ARShadowGAN: Shadow Generative Adversarial Network for Augmented Reality in Single Light Scenes

Daquan Liu¹, Chengjiang Long²*, Hongpan Zhang¹, Hanning Yu¹, Xinzhi Dong¹, Chunxia Xiao¹,³,⁴*

¹School of Computer Science, Wuhan University
²Kitware Inc., Clifton Park, NY, USA
³National Engineering Research Center For Multimedia Software, Wuhan University
⁴Institute of Artificial Intelligence, Wuhan University

cjfykx@gmail.com, {daquanliu,zhanghp,fishaning,dongxz97,cxxiao}@whu.edu.cn

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How to Automatically Generate Virtual Shadows for AR?

With the physically based rendering theory:

- It requires an inverse rendering process which is very expensive and challenging in practice.
- What’s worse, any inaccurate estimation may result in unreasonable virtual shadows.

We propose a data-driven based ARShadowGAN to directly generate virtual shadows without inverse rendering. With the powerful generation ability of GAN, it is much more efficient and easier to use.
Shadow-AR Dataset

- Shadow-AR dataset contains total 3,000 image quintuples
ARShadowGAN

- Image Encoder
- ResNet block
- Pooling
- 32x32x512

- Shadow Decoder
- Occluder Decoder
- 16x16x512

- Refinement

- Discriminator
- Real
- Fake

- Attention Encoder

- Concatenation
- Addition
Attention Visualization

Input Image  Input Mask  Attn-Real Shadow  Attn-Real Object

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# Experimental Results

<table>
<thead>
<tr>
<th>Models</th>
<th>RMSE</th>
<th>SSIM</th>
<th>S (%)</th>
<th>A (%)</th>
<th>ACC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pix2Pix</td>
<td>9.514</td>
<td>0.938</td>
<td>41.468</td>
<td>27.358</td>
<td>90.631</td>
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<tr>
<td>Pix2Pix-Res</td>
<td>8.043</td>
<td>0.959</td>
<td>29.597</td>
<td>26.476</td>
<td>96.689</td>
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<td>ShadowGAN</td>
<td>8.041</td>
<td>0.961</td>
<td>28.347</td>
<td>24.547</td>
<td>97.122</td>
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<tr>
<td>Mask-ShadowGAN</td>
<td>7.493</td>
<td>0.959</td>
<td>23.261</td>
<td>21.131</td>
<td>98.443</td>
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<tr>
<td>ARShadowGAN</td>
<td>6.520</td>
<td>0.965</td>
<td>22.278</td>
<td>19.267</td>
<td>98.453</td>
</tr>
</tbody>
</table>

Input Image | Pix2Pix | Pix2Pix-Res | ShadowGAN | Mask-ShadowGAN | ARShadowGAN | GT
Shadow Generation

Input Image  Input Mask  Attn-Real Shadow  Attn-Real Object  Output Image
Thank you!

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