

## F<sub>5</sub> – Gröbner bases using signatures

by Jan Ferdinand Sauer • Nov 20, 2020 • 0 Comment

$$\begin{array}{ccc}
 \text{vector of origin} & & \text{signatures} \\
 \left. \begin{array}{c} f_0(\mathbf{x}) \cdot \overbrace{q_0(\mathbf{x})} \\ \vdots \\ f_{m-1}(\mathbf{x}) \cdot \overbrace{q_{m-1}(\mathbf{x})} \end{array} \right\} \Sigma = \mathbf{g} & \xrightarrow{\mathfrak{S}} & \begin{array}{c} \overbrace{x^2y + y} \\ xy^2 \\ \overbrace{y^2 + yz} \\ 0 \end{array} \rightarrow \begin{array}{c} \overbrace{0} \\ 0 \\ \overbrace{y^2} \\ 0 \end{array}
 \end{array}$$

One of the biggest milestones regarding Gröbner basis computation was the introduction of F<sub>5</sub> due to Jean-Charles Faugère. In [this video](#), I motivate how F<sub>5</sub> improves on F<sub>4</sub>, introduce the concepts used in F<sub>5</sub>, and present the core algorithm step by step.



There is a lot more to be said regarding signature based Gröbner basis algorithms. For example, thanks to F<sub>5</sub>, we have a better understanding of the complexity of Gröbner basis computations. Stay tuned for upcoming posts!



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