

PERSPECTIVE CONTROL in architectural photography

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PROBLEM

Distortion happens when the camera is at an angle to the structure, **augmenting the vertical/horizontal perspective** from reality.

It is problematic in architectural photography as it is **impractical to capture large structures at a square angle**.

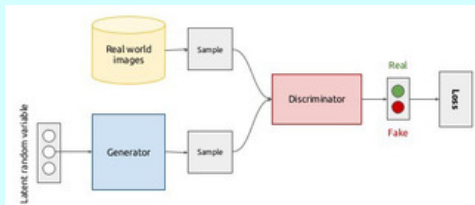
Perspective control corrects distortion, via costly lenses or editing software.

A few photo editing apps have perspective control, but **users have to manually gauge the degree of correction**.

Can we do perspective control with AI?

METHOD

- **pix2pix**
Conditional GAN
observed image x ,
random noise z
 $D(x, G(x, z))$



- **Loss functions:**
Generator loss, Discriminator loss, L1 loss (pixel-wise absolute value loss)

$$G^* = \arg \min_G \max_D \mathcal{L}_{cGAN}(G, D) + \lambda \mathcal{L}_{L1}(G).$$

- **200 epochs**, Loss per epoch (step) graph:



CREATED DATASET

-> **36 images** with perspective control (stock images)

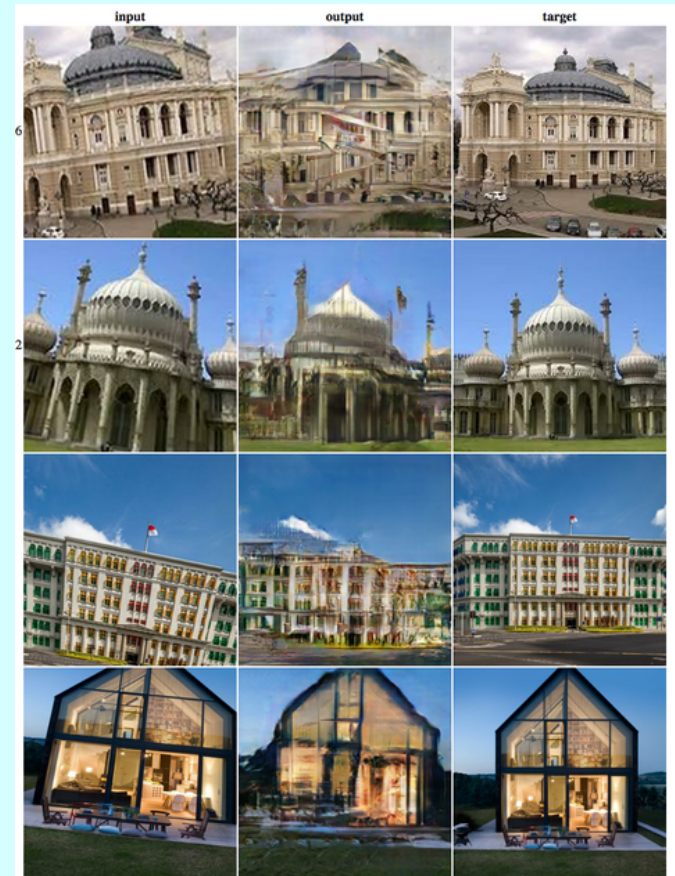
-> **Randomly augmented 10 times:**

- vertical/horizontal skew (0 to 0.2)
- rotation (-10° to 10°)

-> **360 image pairs** (input-output):

- 270 train (66%), 90 val (33%)

RESULTS



CONCLUSION / FUTURE

The model produces a **decent augmentation simulating perspective control** but **inaccurately transfer pixels**, resulting in blurred images. Perhaps the model 'imagines' the pixel due to our L1 loss when instead it needs to shift pixels around.

Future improvements:

1. More realistic augmentations (less rotation).
2. Highlight building edges for the model to attend to.
3. Train for more epochs.

REFERENCES

- [1] pix2pix-tensorflow, <https://github.com/affinelayer/pix2pix-tensorflow>
- [2] Isola, Phillip & Zhu, Jun-Yan & Zhou, Tinghui & Efros, Alexei. (2016). Image-to-Image Translation with Conditional Adversarial Networks. arXiv:1611.07004 [cs.CV]
- [3] Header photo: https://en.wikipedia.org/wiki/Perspective_control