Transitional Asymmetric Non-local Neural Network
For Real-World Dirt Road Segmentation
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Introduction
Understanding dirt roads in real-time by classifying pixel-level semantic classes is essential technique for autonomous driving.

Motivation
• Many approaches (See Fig 1.) have been proposed to reinforce instant context information by capturing long-range dependencies by skip connections in CNNs.
• Recent studies have proposed non-local attention modules as a bottleneck between stages to enlarge receptive-field size of previous convolutional operations.

Contributions
• We present TAN-Net that incorporates ANBs in transitional manner on SOTA semantic segmentation model (HarDNet) and TAN-Net outperforms previous SOTA model.
• We examined applicability of the semantic segmentations method on dirt road dataset. Our dataset consists of 3k images collected from eight different locations of unpaved roads.
• Our ablation studies show that applying attention modules in transitional manner improve accuracies and our adopted ANB is effective than others.

Methodology

Problem
Understand dirt roads in real-time by classifying pixel-level semantic classes is essential technique for autonomous driving.

Asymmetric Nonlocal Block (ANB)*
ANB efficiently reduce the computational cost of multiplications by pyramid pooling of given two input.

Comparisons with SOTA Real-Time SemSeg Models

Study Results

HarDNet (SOTA, blue) vs TAN-Net(Ours, red)

Qualitative Results

TAN-Net contains four ANBs into the all transitional connections to enhance pixel-level global context understanding.

Ablation Studies

Even in the same parameter size and GFLOPs, transitional connections of ANB in TAN-Net are better than bottleneck connections.

Our re-designed ANB on TAN-Net achieves the best mIOU among attention modules. (blocks)