End-to-end Active Object Tracking via Reinforcement Learning

Submitted by NEELU VERMA(MP19AI002)

Contribution of the article: This paper proposed an active object tracking approach for vision problem with the aims to localize an object in continuous video frames.it is an active tracking tracker and this tracker is trained in an end-to-end fashion via RL(reinforcement learning). Authors trained an active tracker combined a ConvNet followed by an LSTM unit,which input raw video frames and outputs camera movement actions .They also customized rewarding function and a technique of environment augmentation that are used in the training stage based on the A3C algorithm.They used VizDoom environment for their experimental results to verify effectiveness of the proposed tracker.

Theoretical novalities: As we know that this novel approach is related to object tracking and RL so they claims that this approach is novel beacuse conventional solutions uses object tracking and camera control in separate components thats why these existing methods are difficult to tune.This novel proposal is completely different from traditional ones as it tackles object tracking and camera control in an end-to-end manner.In their experiments, they proposed a tracking approach that also outperforms a few representative traditional passive trackers.these are equipped with a hand-tuned camera-control module. Although experimental results of this approach is advanced. As far as we know, there has not yet been any attempt to deal with active tracking in an end to-end way so this approach is novel. In this work, they proved it .They present that those traditional passive tracking algorithms are not indispensable in active tracking. Alternatively, a direct end-to-end solution can be indeed effective.

Implementing process:
In this work, for tracking they used ViZDoom(is a deep RL research platform based on a classical 3D First-Person-Shooting video game called Doom) for both training and testing. ViZDoom provides friendly APIs for deep RL research. For training of traker, they proposed a state-of-the-art reinforcement learning algorithm,A3C Algorithm and for the robust and effective training, they have proposed a data augmentation technique and a customized rewarding function.it is composition of a ConvNet followed by an LSTM unit.It consist two convolution layers with ReLU in the ConvNet.
For generalization to be good they propose a simple and very effective environment augmentation technique for training.The experiments are performed in four parts. In the first part they test the active tracker in a testing environment. The second part is about the experiments in more challenging testing environments. In third part comparison with a set of traditional trackers is conducted. Finally, they conduct analysis of what the tracker has learned with a salience visualization technique.
They employed two metrics for the experiments named as Accumulated Reward (AR) value and Episode Length (EL) value of each episode are calculated for quantitative evaluation. In the implementation they use Adam optimizer with network parameter are set to initial value for ex. learning rate, regularization, reward discount factor to 0.0001, 0.01, 0.99 resp.