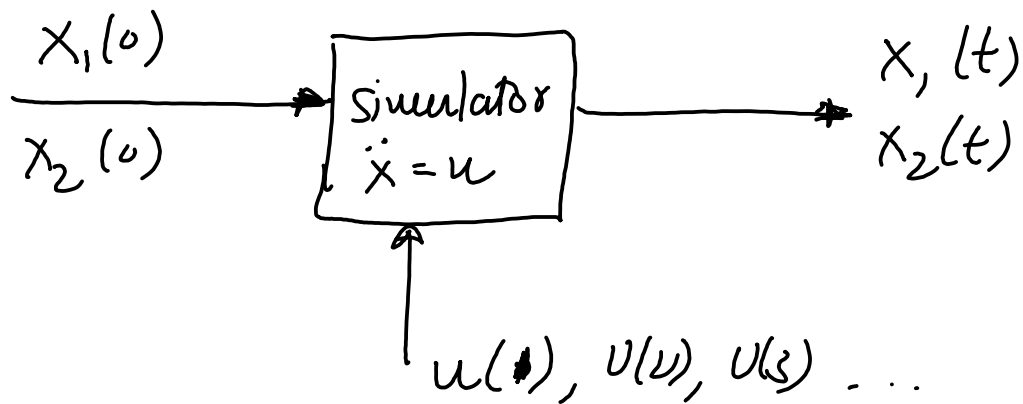


## Single shooting method

- can treat the dynamics as a black-box
- useful when we use a simulator and hence do not have access to the dynamics

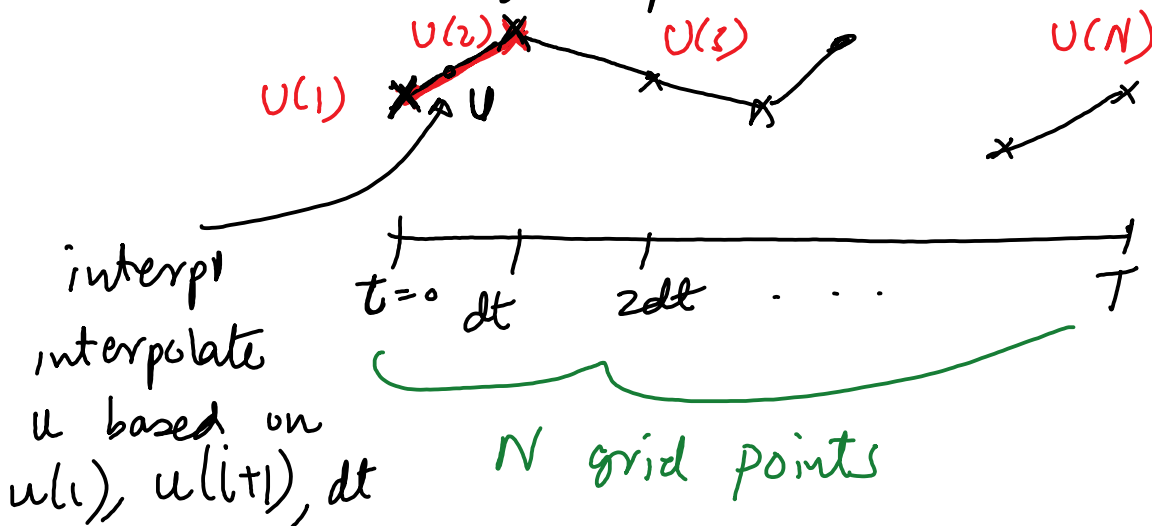
e.g. dynamics  $\ddot{x} = u$

Finite difference to model the dynamics in direct collocation



## Formulation

① Choose  $N$  grid points ( $\sim$  to collocation)



(2) Cost  $\int_0^T dt = T$

(3) Optimization variables  $T, u(1), u(2), \dots, u(N)$

(4) Optimization constraints.

$\otimes$   $x_1(0) = 0$  } initial values  
 $x_2(0) = 0$  } NOT appear as constraints

$x_1(T) = D = 5$  } simulator.  
 $x_2(T) = 0$  }

function  $\rightarrow$  solve the problem.