

Re: nearest integers to the integer powers of a real number, alternation modulo 2

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The sequence of nearest integers to the powers of 2.1500903813481 is:
2, 5, 10, 21, 46, 99, 212, 457, 982, 2111, 4540, 9761, 20986, 45123,
97018, 208597, 448502, 964319, 2073374, 4457941, 9584976, 20608565,
44310278, 95271103, 204841482, 440427699, 946959360, 2036048211,
4377687674, 9412424161, 20237562654, 43512588803, 93555998654,
201153852823, 432498964126, 929911862711, 1999394551516,
(4298878993734), ...

One might expect at first glance that there may be a way to generate a better parent, by say extrapolation or minute alteration from a known one, but this – at least in my experience – has limited potential; Too large a change and the alternation breaks down, and too small a change does not extend the alternation in any way. Exploring the boundary between those extremes tends to find that there is no middle ground. This is very likely to do with the nature of the nearest integer function.

Is there a simple method for finding such numbers or is trial and error the only way to find them? Comments welcome.

While doing some research a few years back with Collatz sequences, I wanted to find starting integers that resulted in a known pattern.

q.v. this thread:

http://groups.google.com/group/sci.math/browse_thread/thread/1e48226a85c43ff5/360924d28642484f?lnk=st&q=Collatz

While it is not the same problem as the one you're investigating, the principle of your search space seems similar enough. (That is, some start condition produces a sequence with some known characteristics. In my case, it was a sequence with N steps to 1, in yours, a consistent even-odd shift.)

I found that using a genetic algorithm worked very, very well in the 32-bit space. If you consider a perfect fitness function to be one that returns the highest fitness for a sequence with no deviations, subtracting from the fitness for every "missed" number in the resulting sequence, you may be able to use the bits of your starting real as your gene.

I have a set of template based C++ classes that make the genetic algorithm fairly easy to modify -- you

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simply have to set the bit-length and override the fitness function. You can email me at quinn_jackson2004@xxxxxxxx if you'd like a zip of the C++ source I used with the Collatz problem.

Failing an ability to use the C++, I could also explain the algorithm used as a fallback, if you'd like.

Cheers,
Quinn

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