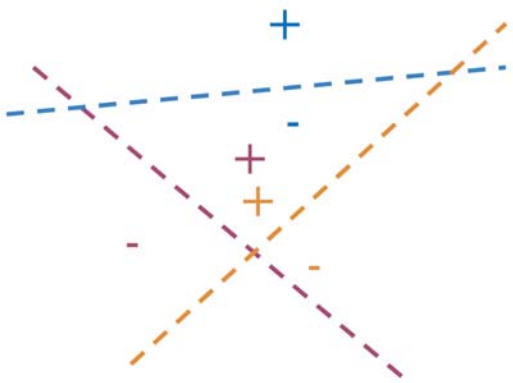
Menu

Multiple Planes

You can use multiple planes to get a single hash value. Let's take a look at the following example:



$$\mathbf{P}_1\mathbf{v}^T = 3, sign_1 = +1, h_1 = 1$$

$$\mathbf{P}_2\mathbf{v}^T = 5, sign_2 = +1, h_2 = 1$$

$$\mathbf{P}_3\mathbf{v}^T = -2, sign_3 = -1, h_3 = 0$$

$$hash = 2^0 \times h_1 + 2^1 \times h_2 + 2^2 \times h_3$$
$$= 1 \times 1 + 2 \times 1 + 4 \times 0$$
$$= 3$$

Given some point denoted by **v,** you can run it through several projections P_1, P_2, P_3 to get one hash value. If you compute $P_1 v^T$ you get a positive number, so you set $h_1 = 1$. $P_2 v^T$ gives you a positive number so you get $h_2 = 1$. $P_3 v^T$ is a negative number so you set h_3 to be 0. You can then compute the hash value as follows.

$$hash = 2^0 \times h_1 + 2^1 \times h_2 + 2^2 \times h_3$$

$$= 1 \times 1 + 2 \times 1 + 4 \times 0 = 3$$

Another way to think of it, is at each time you are asking the plane to which side will you find the point (i.e. 1 or 0) until you find your point bounded by the surrounding planes. The hash value is then defined as:

$$hash_value = \sum_i^H 2^i \times h_i$$

Here is how you can code it up:

```
def hash_multiple_plane(P_l,v):
```