Subject: Re: Calculating Pi
Posted by lasse on Sun, 01 Apr 2007 17:18:59 GMT
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On 1 Apr, 18:07, "Braedley" <mike.braed...@gmail.com> wrote:
> Does anyone have code that can calculate pi to an arbitrary
> precision? This is purely an academic endeavour.
>
> Actually that's a lie. This is just so that I can show others up.

Hi,

I remembered that there was a Monte Carlo mehtod to do this and the following came up after a quick search. This is probably not very efficient, but very instructive, since you can actually paint the circle and the square on piece of paper and have your kids throw stones at it... anyway, here we go:

If a circle of radius R is inscribed inside a square with side length 2R, then the area of the circle will be pi*R^2 and the area of the square will be (2R)^2. So the ratio of the area of the circle to the area of the square will be pi/4.

This means that, if you pick N points at random inside the square, approximately N*pi/4 of those points should fall inside the circle.

This program picks points at random inside the square. It then checks to see if the point is inside the circle (it knows it's inside the circle if x^2 + y^2 < R^2, where x and y are the coordinates of the point and R is the radius of the circle). The program keeps track of how many points it's picked so far (N) and how many of those points fell inside the circle (M).

Pi is then approximated as follows:

```
     4*M
pi = ---
      N
```

Although the Monte Carlo Method is often useful for solving problems in physics and mathematics which cannot be solved by analytical means, it is a rather slow method of calculating pi. To calculate each significant digit there will have to be about 10 times as many trials as to calculate the preceding significant digit.

cheers
lasse

Subject: Re: Calculating Pi
Posted by Jean H. on Sun, 01 Apr 2007 18:22:52 GMT
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Hi,

interesting question indeed....
My friend google found the following.
The first method is easy to implement, does not require paper, scissors nor kids throwing rocks ....

Jean

http://www.faqs.org/faqs/sci-math-faq/specialnumbers/compute Pi/
Newsgroups: sci.math
From: alopez-o@neumann.uwaterloo.ca (Alex Lopez-Ortiz)
Subject: sci.math FAQ: How to compute Pi?
Summary: Part 12 of many, New version,
Message-ID: <DhahaI76KE.HAv@undergrad.math.uwaterloo.ca>
Sender: news@undergrad.math.uwaterloo.ca (news spool owner)
Date: Fri, 17 Nov 1995 17:14:38 GMT
Reply-To: sci.math@news.news.demon.net

Archive-Name: sci-math-faq/specialnumbers/computePi
Last-modified: December 8, 1994
Version: 6.2

How to compute digits of pi ?

Symbolic Computation software such as Maple or Mathematica can compute 10,000 digits of pi in a blink, and another 20,000-1,000,000 digits overnight (range depends on hardware platform).

It is possible to retrieve 1.25+ million digits of pi via anonymous ftp from the site wuarchive.wustl.edu, in the files pi.doc.Z and pi.dat.Z which reside in subdirectory doc/misc/pi. New York's Chudnovsky brothers have computed 2 billion digits of pi on a homebrew computer.

There are essentially 3 different methods to calculate pi to many decimals.

1. One of the oldest is to use the power series expansion of atan(x) = x - x^3/3 + x^5/5 - ... together with formulas like pi =

16*atan(1/5) - 4*atan(1/239) . This gives about 1.4 decimals per term.

2. A second is to use formulas coming from Arithmetic-Geometric mean computations. A beautiful compendium of such formulas is given in the book pi and the AGM, (see references). They have the advantage of converging quadratically, i.e. you double the number of decimals per iteration. For instance, to obtain 1 000 000 decimals, around 20 iterations are sufficient. The disadvantage is that you need FFT type multiplication to get a reasonable speed, and this is not so easy to program.

3. The third, and perhaps the most elegant in its simplicity, arises from the construction of a large circle with known radius. The length of the circumference is then divided by twice the radius and pi is evaluated to the required accuracy. The most ambitious use of this method was successfully completed in 1993, when H. G. Smythe produced 1.6 million decimals using high-precision measuring equipment and a circle with a radius of a staggering nine hundred and fifty miles.

References

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alopez-o@barrow.uwaterloo.ca
Tue Apr 04 17:26:57 EDT 1995

Subject: Re: Calculating Pi
Posted by Paolo Grigis on Mon, 02 Apr 2007 08:09:45 GMT
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The problem here is not one of method for computing Pi
(as remarked, plenty are available), but rather the lack
of an arbitrary precision library in IDL... (or has
anybody already written one?)

Ciao,
Paolo

Jean H. wrote:
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> Jean
>
> [...]

Subject: Re: Calculating Pi
Posted by jschwab@gmail.com on Mon, 02 Apr 2007 21:41:38 GMT
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On Apr 2, 4:09 am, Paolo Grigis <pgri...@astro.phys.ethz.ch> wrote:
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>
> Ciao,
> Paolo

There are a class of formulas called Bailey-Borwein-Plouffe (BBP) that
let you find the nth digit, without having found the preceding ones.

If you head to your library or Google around, I'm sure you can find
out enough to show off to your heart's content. With double precision,
I think that should let you get the first 10^7 digits or so.

I Googled and found code examples here
http://crd.lbl.gov/~dhbailey/expmath/bbp-codes/

Cheers,
Josiah

Subject: Re: Calculating Pi
Posted by jschwab@gmail.com on Mon, 02 Apr 2007 21:41:49 GMT
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