Selective Feature Learning with Filtering Out Noisy Objects in Background Images

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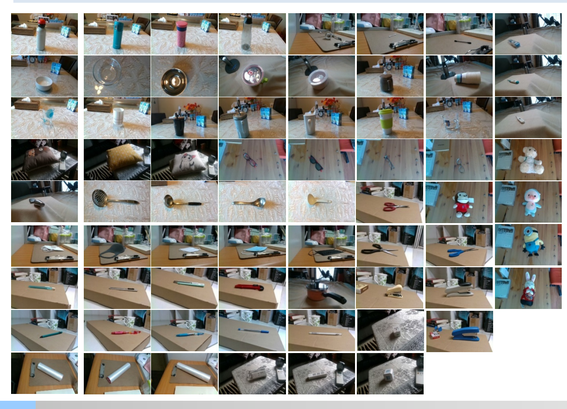
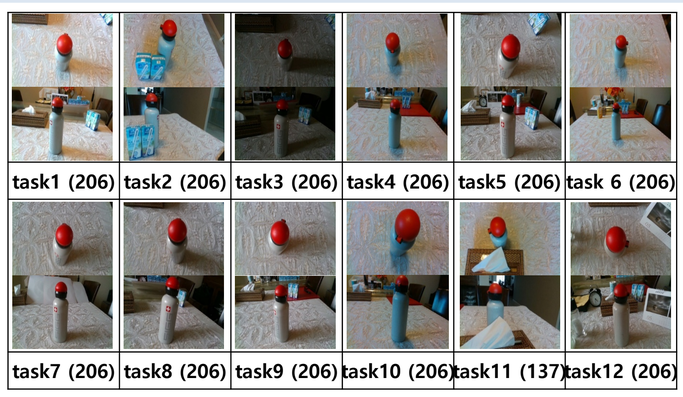
Introduction

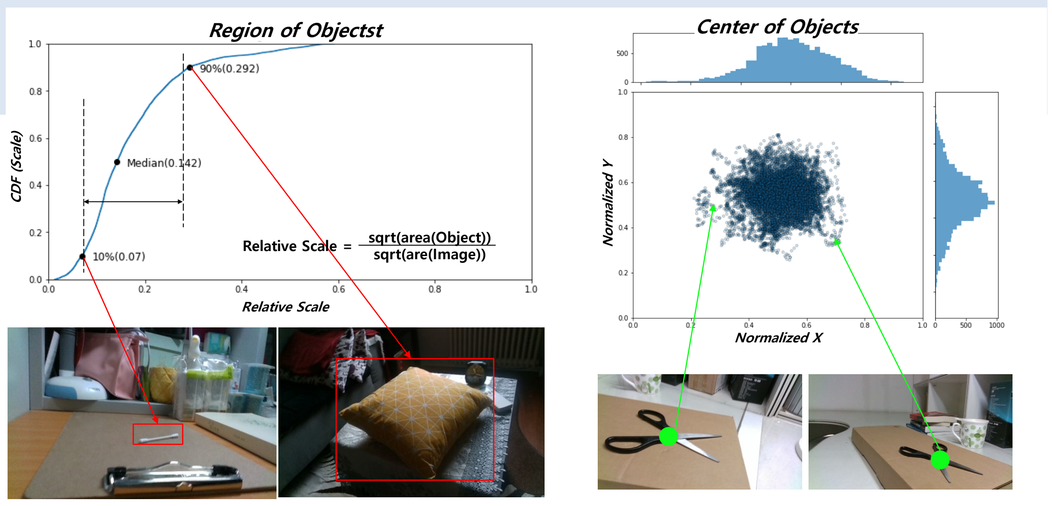
- **Lifelong Robot Vision – Lifelong Object Recognition**
- Human could recognize some objects through pre-built large datasets before and continuous learning in the current environment. But machines are hard to recognize objects in a strange environment and conditions. Therefore machine should update their model weight without distortion of previous model to trained data. In this competition, we propose a selective feature learning method to eliminate irrelevant objects in target images.

Dataset Analysis

- The provided data set of each task were taken in different environment conditions (illumination, Occlusion, Pixel, Clutter)
- Each 69 objects had different sizes and backgrounds. Therefore, reducing the size and background effects should be designed.
- The data sets were analyzed in two ways for design of software architecture
- Region of Objects (relative scale) :
  - Median relative size = 0.142
  - Relative size difference: 4.14 = object@90% / object@10%
- Position of Objects (relative scale) :
  - 0.2< center of object < 0.8

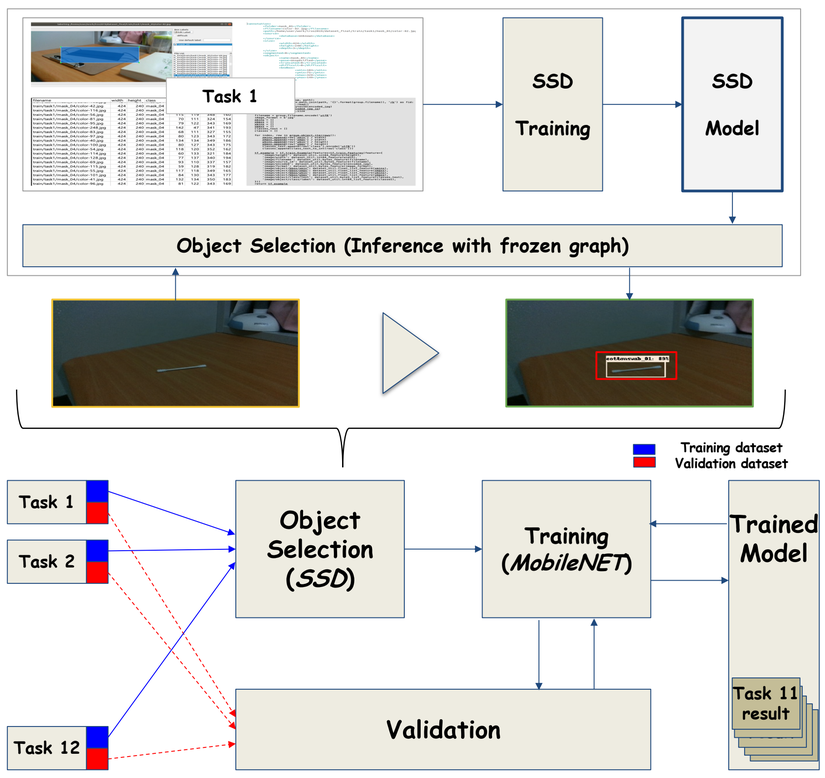






Software Design

- Propose a selective feature learning method by eliminating irrelevant features in training dataset.
- Selective learning procedure:
  1) Extracting target objects from training dataset by an object detection algorithm
  2) Feeding the refined dataset into a deep neural network to predict labels.
- Object detection algorithm : ***SSD*** (Single Shot Multibox Detection) for convenience of flexible feature network design
  - *SSD* model with human-annotated dataset in task1
  - Converted the *SSD* model to a frozen graph to infer object location
- Classification network : traditional ***MobileNet***
  - The refined dataset were fed into the network



Future works

- Lifelong learning of object selection inference graph
  - Update inference technique to each task learning
- Lifelong learning of Feature extraction network
  - Update create and connection neurons under deformation and restoration of the object
- Object selection Deep Learning Neural Network Integration

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