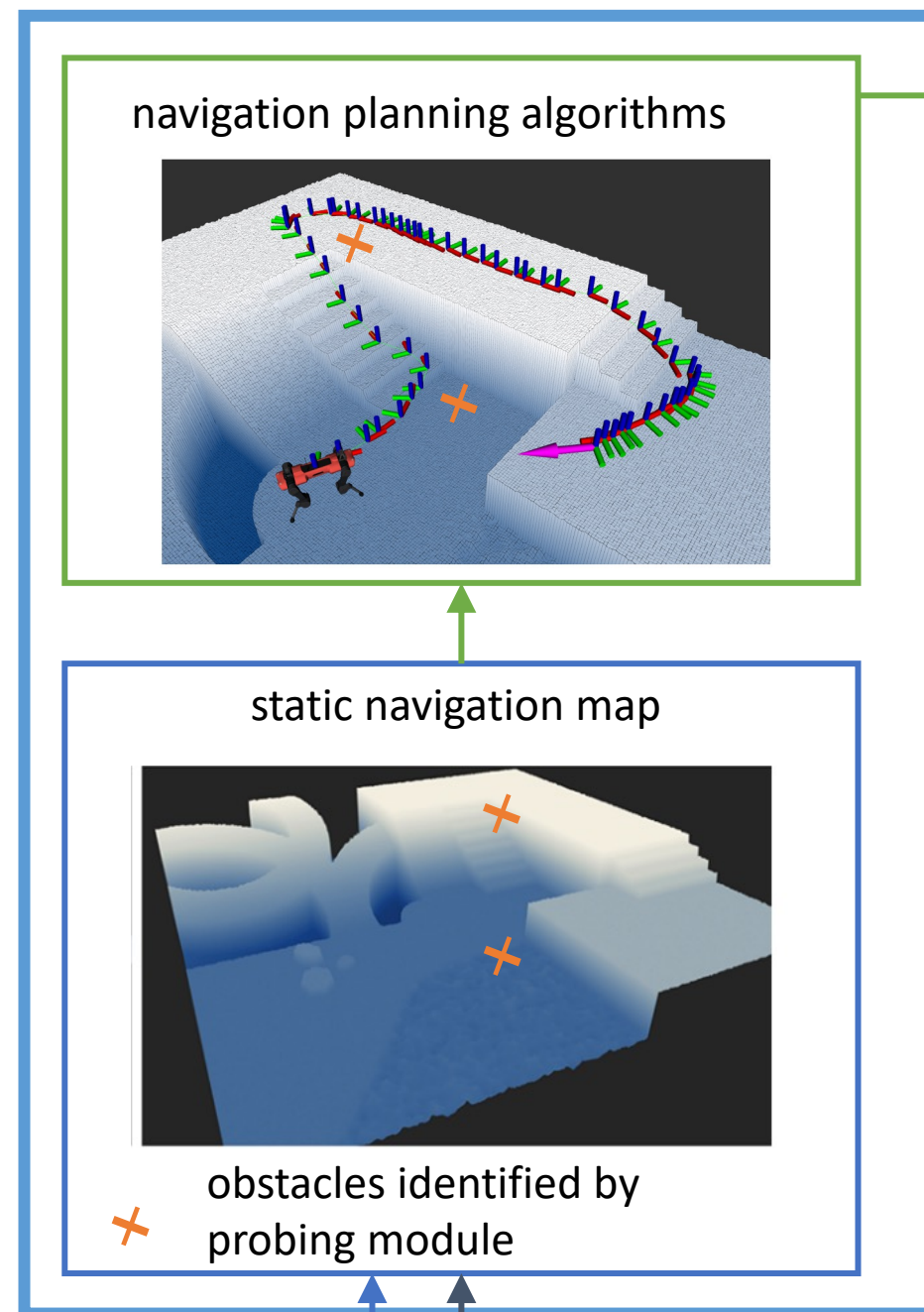
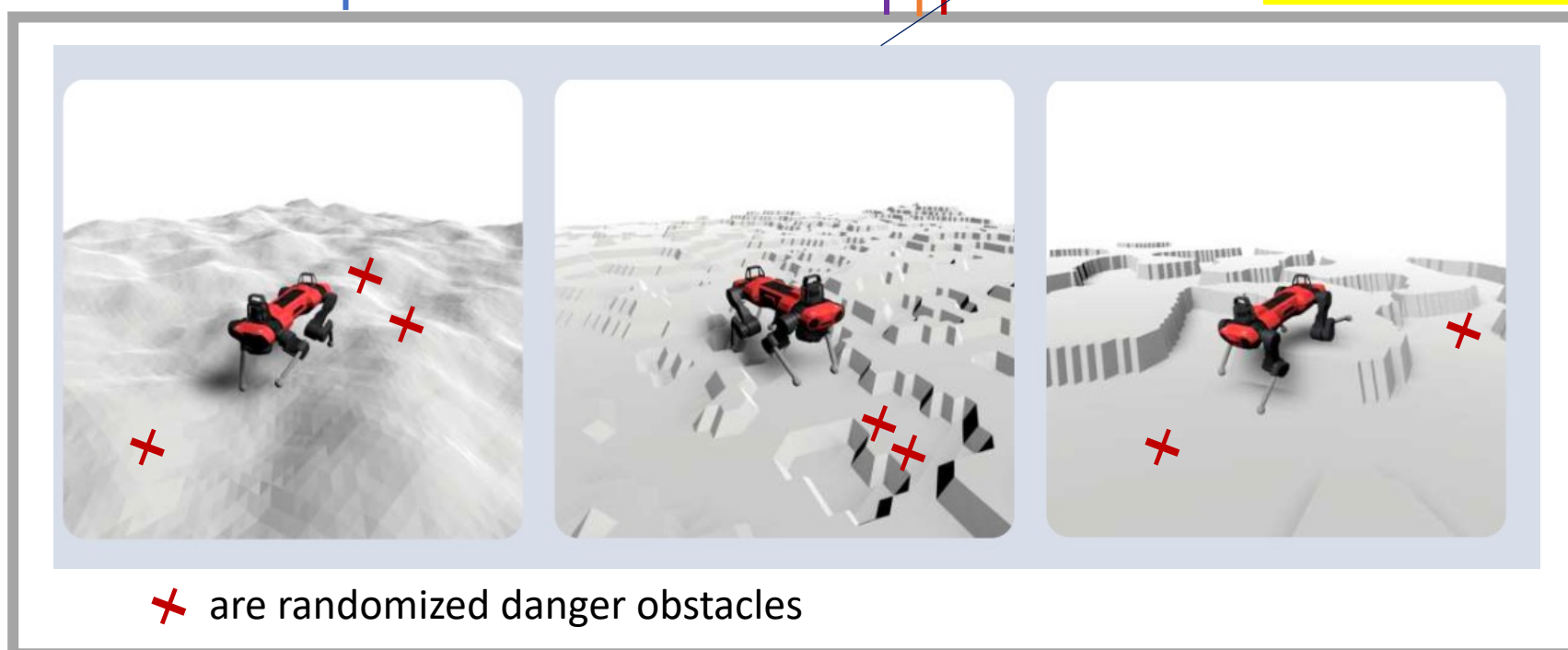


