Voelsti Tests

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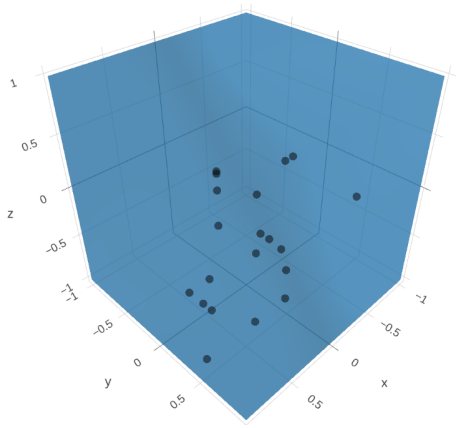
1 Easy:

We want to visualize sampling from a polytope, We cannot go beyond polyhedra since plotting 2D projections of a 4D figure is hard. After building, let us create a cube to plot to sample from (use V-representation to plot the points with plotly).



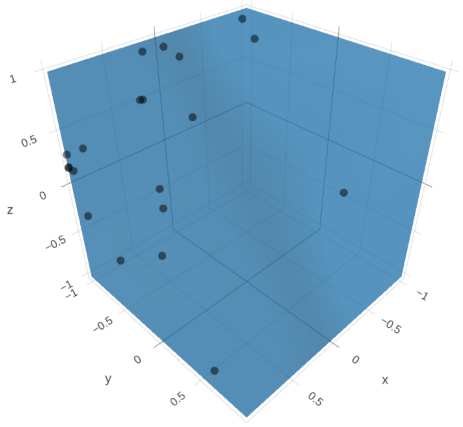
In code, I added a pause because I want to watch points being sampled.

2 Medium:

Honestly I am not sure what this asks, supplying `random_walk = c(walk = 'BRDHR' | 'BCDHR')` should modify the output to sample from the bounds of a polytope (or a spectrahedron), but I do not think this qualifies as 'extending the HnR algorithm', I'll do this for now.

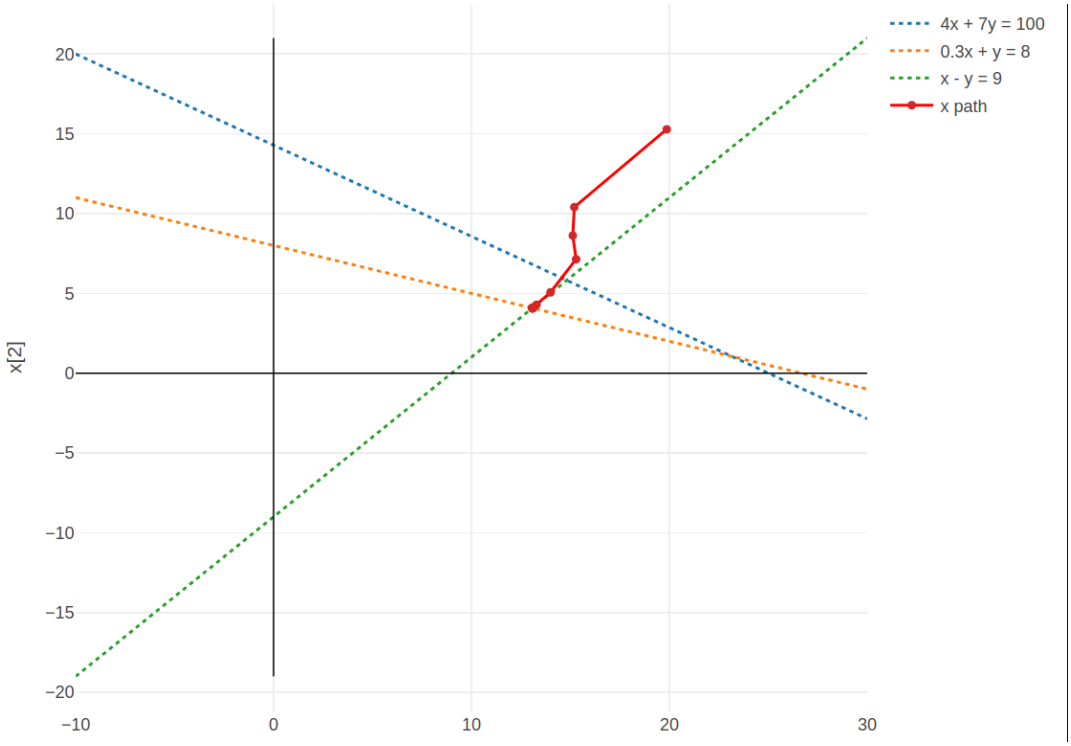
3 Hard

I used Eigen to implement algorithm 13.3 from Nocedal & Wright, `https://github.com/FaidullaMoftah/volesti_tests` We solve the following linear program for demon-



stration:

$$\begin{aligned} \text{Minimize:} \quad & -x-y \\ \text{subject to:} \quad & 4x+7y \leq 100, \\ & 0.3x+y \leq 8, \\ & x-y \leq 9, \\ & x,y \geq 0. \end{aligned}$$



Many optimizations are possible, in particular a more robust structure for numerical stability and exploiting the sparsity of `gram`.