
Algorithm 1: Improved Buchberger's Algorithm

Input: $F = (f_1, \dots, f_s), \geq$ (monomial ordering)

Output: Gröbner basis G of F w.r.t. $\geq$ monomial ordering

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1  $t \leftarrow s$ 
2  $G \leftarrow F$ 
3  $B \leftarrow \{(i, j) \mid 1 \leq i < j \leq s\}$ 
4 while  $B \neq \emptyset$  do
5   Select  $(i, j) \in B$ 
6    $B \leftarrow B \setminus \{(i, j)\}$ 
7    $r \leftarrow \overline{S_{\geq}(f_i, f_j)}^{(G, \geq)}$ 
8   if  $r \neq 0$  then
9      $t \leftarrow t + 1$ 
10     $f_t \leftarrow r$ 
11     $G \leftarrow (f_1, \dots, f_t)$ 
12     $B \leftarrow B \cup \{(i, t) \mid 1 \leq i \leq t - 1\}$ 
13 return  $G$ 
```
