

offline  
optimization

Reference  
poses

2 Simple Controllers Combiner

$\phi$

Spline  
trajectories  $f(\phi, V_d)$

$V_d$

swing foot  
trajectory  $y(\phi, V_d)$

3

IP Model

$\phi$

NULL speed  
IPM  $p_x, p_z$

$V_d$

$V$

IPM speed  
adapater  $\Delta p_x, \Delta p_z$

Target pose generation modules

4

External Forces Field  
Compensation

5

$\phi$

$V$

Velocity  
Tuning

Direct torque generation modules

External Forces module

1

Water simulation

Physics  
engine

$\Sigma$

Target  
pose

PD  
controller

