t_{init}
t_{final}
$\mathcal{R}$
B
$\dot{q}(t) = f(q(t), u(t))$
$q \in$
R^n
$u \in$
R^p
$R_b, R_b \in$
$\mathcal{R}, b \in$
$\{0, \ldots, B-$
$1\}$
ρ_b
(x_b, y_b)
$t_{b,init}$
$t_{b,final} \leq$
t_{final}
q_{init}, q_{goal}
$\dot{q}_{init}, \dot{q}_{goal}$
$\mathcal{O}$
M
O_m,$O_m \in \mathcal{O}$,
$m \in \{0, \ldots, M-1\}$
r_{O_m}
(x_{O_m}, y_{O_m})
$t \in$
$[t_{init}, t_{final}]$
O_m
R_b
$d_{b,sen}$
R_b
$\mathcal{O}_b$
$\mathcal{O}_b \subset$
$\mathcal{O}$
R_b
R_b
$|u_{b,i}(t)| \leq$
$u_{b,i,max}, \forall i \in$
$[1, p], \forall t \in$
$[t_{init}, t_{final}]$
$(q^*(t), u^*(t))$
$(q_b^*(t), u_b^*(t))$
?
$(q^*(t), u^*(t))$
$(q^*(t), u^*(t))$
R_b
$(q_b^*(t), u_b^*(t))$
$\dot{q}_b^*(t) = f(q_b^*(t), u_b^*(t)), \forall t \in [t_{init}, t_{final}], \forall b \in \{0, \ldots, B-1\}.$
(1)
R_b
R_b
$_b^*(t_{init}) =$
$q_{b,init}$,
$u_b^*(t_{init}) =$
$u_{b,init}, \forall b \in$
$\{0, \ldots, B-$
$1\}.$
R_b
R_b
$_b^*(t_{final}) =$
$q_{b,goal}$,
$u_b^*(t_{final}) =$
$u_{b,goal}, \forall b \in$
$\{0, \ldots, B-$
$1\}.$
$\forall t \in$
$[t_{init}, t_{final}]$
$\forall i \in$
$[1, 2, \cdots, p]$
$\forall b \in$
$\{0, \ldots, B-$
$1\}$

$|u_{b,i}^*(t)| \leq u_{b,i,max}.$
(2)

$$L(q(t), u(t)) = \sum_{b=0}^{B-1} L_b(q_b(t), u_b(t), q_{b,goal}, u_{b,goal})$$
(3)
$L_b(q_b(t), u_b(t), q_{b,goal}, u_{b,goal})$
R_b
?