- $c : E \to \mathbb{R}_0^+$: capacity of an edge
- $e : V \to \mathbb{R}_0^+$: excess (too much flow in one node)
- $r_f : V \times V \to \mathbb{R},\ r_f(u,v) := c(u,v) - f(u,v)$: remaining capacity
- $dist : V \to \mathbb{N}$: the label (imagine this as height)

Algorithm 1 Algorithm of Goldberg and Tarjan

function PUSHRELABEL(Network $N(D, s, t, c)$)
  for all $(v, w) \in (V \times V \setminus E)$ **do** ▷ If an edge is not in $D = (V, E)$,
    $c(v, w) \leftarrow 0$ ▷ then its capacity is 0
  end for

  for all $(v, w) \in V \times V$ **do** ▷ At the beginning, every edge
    $f(v, w) \leftarrow 0$ ▷ has flow=0
    $r_f(v, w) \leftarrow c(v, w)$ ▷ flow=max in the residualgraph
  end for

  $dist(s) \leftarrow |V|$
  for all $v \in V \setminus \{ s \}$ **do**
    $f(s, v) \leftarrow c(s, v)$ ▷ Push maximum flow out at the beginning
    $r(v, s) \leftarrow c(v, s) - f(v, s)$
    $dist(v) \leftarrow 0$
    $e(v) \leftarrow c(s, v)$ ▷ v has too much flow
  end for

  while $\exists v \in V$: ISACTIVE(v) **do**
    if ISPUSHOK(v) **then**
      PUSH(v)
    end if
    if ISRELABELOK(v) **then**
      RELABEL(v)
    end if
  end while

  return f ▷ Maximaler Fluss
end function

function PUSH(Node v, Node w)
  $\Delta \leftarrow \min \{ e(v), r_f(v, w) \}$
  $f(v, w) \leftarrow f(v, w) + \Delta$
  $f(w, v) \leftarrow f(w, v) - \Delta$
  $r_f(v, w) \leftarrow r_f(v, w) - \Delta$
  $r_f(w, v) \leftarrow r_f(w, v) + \Delta$
  $e(v) \leftarrow e(v) - \Delta$
  $e(w) \leftarrow e(w) + \Delta$
end function

function RELABEL(Node v)
  if $\{ w \in V \mid r_f(v, w) > 0 \} == \emptyset$ **then**
    $dist(v) \leftarrow \infty$
  else
    $dist(v) \leftarrow \min \{ dist(w) + 1 \mid w \in V : r_f(v, w) > 0 \}$
  end if
end function

function ISACTIVE(Node v)
  return $(e(v) > 0) \wedge (dist(v) < \infty)$
end function

function ISRELABELOK(Node v)
  return ISACTIVE(v) $\bigwedge_{w \in \{ w \in V \mid r_f(v,w) > 0 \}} (dist(v) \leq dist(w))$
end function

function ISPUSHOK(Node v)
  return ISACTIVE(v) $\wedge (e(v) > 0) \wedge (dist(v) == dist(w) + 1)$
end function