Deep Representation and Estimation of State for Robotics-2

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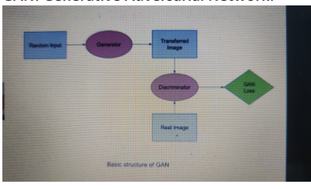
Sim2Real for Robot Grasping -- How to Solve Sim2Real for Robot Grasping with GAN – Google X

Robot grasping with Deep Learning

Model predicts how successful grasp will be

Reinforcement Learning used,
QT-OPT Deep Q Learning, Distributed version of DQN in conts space
7 kuka robots running for 2-3 months
Reality GAP: TRANSFERRING TO REALITY FROM SImulation
Categories: Visual Domain (what robot can see) and Physics domain (how robot interact with object)
SIM2Real
Visual Domain: Domain randomization, visual representation(point cloud), feature domain adaption(extract features), Pixel Domain adaptation(Look more realistic)
GAN: Generative Adversarial Network:

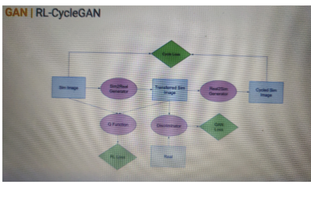


GAN And Sim2Real
Sim image -> generator->transferred sim -> discriminator->Gan loss

- Transferered sim images with GraspGAN (achieved 50x data reduction) able to reduce the number of real world samples needed to achieve this performance

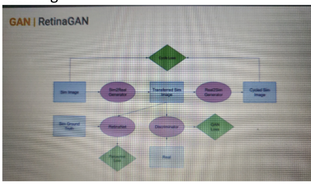
GAN and RCAN
Can we use sim data to train the generator?
RCAN: real 2 sim image translator train with to mean randomization ; Canonical version of simulation and randomizations tries to discriminate whether the image is transferred or canonical
RCAN quite good performance 70%
With QT-OPT performance in real with online grasps- 94%
GAN And CycleGAN
Simultaneous training of 2 generator models and 2 discriminator models

Gan and RL-CycleGAN (improved performance)
Ensures Q values transferred matches the q value from original sim image (Q value matching)
RL Scene consistency (
We need Q value associated with image data



GAN and Retina GAN

OBJECT AWARENESS WITH perception loss – retinanet makes object detection prediction
It is task agnostic – grasping and object pushing with RL, Door opening with imitation learning



Conclusion
1. SIM2REAL – CRITICIAL to enable large scale ML
2. Can be of visual or physical domains
3. 4 main sim2real techniques categories
4.GAN solves by adapting simulated images to be more realistic

SIM2REAL – open problem for robotics community