

Sage 2008: Sage on Microsoft Windows

William Stein

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1 Introduction

Stein started the open source software project Sage in 2005 to support advanced research in number theory. Now that a much larger group of people are using and contributing to Sage, the main goals for 2008 are to greatly improve the overall polish and quality of Sage, enormously broaden the areas of mathematics addressed by Sage, and improve support for using Sage on Solaris and Microsoft Windows.

Sage is the only serious general purpose mathematics software that uses a mainstream programming language as the end user language. The programming language used for working with Sage is Python, which is a powerful modern interpreted programming language.

“Python plays a key role in our production pipeline. Without it a project the size of Star Wars: Episode II would have been very difficult to pull off. From crowd rendering to batch processing to compositing, Python binds all things together,” said Tommy Burnette, Senior Technical Director, Industrial Light & Magic.

With Python it is easy to define new data types (e.g., bitstreams, ciphers, rings, etc.), and Python has excellent support for string and bit manipulation. Python is a “clean” language that results in readable and maintainable code. Many standard Python libraries are available for statistics, networking, databases, bioinformatics, physics, 3d graphics, cryptography, and many other application domains. There is also a Python to C compiler (Cython). Python is also a language strongly supported by Microsoft via the IronPython project:

<http://www.codeplex.com/Wiki/View.aspx?ProjectName=IronPython>

Sage is *open source*, so it is significantly more flexible and extensible than traditional commercial mathematical software offerings. In particular, you are allowed to view and modify absolutely all of the source code of their copy of Sage. This makes investing in Sage as a support tool for mathematical research a good long-term investment.

Instead of reinventing the wheel, Sage combines many of the best existing open source libraries that have been developed over the last 40 years (well

over *4 million lines of code*) with *200,000 lines of new code*. Some of what Sage includes standard are:

- Algebra and calculus: Maxima, Sympy
- High precision arithmetic: GMP, MPFR, MPFI, quaddouble, Givaro
- Algebraic geometry: Singular
- Arithmetic geometry: PARI, NTL, mwrank, ECM, FLINTQS
- Exact linear algebra: Linbox, IML
- Group theory: GAP
- Numerical computation/Signal processing/Optimization: GSL, Scipy, Numpy, cvxopt
- Graphics (2d and 3d): Matplotlib, Tachyon3d, Java3d

In November 2007, Sage won first place in the scientific category of the Trophées du Libre, (<http://www.tropheesdulibre.org/?lang=en>) which is a major international free software competition.

1.1 Overall Budget Summary

In this proposal we are requesting **\$30,000** to fund one full time employee to work full time for one year on a port of Sage to Microsoft Windows.

2 Sage on Microsoft Windows

Michael Abshoff, an extremely talented software engineer currently living in Germany, is the right person for this job. He has extensive experience working with the CoCoA and ApCoCoA projects, is skilled at Microsoft Windows build and porting issues, and is dedicated to following through with this port; in fact, he has been working on it steadily in his spare time (however, funding from the present grant is critical to this work continuing!). To quote Abshoff,

“I am much more at home philosophically with Sage and the problems I can/will solve there are much more interesting than those of my current employment. My decision becomes a no-brainer from my perspective provided some reasonable amount of funding is available.”

Abshoff is also very experienced with Sage. He has already helped enormously with our Microsoft Windows porting efforts, has attended two Sage Days coding weeks and has made numerous releases of Sage. He has a very rare combination of people skills and technical capabilities.

2.1 Current Status

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2.2 Budget

We are requesting \$30,000 to employ Michael Abshoff full time from January 1, 2009 until December 31, 2009. His responsibilities, in order of priority, will be as follows:

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