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Terrain Super-resolution through Aerial Imagery and Fully Convolutional Networks

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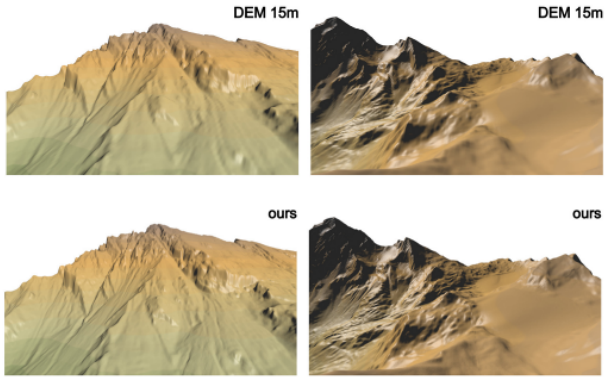

Despite recent advances in surveying techniques, publicly available Digital Elevation Models (DEMs) of terrains are lowresolution except for selected places on Earth. In this paper we present a new method to turn low-resolution DEMs into plausible and faithful high-resolution terrains. Unlike other approaches for terrain synthesis/amplification (fractal noise, hydraulic and thermal erosion, multi-resolution dictionaries), we benefit from high-resolution aerial images to produce highly-detailed DEMs mimicking the features of the real terrain. We explore different architectures for Fully Convolutional Neural Networks to learn upsampling patterns for DEMs from detailed training sets (high-resolution DEMs and orthophotos), yielding up to one order of magnitude more resolution. Our comparative results show that our method outperforms competing data amplification approaches in terms of elevation accuracy and terrain plausibility.

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