SMA* Pseudo

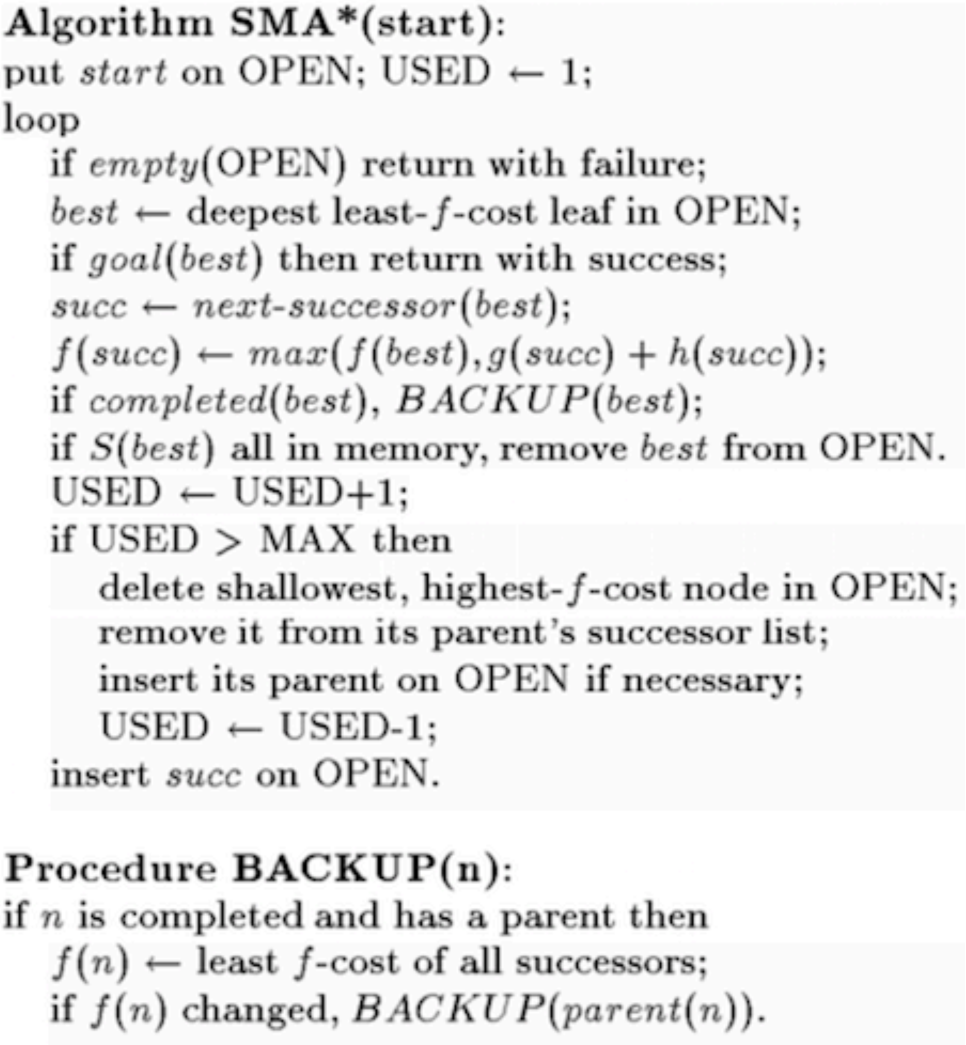
Wikipedia

```
function SMA-star(problem): path
  queue: set of nodes, ordered by f-cost;
begin
  queue.insert(problem.root-node);

  while True do begin
    if queue.empty() then return failure;
    //there is no solution that fits in the given memory
    node := queue.begin(); // min-f-cost-node
    if problem.is-goal(node) then return success;

    s := next-successor(node)
    if !problem.is-goal(s) && depth(s) == max_depth then
        f(s) := inf;
        // there is no memory left to go past s,
        // so the entire path is useless
    else
        f(s) := max(f(node), g(s) + h(s));
        // f-value of the successor is the maximum of
        //  f-value of the parent and
        // heuristic of the successor + path length to the successor
    endif
    if no more successors then
       update f-cost of node and those of its ancestors if needed

    if node.successors ⊆ queue then queue.remove(node);
    // all children have already been added to the queue
    // via a shorter way
    if memory is full then begin
      badNode := shallowest node with highest f-cost;
      for parent in badNode.parents do begin
        parent.successors.remove(badNode);
        if needed then queue.insert(parent);
      endfor
    endif

    queue.insert(s);
  endwhile
end
```

https://cis.temple.edu/

```
function SMA*(problem) returns a solution sequence
   Queue, a queue of nodes ordered by f-cost
       {Queue is a static local variable}
{  Queue <-- MAKE-QUEUE(MAKE-NODE(INITIAL-STATE[problem]))
   loop {
      if Queue is empty then return failure
      n <-- deepest least f-cost node in Queue
      if GOAL-TEST(n) then return success
      s <-- NEXT-SUCCESSOR(n)
      if s is not a goal and is at maximum depth then
         f(s) <-- INFINITY
      else
         f(s) <-- MIN(f(n),g(s)+h(s))
      if all of n's successors have been generated then
         update n's f-cost and those of its ancestors if necessary
      if SUCCESSORS(n) all in memory then remove n from Queue
      if memory is full then
        {delete shallowest, highest f-cost node in Queue
         remove it from its parent's successor list
         insert its parent on Queue if necessary}
      insert s in Queue}}
```

Efficient memory-bounded search methods S.Russel



```
Algorithm SMA*(start):
put start on OPEN; USED $\leftarrow$ 1;
loop
  if $empty$(OPEN) return with failure;
  $best \leftarrow$ deepest least-$f$-cost leaf in OPEN;
  if $goal(best)$ then return with success;
  $succ \leftarrow next\text{-}successor(best)$;
  $f(succ) \leftarrow max(f(best), g(succ) + h(succ))$;
  if $completed(best)$, $BACKUP(best)$;
  if $S(best)$ all in memory, remove $best$ from OPEN.
  USED $\leftarrow$ USED+1;
  if USED > MAX then
    delete shallowest, highest-$f$-cost node in OPEN;
    remove it from its parent's successor list;
    insert its parent on OPEN if necessary;
    USED $\leftarrow$ USED-1;
  insert $succ$ on OPEN.

Procedure BACKUP(n):
if $n$ is completed and has a parent then
  $f(n) \leftarrow$ least $f$-cost of all successors;
  if $f(n)$ changed, $BACKUP(parent(n))$.
```

Norgiv 1st edition

```
function SMA*(problem) returns a solution sequence
  inputs: problem, a problem
  local variables: Queue, a queue of nodes ordered by f-cost

  Queue ← MAKE-QUEUE({MAKE-NODE(INITIAL-STATE[problem])})
  loop do
      if Queue is empty then return failure
      n ← deepest least-f-cost node in Queue
      if GOAL-TEST(n) then return success
      s ← NEXT-SUCCESSOR(n)
      if s is not a goal and is at maximum depth then
          $f(s) \leftarrow \infty$
      else
          $f(s) \leftarrow \mathrm{MAX}(f(n), g(s)+h(s))$
      if all of n's successors have been generated then
          update n's f-cost and those of its ancestors if necessary
      if SUCCESSORS(n) all in memory then remove n from Queue
      if memory is full then
          delete shallowest, highest-f-cost node in Queue
          remove it from its parent's successor list
          insert its parent on Queue if necessary
      insert s on Queue
  end
```