

Algorithm 9.2. Computing the failure function.

Input. Pattern $y = b_1b_2 \cdots b_l, l \geq 1$.

Output. Failure function f for y .

Method. Execute the program in Fig. 9.14. \square

```
begin
1.    $f(1) \leftarrow 0$ ;
2.   for  $j \leftarrow 2$  until  $l$  do
      begin
3.      $i \leftarrow f(j - 1)$ ;
4.     while  $b_j \neq b_{i+1}$  and  $i > 0$  do  $i \leftarrow f(i)$ ;
5.     if  $b_j \neq b_{i+1}$  and  $i = 0$  then  $f(j) \leftarrow 0$ 
6.     else  $f(j) \leftarrow i + 1$ 
      end
    end
end
```

Fig. 9.14. Computation of the failure function.

Algorithm 9.3. Construction of a DFA for I^*y .

Input. A pattern string $y = b_1b_2 \cdots b_l$ over alphabet I . For convenience, we take b_{l+1} to be a new symbol not equal to any symbol in I .

Output. A DFA M such that $L(M) = I^*y$.

Method

1. Use Algorithm 9.2 to construct the failure function f for y .
2. Let $M = (S, I, \delta, 0, \{l\})$, where $S = \{0, 1, \dots, l\}$ and δ is constructed as follows.

```
begin
  for  $j = 1$  until  $l$  do  $\delta(j - 1, b_j) \leftarrow j$ ;
  for each  $b$  in  $I, b \neq b_1$  do  $\delta(0, b) \leftarrow 0$ ;
  for  $j = 1$  until  $l$  do
    for each  $b$  in  $I, b \neq b_{j+1}$  do  $\delta(j, b) \leftarrow \delta(f(j), b)$ 
  end
end  $\square$ 
```