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Title : MSG-GAN: Multi-Scale Gradients for Generative Adversarial Networks.

MSG-GAN is a branch of a network architecture generated from ProGAN/GAN. The GAN is widely adopted for Image synthesis via generative modelling, but it suffers peculiarly from training instability. One of the known reasons for this instability is the passage of uninformative gradients from the Discriminator to the Generator due to learning imbalance between them during training. MSG-GAN successfully alleviates such drawbacks of GAN models.

The most evident difference between MSG GAN and ProGAN is that MSG is trained through making connections between intermediate layers of the singular generator and the discriminator, not through progressively growing layers.

The resulting stability is more rigorous : the resolution gradients of any level (lower -high) are all scaled synchronized to produce a set, sufficiently, high resolution images. Initially, only the lower resolution gradients are meaningful and thus start generating good images at those resolutions, but eventually, all the scales synchronize and start producing images. This results in a stabler training for the higher resolution.

There does exist an exchange between FID score (indication of the quality of images generated) and the stability compared to other systems such as StyleGAN. However, the score difference is not too significant, and the stability advantage given by MSG-GAN can be far more valuable. While not necessary for generating good results (very high resolution images), methods that present high stability can be advantageous in that it is easier to get a reasonable estimate for how the final result will look by visualizing snapshots during training, which can help when training jobs take on the order of days to weeks.