

$$\begin{aligned}
& t_{init} \\
& t_{final} \\
& \mathcal{R} \\
& R_b, R_b \in \\
& \mathcal{R}, b \in \\
& \{0, \dots, B- \\
& 1\} \\
& \rho_b \\
& (x_b, y_b) \\
& \mathcal{O} \\
& M \\
& O_m, O_m \in \mathcal{O}, \\
& m \in \{0, \dots, M-1\} \\
& r_{O_m} \\
& (x_{O_m}, y_{O_m}) \\
& t_k \in \\
& [t_{init}, t_{final}] \\
& O_m \\
& R_b \\
& d_{b, sen} \\
& R_b \\
& \mathcal{O}_b \\
& \mathcal{O}_b \subset \\
& \mathcal{O} \\
& R_b \\
& ?? \\
& R_b \\
& (q_b^*(t), u_b^*(t)) \\
& q_b^*(t) \in \\
& R_b^n \\
& u_b^*(t) \in \\
& R_b^p \\
& \dot{q}_b^*(t) = f(q_b^*(t), u_b^*(t)), \forall t \in [t_{init}, t_{final}].
\end{aligned}
\tag{1}$$

$$\begin{aligned}
& R_b \\
& R_b \\
& q_b^*(t_{init}) = q_{b,init}, \\
& u_b^*(t_{init}) = u_{b,init}.
\end{aligned}
\tag{2}$$

$$\begin{aligned}
& R_b \\
& R_b \\
& q_b^*(t_{final}) = q_{b,goal}, \\
& u_b^*(t_{final}) = u_{b,goal}.
\end{aligned}
\tag{3}$$

$$\begin{aligned}
& \forall t \in \\
& [t_{init}, t_{final}] \\
& \forall i \in \\
& [1, 2, \dots, p] \\
& |u_{b,i}^*(t)| \leq u_{b,i,max}.
\end{aligned}
\tag{4}$$

$$\begin{aligned}
& L(q(t), u(t)) = \sum_{b=0}^{B-1} L_b(q_b(t), u_b(t), q_{b,goal}, u_{b,goal})
\end{aligned}
\tag{5}$$

$$\begin{aligned}
& L_b(q_b(t), u_b(t), q_{b,goal}, u_{b,goal}) \\
& ? \\
& \mathsf{d}(R_b, O_m) | O_m \in \\
& \mathcal{O}_b, R_b \in \\
& \mathcal{B} \\
& \mathsf{d}(R_b, O_m) \geq 0.
\end{aligned}
\tag{6}$$

$$\begin{aligned}
& \mathsf{d}(R_b, O_m) \\
& \sqrt{(x_b - x_{O_m})^2 + (y_b - y_{O_m})^2} - \\
& \rho_b^- \\
& r_{O_m}. \\
& ? \\
& R_b \\
& ?? \\
& ABCD \\
& 1 \\
& \sqrt{(x_b - x_A)^2 + (y_b - y_A)^2} - \\
& \rho_b \\
& A \\
& 2 \\
& {}_{DA}, (x_b, y_b)) - \\
& \rho_b \\
& {}_{DA}, (x_b, y_b)) = \\
& \frac{|a_{sDA}x_b + b_{sDA}y_b + c_{sDA}|}
\end{aligned}
\tag{7}$$