Parallel Minimum degree ordering

- algorithms not explicitely changing the graph
- algorithms changing the graph

1 finding indinstinguishable nodes when computing reachable set

Input: v is the node eliminated at step s. R_v is its reachable set.
marker and *label* arrays, *tag*

$label(v) = s$
$indistCount = 0$
$tag = tag + 1$
$tag_v = tag$
forall the *node* $u \in R_v$ **do**
  $mask(u) = tag_v$
end
forall the *node* $t \in R_v$ **do**
  $tag = tag + 1$
  $indist, deg(t) \leftarrow$
  $update\_degree(t, v, deg(v), label, marker, tag, tag_v, mask)$
  if *indist* **then**
    $s = s + 1$
    $label(t) = s$
    $indistCount \leftarrow indistCount + 1$
  end
end
forall the *node* $t \in R_v$ **do**
  if $label(t) = 0$ **then**
    $deg(t) \leftarrow deg(t) - indistCount$
  end
end

Algorithm 1: Sketch of the MDO algorithm calling *update_degree*

Input:

1. u, node of which we're computing the reachable set (starting point of the exploration).
2. v, node eliminated at current step.
3. $deg(v)$, degree of v.
4. $label$, array of size n indicating if a node has been labeled or not.
5. $marker$, array of size n used to mark explored nodes with value tag.
6. tag_v, special tag value used to mark nodes in R_v.
7. $mask$, array of size n used to mark nodes in R_v with tag_v.

Output:

1. $indist$, boolean indicating if v and u are indistinguishable.
2. $\bar{deg}(u)$, updated degree of u after the elimination of v.

$\bar{deg}(u) \leftarrow deg(v) - 1$
$explore \leftarrow \{u\}$
$indist \leftarrow true$
$count \leftarrow 1$
forall the *node* t *in* $explore$ **do**
  forall the *node* x *in* Adj_t **do**
    if $marker(x) \neq tag$ **then**
      if $label(x) \neq 0$ **then**
        if $x \neq v$ **then**
          $explore \leftarrow explore \cup \{x\}$
        end
      end
      else
        if $mask(x) \neq tag_v$ **then**
          $indist \leftarrow false$
          $\bar{deg}(u) \leftarrow \bar{deg}(u) + 1$
        end
        else
          $count \leftarrow count + 1$
        end
      end
      $marker(x) = tag$
    end
  end
end
if $indist = true\ AND\ count + 1 \neq deg(v)$ **then**
  $indist \leftarrow false$
end

Algorithm 2: *update_degree*