
Algorithm 4 Mapping(BOM, Facilities, seed, min_demand, max_demand)

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1: Let facilities_mapping be an empty list of alternative facilities for each node in BOM
2: Let processing_time be an empty list indicating processing times of each item in alternative facilities
3: Let inventory be an empty list indicating inventory level of each item in alternative facilities
4: Let PGHG be an empty list indicating production greenhouse gas emission levels for unit processing time
   of each item in each alternative facility
5: for each  $i$  in BOM do                                      $\triangleright$  Generating alternative facilities for each node
6:   facilities_mapping[ $i$ ]  $\leftarrow \{\}$ 
7:    $num\_facilities \leftarrow U(2, \max(3, |Facilities|/3))$ 
8:    $alternative\_facilities \leftarrow \text{Uniform\_sample}(Facilities, num\_facilities)$      $\triangleright$  Choose alternative
   facilities as a random sample from all facilities
9:   facilities_mapping[ $i$ ]  $\leftarrow alternative\_facilities$ 
10: end for
11: for each  $i$  in BOM do       $\triangleright$  Generating processing times, inventory and PGHG in alternative facilities
12:   for each  $j$  in facilities_mapping[ $i$ ] do
13:     processing_time[ $i$ ][ $j$ ]  $\leftarrow U(5, 10)$ 
14:     inventory[ $i$ ][ $j$ ]  $\leftarrow U(\min\_demand \times 2, \max\_demand \times 2)$ 
15:     PGHG[ $i$ ][ $j$ ]  $\leftarrow \text{processing\_time}[i][j] \times \max\_demand$ 
16:   end for
17: end for
18: return facilities_mapping, processing_time, inventory, PGHG
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