Iteration algorithm with doubling up

input: $\mathbb{R}$-weighted graph $G = (V, E, \lambda)$ without negative weighted cycles

output: shortest-path matrix $D = (d_{u,v} \mid 1 \leq u, v \leq |V|)$

var: $\Delta = (\delta_{u,v} \mid 1 \leq u, v \leq |V|)$: $|V| \times |V|$-matrix;

```
01 begin
02     Δ := W_G;
03     l := 1;
04     while l < |V| − 1 do
05         begin
06             Δ := multiply(Δ,Δ);
07             l := 2 · l
08         end;
09     D := Δ
10 end
```

where $W_G = (w_{u,v} \mid 1 \leq u, v \leq |V|)$ with $w_{u,v} = \begin{cases} 0 & \text{if } u = v \\ \infty & \text{if } u \neq v, (u,v) \notin E \\ \lambda(u,v) & \text{if } u \neq v, (u,v) \in E \end{cases}$

and **multiply** is as in the Iteration algorithm.