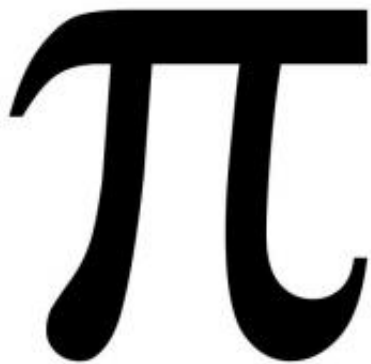# Pi calculation smashes records

January 7 2010, by Lin Edwards

(PhysOrg.com) -- A computer scientist in France has broken all previous records for calculating Pi, using only a personal computer. The previous record was approximately 2.6 trillion digits, but the new record, set by Fabrice Bellard, now stands at almost 2.7 trillion decimal places.

Bellard, of Paris Telecom Tech, made and checked the calculation by running his own software algorithms for 131 days. The previous record calculation, set by Daisuke Takahashi at the University of Tsukuba in Japan in August 2009, took only 29 hours to complete, but used a super-computer costing millions of dollars, and running 2000 times faster than Bellard's PC.

Pi is the value of the ratio of the circumference of a circle to its diameter, and has been of interest to mathematicians for hundreds of

years, since Sir [Isaac Newton](link) developed formulae to extend the number of decimal places.

Bellard has been following the records for calculating Pi to the maximum number of decimal places since he received his first book about Pi at the age of 14. Computations to find a value to any number of decimal places are part of a branch of mathematics called "arbitrary-precision arithmetic". For Bellard the calculation was more for fun than because of an obsession with the digits, but he said that arbitrary-precision arithmetic has applications because it can be used for testing algorithms and computers. He claims his method is about 20 times more efficient than previous methods.

Bellard said he used the Chudnovsky formula to produce a binary result (a process that took 103 days), which was then checked (which actually took 34 hours on 9 computers, but would have taken 13 days on one PC), and converted to a base-10 result (12 days), which was then verified (3 days).

Bellard's computer cost less than €2000 (roughly $2870 US) and ran Linux's Red Hat Fedora operating system. It had a Core i7CPU at 2.93 GHz, and had 6 GB of RAM and 7.5 TB of disk storage space in five 1.5 TB hard disks. He wrote all the required software.

The world record for memorizing and reciting Pi was set in 2005 by a Chinese graduate student, Lu Chao, who spent a year learning 100,000 digits and was able to recite Pi to the 67,890th decimal place before he made an error. The feat took just over 24 hours. Reciting Bellard's result of 27 trillion digits would take over 1,284,000 years at the Guinness Book of Records' required rate of one digit every 15 seconds.

M Bellard is perhaps best known as the writer of the open source project FFmpeg and processor emulator QEMU. He said he has no immediate

plans to calculate Pi to further digits in the future, but may do, depending on his motivation and the availability of larger and faster storage. He intends to release open-source versions of his software for Linux and Windows to enable anyone who is interested in furthering the calculation to beat him to it.

More information: bellard.org/pi/pi2700e9/

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