(2) Global navigation



(1) Simulator



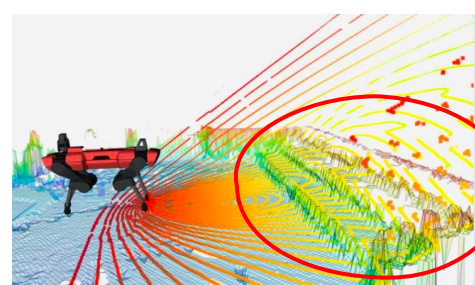
command sequence

proprioception

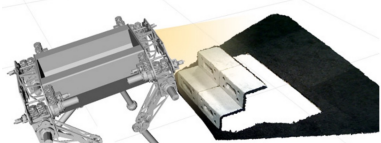
noisy height scan



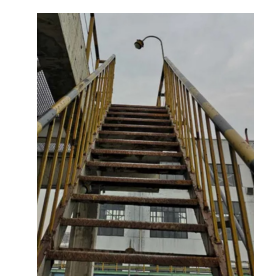
multi-modal noisy future scan



noisy forward scan



noisy state of model rollout



noisy camera image

temperature sensor

...

add an obstacle "✕" to the map and generate a new command sequence

domain randomization for different terrains and treacherous situations

(4) Robust joint Controller

pretrained joint controller

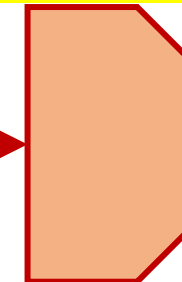
action



correct for safe probing

(3) Safe-probing policy

looking-ahead perception model



belief encoder

hidden

MLP

near zero?

yes

decoder

safety confidence

train for reconstruction

privileged states

rewards and constraints

train via safe RL