

COS 488 - Homework 10 - Program V.1

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The following code plots the generating function for the set of bitstrings having no occurrence of a specified pattern.

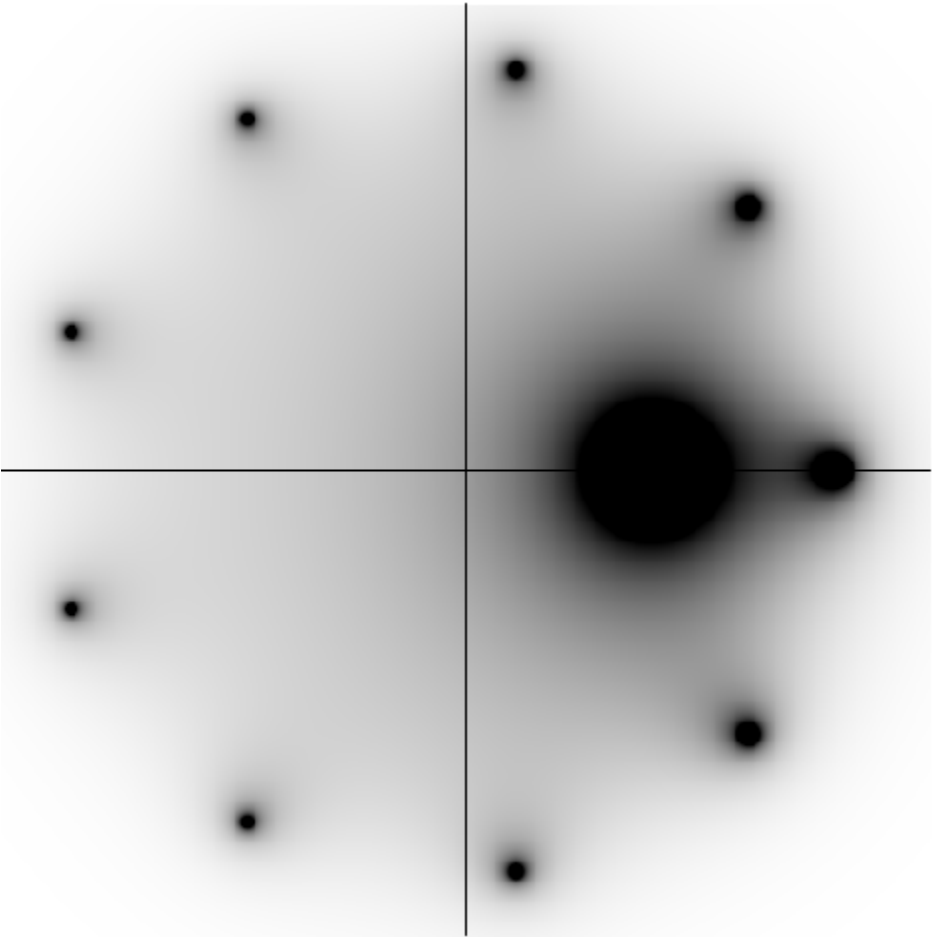
```
1  /*****
2  * Author:   Matt Tyler
3  *
4  * Description: Plots the generating function for the set of bitstrings having
5  * no occurrence of a given pattern. The pattern is a command-line argument,
6  * and should take the form of a binary bitstring.
7  *
8  * Usage example:
9  *   java-algs4 Bitstring 0000000001
10 *   java-algs4 Bitstring 0101010101
11 *****/
12
13 public class Bitstring implements ComplexFunction
14 {
15     // The pattern
16     private String p;
17
18     // Constructs a new Bitstring with the given pattern
19     public Bitstring(String p)
20     {   this.p = p;   }
21
22     // Implements the generating function corresponding to the given pattern
23     public Complex eval(Complex z)
24     {
25         Complex autocor = autocor(z);
26         Complex one     = new Complex(1, 0);
27         Complex a       = autocor.times(one.minus(z.plus(z)));
28         Complex denom   = power(z, p.length()).plus(a);
29         return autocor.times(denom.reciprocal());
30     }
}
```

```

32 // Implements the function corresponding to the autocorrelation polynomial
33 private Complex autocor(Complex z)
34 {
35     int N = p.length();
36     Complex result = new Complex(1, 0);
37     for (int i = 1; i < N; i++)
38     {
39         if (p.substring(0, i).equals(p.substring(N-i, N)))
40             { result = result.plus(power(z, N - i)); }
41     }
42     return result;
43 }
44
45 // Returns the Complex number corresponding to z^n, where n is positive
46 private static Complex power(Complex z, int n)
47 {
48     Complex result = new Complex(1, 0);
49     for (int i = 0; i < n; i++)
50         { result = result.times(z); }
51     return result;
52 }
53
54 public static void main(String[] args)
55 { Plot2Dez.show(new Bitstring(args[0]), 512); }
56 }

```

With the pattern 0000000001, it produces the following plot:



With the pattern 0101010101, it produces the following plot:

