A Practical Study of Some Symbolic Computation Implementations

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1 Overview

The purpose of this project is to study implementation issues in the design and coding of real symbolic computation engines. Source code for packages such as GAP and Pari will be obtained and analyzed to get an understanding of the high-level structure for such programs. Research articles and texts describing symbolic computation issues in a more abstract setting will also be used for background information and to provide a framework for the analysis of actual source code.

Descriptions of the internals of many symbolic computation packages exists when the code itself is not available, so the thrust of this project will be to compare the *differences* in the variety of packages. Key data structures, interfaces, and algorithms will be rooted out of each package and contrasted with one another to find out exactly what design choices were made.

Emphasis will *not* be on the implementation of any particular package, but some points in the implementation of each package will be used to contrast with another package's implementation of a particular feature. Likewise, emphasis will not be on source code itself, but small portions of source code might be used to make particular implementation issues more concrete.

As this project progresses, it might shift to a narrower focus because of time constraints or the amount of material required for research at a general level. For instance, the final topic could be something such as analyzing different implementations of abstract groups: how they are represented as data structures, what group operations are provided, etc... No matter how narrow or broad the final topic, the underlying concept of analyzing several actual symbolic computation packages at the source code level to get a concrete understanding of their inner workings, will be the same.