**Contributions**

We provide a fast and accurate Hierarchical Image Segmentation algorithm that results in State-of-the-Art boundaries, regions, and object proposals. The core components are:

1. A Base-CNN that predicts multi-scale contours in a single pass.
2. Orientation-specialized sub-CNNs that regress the contour orientations in the same forward pass with the Base-CNN.
3. Fast algorithm that combines multi-scale contours into Ultrametric Contour Maps (UCM). Based on sparse representations of the contours.

**Convolutional Oriented Boundaries (CDB) - General Pipeline**

**Base-CNN for contour detection**

1. **Input Image**
2. **Base-CNN**
   - **Fine detections**
   - **Coarse detections**
3. **Orientation of Contour Orientation**

**Speed-up Using Sparse Contour Representation - Timing**

- **Temporal Efficiency**
  - **Input Image**
  - **Base-CNN**
    - **Orientation of Contour Orientation**
      - **Final Output**

**State-of-the-Art Boundaries and Object Proposals**

**Boundaries and Regions: PASCAL Context**

**Object Proposals: PASCAL and MS-COCO comparison**

**Qualitative Results**

- **Segmentation and Boundary Detection**
  - **Image**
  - **Ground Truth**
  - **Hierarchical Segmentation**
  - **Object Proposals**

**Size of Segmentation Datasets**

- **Number of Train Images**
- **Number of Val Images**
- **Number of Test Images**

**Contact**

- [http://vision.ee.ethz.ch/~cvsegmentation](http://vision.ee.ethz.ch/~cvsegmentation)
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