HIERARCHY OF GANS FOR LEARNING EMBODIED SELF-AWARENESS MODEL

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Introduction

Recently, several architectures have been proposed for learning embodied agents complex self-awareness (SA) models [1,2,3]. The main goal is that the autonomous system learn a model of itself while doing a certain task when driven by a human by looking at. Accordingly, by transferring the learned model from human driver to the autonomous system develop a self-awareness model.

- We propose the dynamic incremental SA models.
- Experiences done by an agent modeled in a hierarchical fashion, starting from more simple situations to more structured ones.
- A cross-modal Generative Adversarial Networks (GANs) used to process high dimensional visual data.
- Different levels of the GANs are detected in a weakly-supervised manner using GANs discriminators decision boundaries.

Training hierarchy of GANS

- **Goal:** learning a complex distribution.
- **Idea:** Split the distribution into smaller sets and estimate it as a mixture of multiple small distributions.
- **Procedure:** Learning starts by normal scenarios and from a simple situation, when the agent moves straight.
- **Using the discriminator scores** as a measure to detect new situations, and train new models incrementally.

- The **discriminator scores** correspond to the error/innovations with respect to the other models that already learned.

Training output

- a) The reference GANs: detects straight movements, fails on curves
- b) Detected new situation: training the next level of GANs.

Online testing

Test scenario is an abnormal situation (presence of a pedestrian), where it never observed by the autonomous agent before.

Abnormality visualization

a) moving straight with normal situation
b) curving with normal situation
c) first observation of the pedestrian
d) starting to perform the avoiding action
e) the avoiding action

Results analysis

- Abnormality heatmap shows the possible abnormal areas

References