Navigation by reinforced learning

Introduction

In the Industry 4.0 the need for automation increases tremendously and thus the demand for robots with high navigation abilities in complex three-dimensional surroundings grows vastly. Especially deep learning allows an efficient approach to meet this demand. Further, it allows a generalization of their areas of application and changes in their surroundings can be taken into account with minimal effort.

According to Savinov *et al*.[1], there are three main approaches for navigation by deep learning . The purely reactive one as described by Dosovitskiy & Koltun [2], the employment of a navigation-specific memory structure based on a metric map by Gupta *et al.* and the unstructured general-purpose memory approach like LSTM, described by Mirowski *et al.* [3].   
Studies with animals (Gillner & Mallot, Foo *et al.*)[4, 5] showed that they do not rely on metric maps. Instead, they use landmark navigation “the abilitiy to orient with respect to a known object” or non-metric route-based navigation “involves remembering specific sequences of positions”. Relying on these studies, Savinov *et al.*[1] propose a semi-parametric topological memory (SPTM) approach. This is a deep learning architecture encouraged by the landmark-based navigation of animals.

They were able to improve their success rate “in goal-directed navigation across test environments” compared to the best-performing baseline by a factor of three.

This work is expected to build on Savinov *et al.* [1]‘s work. Our team evaluates further RL baselines using Tensorforce, which follow the same protocol as the one evaluated by Savinov *et al.*[1]. This allows to put their work on an even more solid foundation than hitherto.

The used methods and training procedure can be found in section 2. The corresponding results of the testing phase can be found in section 3.

References

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