Recurrent Neural Networks for object detection

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***Abstract*—ToDo**

***Index Terms*—TBD.**

I. Introduction

A. *Image and Video Object Detection in general*

- Image object detection history.
  - Bayesian methods before deep learning
  - ImageNet challenge and VID [15]
  - Deep Learning and AlexNet [16]
- Single stage and 2-stage image object detectors.
  - A two-stage pipeline firstly generates region proposals, which are then classified and refined. [17]
  - A single-stage method is often more efficient but less accurate. Directly regress on bounding boxes and classes. [18], [19]
- Why is video object detection harder?
  - Large size
  - Motion blur
  - Quality of the dataset
  - Partial occlusion
  - Unconventional Poses

B. *Recurrent Neural Networks in general*

ToDo

II. Feature-based Video Object Detection

A. *Definition*

ToDo

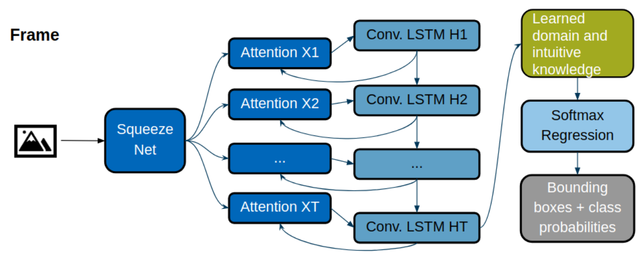
B. *Recurrent Multi-fram Single Shot Detector for Video Object Detection*

ToDo

C. *Mobile Video Object Detection with Temporally Aware Feature Maps*

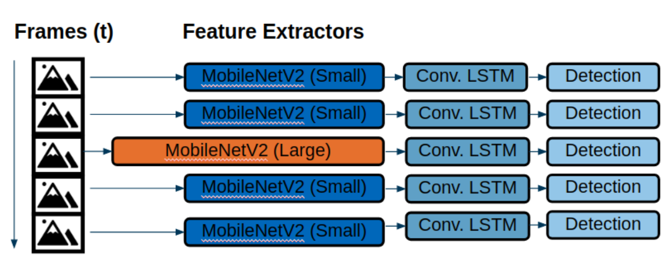
ToDo

D. *Feature Selective Small Object Detection via Knowledge-based recurrent attentive neural networks*



- Compute feature maps using a modified SqueezeNet architecture.
- Propagate the features through a Recurrent Attentive Neural Network, comprised of:
  - Attention Mechanism to detect key areas within the feature maps.
  - Convolutional LSTM for temporal feature propagation.
- Reverse gaussian feature maps are combined with the maps obtained from Conv. LSTM.
  - These feature maps are based on learnable mean and covariance terms.
  - This prior knowledge is derived from the assumption that traffic signs are always located at the bias of the center.

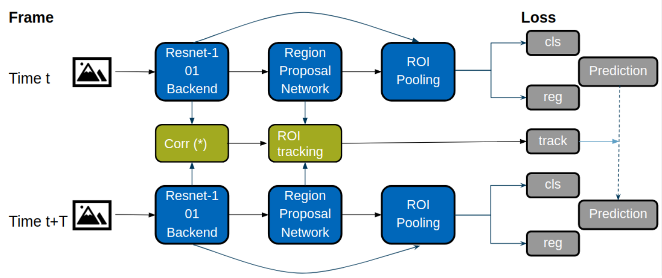
E. *Looking fast and slow: memory-guided mobile video object detection*



- Run multiple feature extractors sequentially or concurrently to obtain feature maps.
  - The idea is to use small and large feature extractors to optimize performance.
- Aggregate and refine these feature maps using convolutional LSTM based memory network.

- To improve speed of LSTM network, add skip connections and LSTM state groups.
- Apply SSD-style detection on refined features to obtain classification and bounding boxes.
- Use a reinforcement learning based policy for selection of which feature extractor to run.
- Large and small frame extractors can run in parallel using asynchronous mode.

F. Detect to Track and track to detect



- Compute Convolutional feature maps using a Resnet-101 architecture.
- Use a RPN (region proposal network) to find candidate regions in the frame.
- ROI Pooling layer, to classify boxes and refine their coordinates (regression).
- Find correlation features between two frames' feature maps and do ROI tracking.
- Due to memory constraints, use tracklets, which are class-based optimal paths in video.

III. Box-Level-based Video Object Detection

A. Definition

ToDo

B. Object Detection from Video Tubelets with Convolutional Neural Networks

ToDo

C. Optimizing Video Object Detection via Scale-Time Lattice

ToDo

D. Context Matters: Refining Object Detection in Video with Recurrent Neural Networks

ToDo

E. Spatially Supervised Recurrent Convolutional Neural Networks for Visual Object Tracking

ToDo

IV. Flow-based Object Detection

A. Definition

Todo

B. Deep Feature Flow for Video Recognition

Todo

V. Comparison of different approaches

A. General

ToDo

B. Conclusion Perfomance

Todo

C. Conclusion Prediction Quality

Todo

VI. Outro

A. Conclusion

Todo

B. Further work

Todo

Acknowledgment

Todo

References

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