X Gate detection

TL;DR: incorporating geometric cues into CNNs
Task: localize gates for autonomous drones (It is likely to go more than gates)

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Description:

The IROS Autonomous Drone Racing Challenge [1] is organized to promote the development of indoor navigation technology. Participants are required to build a drone that can fly through a number of obstacles in a sequential manner. To detect a closed gate, we have to rely on vision-based techniques. However, gate recognition is difficult due to the fact

that the gate is an empty wireframe without any appearance information inside. In this project, we proposed a two-stage framework to detect gates, which contains keypoint detection and grouping. The key point detection part can be done by using human pose estimation methods [2], while the grouping part is still unsolved: how to correctly group those corners which belong to the same gate?

In this project, we will use techniques from object detection and human pose estimation tasks, and implement a neural network which is able to accurately detect gates. This project contains the following three steps:

(i) Keypoint detection (THIS IS VITAL! Learnable HARRIS detector?)

(ii) Keypoint grouping : How can we correctly group all keypoints without too much context?

(iii) Gate localization.

References and pointers:

S. Jung, S. Cho, D. Lee, H. Lee, and D. H. Shim. A direct visual servoing-based framework for the 2016 iros autonomous drone racing challenge. Journal of Field Robotic, 35(1):146–166, 2018.

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