GENERATIVE ADVERSARIAL NETWORK BASED HEURISTICS FOR SAMPLING-BASED PATH PLANNING

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MIPT

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PROBLEM STATEMENT

Motivation & Idea

Motivation

Sampling-based path planning is a popular methodology for robot path planning. However, the quality of initial solution is not guaranteed and the convergence speed to the optimal solution is slow.

Idea

The idea is to use a generative adversarial network (GAN) which is designed to take the environment map as the input without other preprocessing works and obtain the promising region as output. This promising region is utilized as a heuristic to achieve non-uniform sampling for the path planner.

MODEL STRUCTURE

Heuristic RRT* searching algorithm

Algorithm 1: Outline of GAN-based heuristic RRT*

Input : x_{init}, x_{goal}, Map

Output: $G(V, E)$

$V = x_{init}, E = \emptyset$;

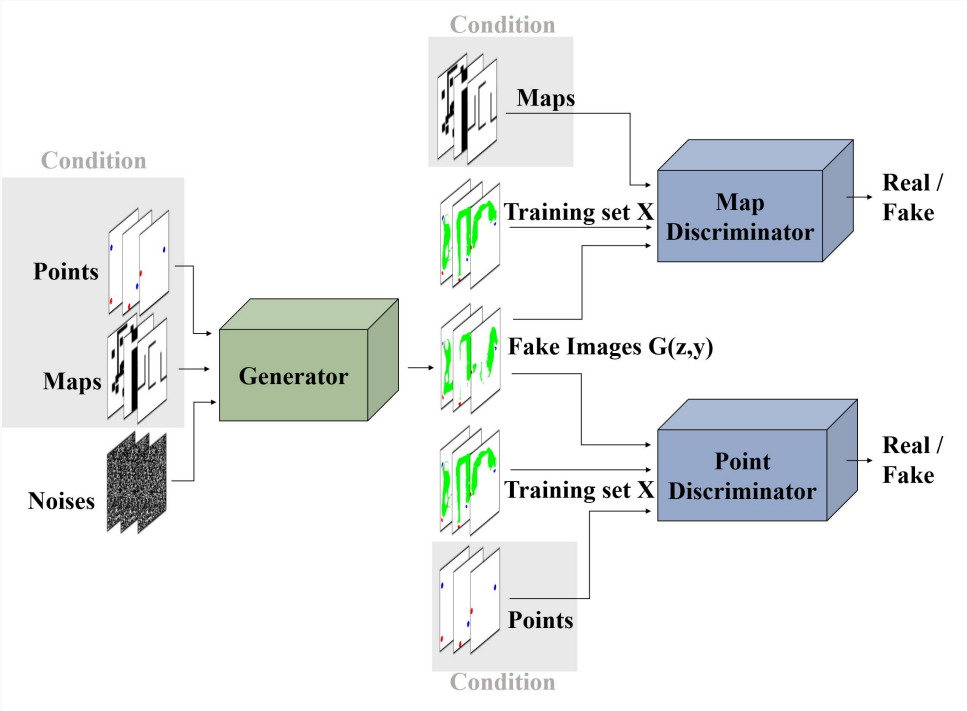
$\mathcal{S} \leftarrow$ ROIGenerator$(x_{init}, x_{goal}, Map)$;

$\mathcal{X}_H \leftarrow$ Discretization$(\mathcal{S})$;

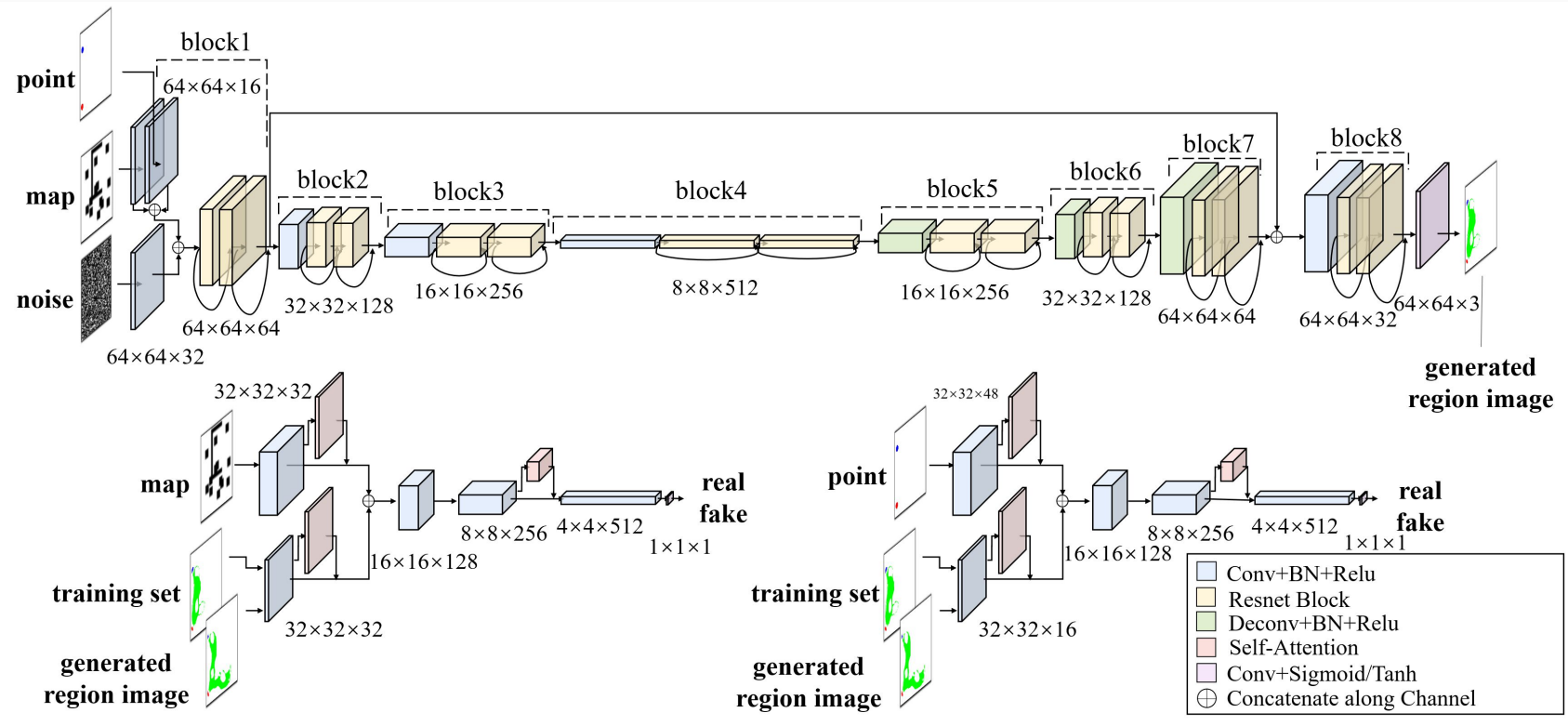
$G(V, E) \leftarrow$ HeuristicSBP*$(x_{init}, x_{goal}, Map, \mathcal{H})$;

