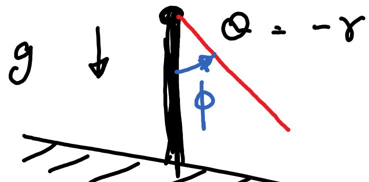
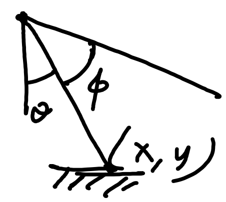
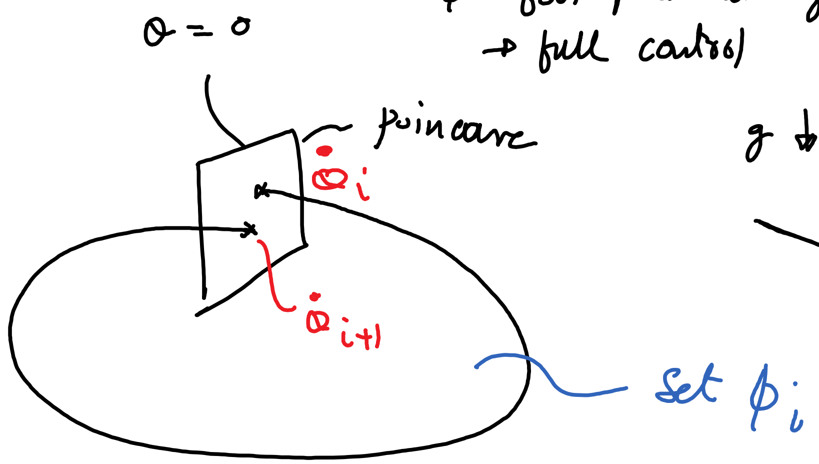
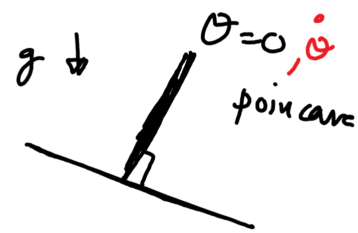
Controlled walker going downhill.





φ = foot placement angle
→ full control





walker $\quad \dot{\theta}_{i+1} = F(\dot{\theta}_i, \phi_i)$

$\dot{\theta}_{i+1}$: 1 state; $\dot{\theta}_i$: 1 state; ϕ_i ← control.

hopper $\quad \begin{bmatrix} \dot{x}_{i+1} \\ y_{i+1} \end{bmatrix} = F([\dot{x}_i, y_i], \phi_i)$

$\begin{bmatrix} \dot{x}_{i+1} \\ y_{i+1} \end{bmatrix}$: 2 states; $[\dot{x}_i, y_i]$: 2 states; ϕ_i ← 1 control

↳ raibert $\quad \phi_i = g(\dot{x}_i)$ ← note y_i is not used

$\phi_i = g(\dot{x}_i)$ ↓ $\sin^{-1}(\ldots) + k(\ )$

walker $\dot{\theta}_{i+1} = F(\dot{\theta}_i, \phi_i)$ ← control

(1 state) (1 state)

$\phi_i \overset{?}{=} g(\dot{\theta}_i)$

① Find g from physics & intuition

② Try linear control

$\phi_i = K(\dot{\theta}_i - \dot{\theta}_{des})$ will it work

③ Two stages

Data generation:

$\dot{\theta}_{i+1} = F(\dot{\theta}_i, \phi_i)$

$\dot{\theta}_{i+1}$ ↑ output; F ↑ simulator; $\dot{\theta}_i, \phi_i$ ↑ input different values

$\dot{\theta}_i$	ϕ_i	$\dot{\theta}_{i+1}$
–	–	–
–	–	–
–	–	–

Table → control

$\dot{\theta}_{des}$ is given

(4) $\dot{\alpha}_i$, $\dot{\theta}_{i+1}$, ϕ_i

$\dot{\alpha}_i$	$\dot{\theta}_{i+1}$	ϕ_i
—	—	—
—	—	—
—	—	—

?

$$\phi_i = \bar{u}(\dot{\alpha}_i, \dot{\theta}_{i+1})$$

ϕ_i: control

$\bar{u}$: linear polynomial, quadratic polynomial, neural network } parametric

$\dot{\alpha}_i$: measured

$\dot{\theta}_{i+1}$: given $= \dot{\theta}_{des}$

gaussian process regression — non-parametric

HW 7 2 parts

(1) Table look up

(2) Find controller $\bar{U}$