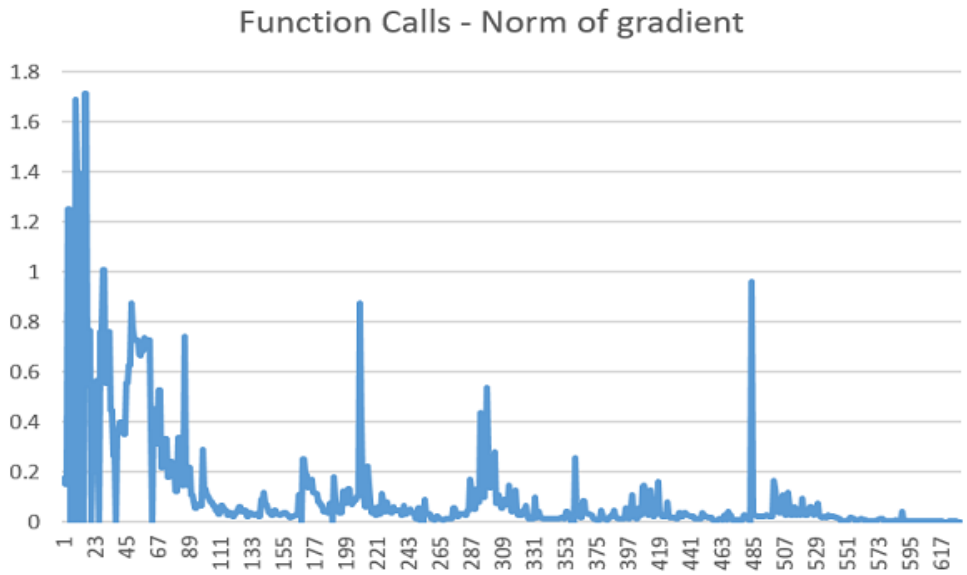


Figure 8: test4

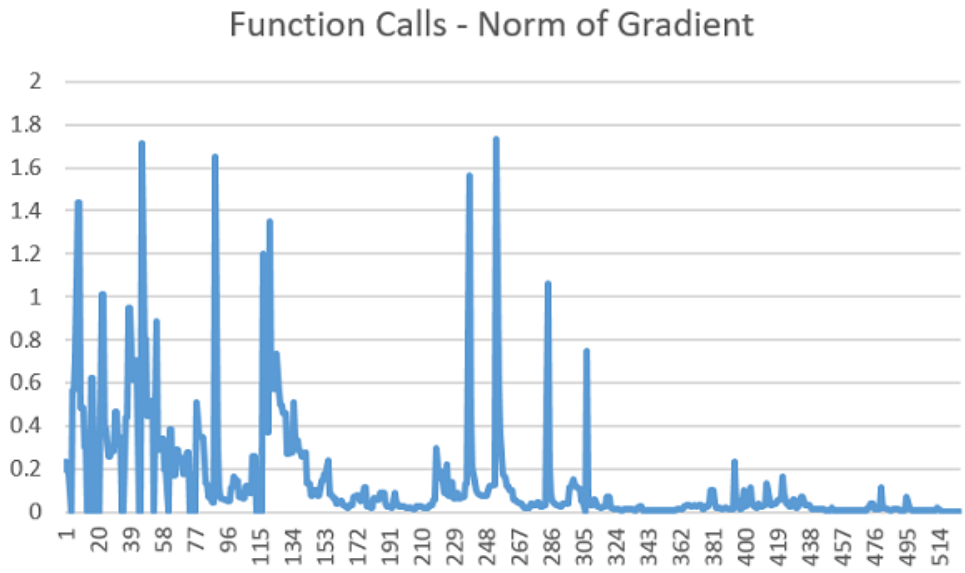
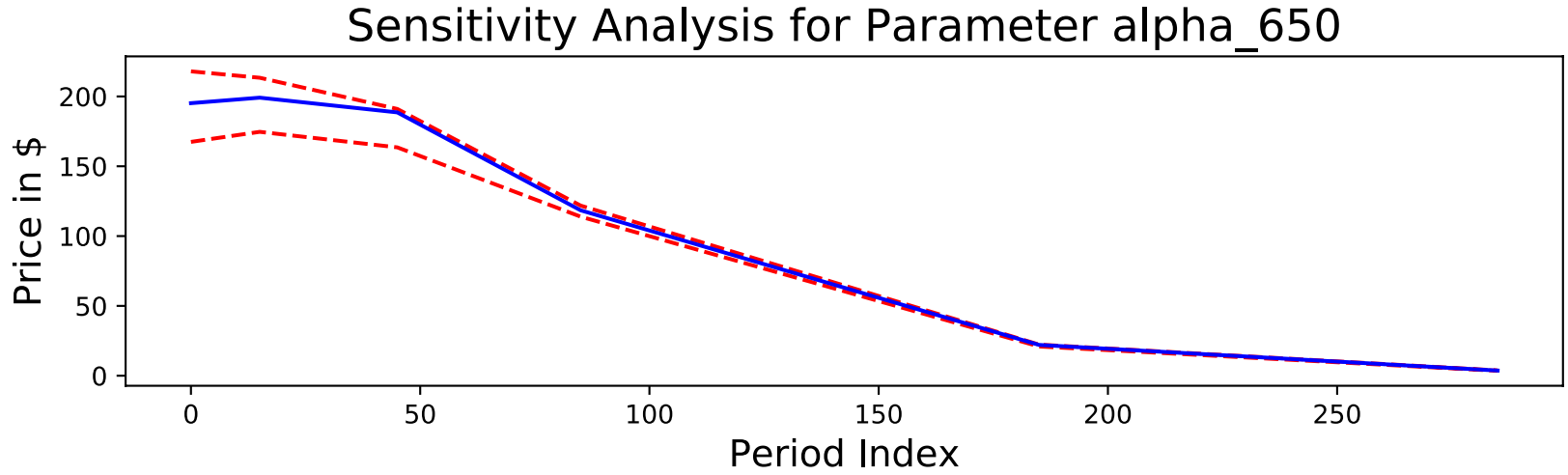


Figure 9: test5

3 Sensitivity Test Analysis for Parameter 2: α_{650}

Attached next page is the plot and summary of our sensitivity test for parameter α_{650}.



	In 0 Years	In 15 Years	In 45 Years	In 85 Years	In 185 Years	In 285 Years
Expected Price	194.73871499	196.809572587	182.021904937	116.904995828	21.3182780582	3.64956640826

	Iteration Number	Utility at Start Point	Norm of Gradient
Average of 99 Tests	242.111111111	9.45017723658	0.00180328671365