Return $G(V, E)$;

GAN ARCHITECTURE



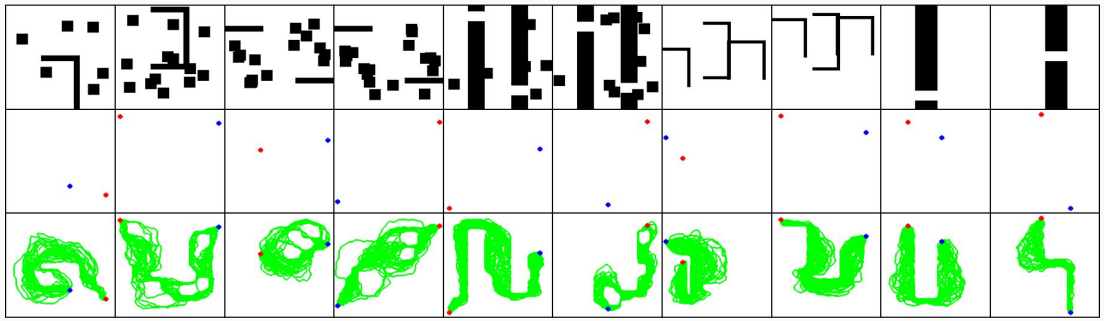
GAN architecture in details



DATASET

Maps & Tasks

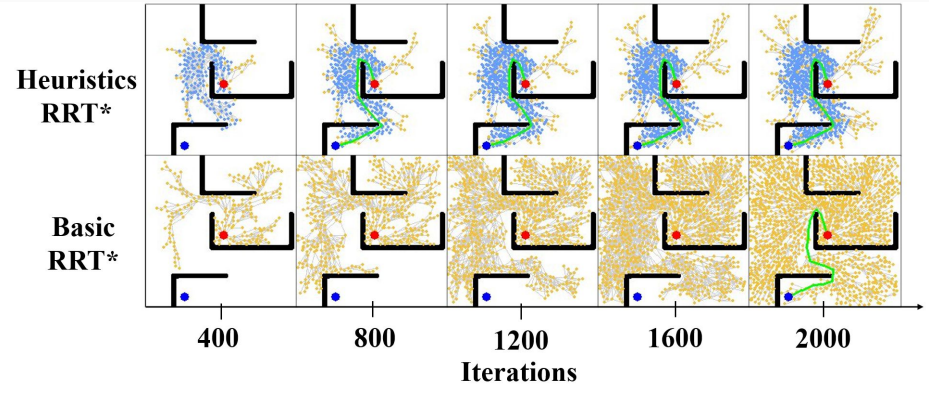
The maps and tasks are generated. To obtain the 'ground truth' regions the RRT* was launched 50 times on each task.

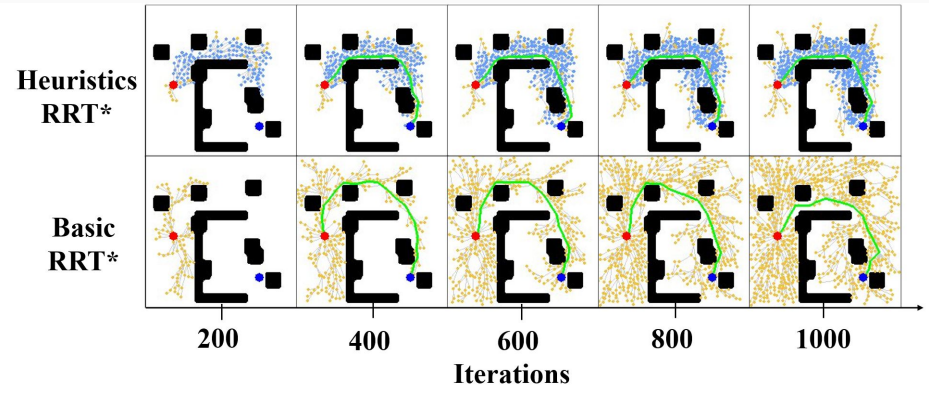


RESULTS

Results

Results on different maps:





Thank You