

0.1 The Mathematical Foundation of Map model

Algorithm 1: generateCycleSpace

Input: $c_{initial}, c_{goal}, \Delta t$

Output: success_status

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1 Function generateCycleSpace( $c_{goal}, c_{initial}$ ):  
2   success_status  $\leftarrow$  false  
3   while within iteration do  
4      $\mathcal{T}_{initial \rightarrow goal} \leftarrow$  generateRRT( $c_{initial}, c_{goal}, \Delta t$ )  
5     success_status  $\leftarrow$  moveRobot( $\mathcal{T}_{initial \rightarrow goal}, \Delta t$ )  
6     if success_status = true then  
7        $\mathcal{T}_{goal \rightarrow initial} \leftarrow$  generateRRT( $c_{goal}, c_{initial}, \Delta t$ )  
8       success_status  $\leftarrow$  moveRobot( $\mathcal{T}_{goal \rightarrow initial}, \Delta t$ )  
9   return success_status  
10 Function moveRobot( $\mathcal{T}, \Delta t$ ):  
11   for all index in  $\mathcal{T}.vertices$  do  
12      $c^{cycle}(\text{index}) \leftarrow$  getIK( $\mathcal{T}.vertex(\text{index})$ )  
13      $t \leftarrow \mathcal{T}.u.(\text{index}) \Delta t$   
14      $\mathcal{T}.append(c^{cycle}, t)$   
15   success_status  $\leftarrow$  TrajectoryController( $\tau$ )
```
