

# A novel approach to Gröbner basis algorithms with implementations in GAP

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The theory of the Gröbner bases has an important role in solving complex problems in mathematics and physics. The Gröbner basis is basically the generator system of a polynomial ideal with really good attributes and it is rather complex to calculate. Since the seminal work of Buchberger, much research has been conducted in order to develop an efficient algorithm to calculate the Gröbner basis. Most computer algebra systems use Faugère's F5 and F4 algorithms.

The GVW algorithm by Gao, Volny and Wang has a clearer theoretical description and is more efficient than the Faugère algorithms.

We created an own implementation for the GAP open source computer algebra system, based on the GVW algorithm, enhanced with optimizations and extensions. Our implementation is considerably faster than the built-in implementation currently used by GAP (which is based on Buchberger's algorithm).

The talk introduces briefly the theory of Gröbner bases and presents our own implementation based on the GVW algorithm, which we compare with other commonly known computer algebra systems.

## References

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