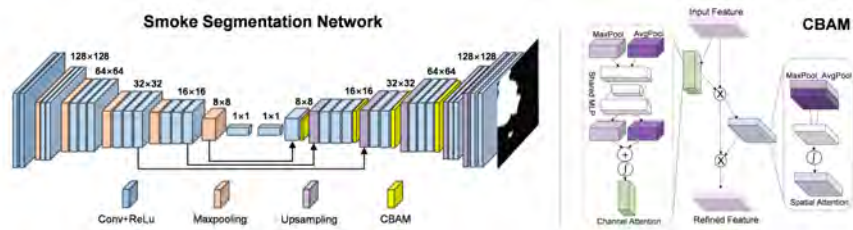
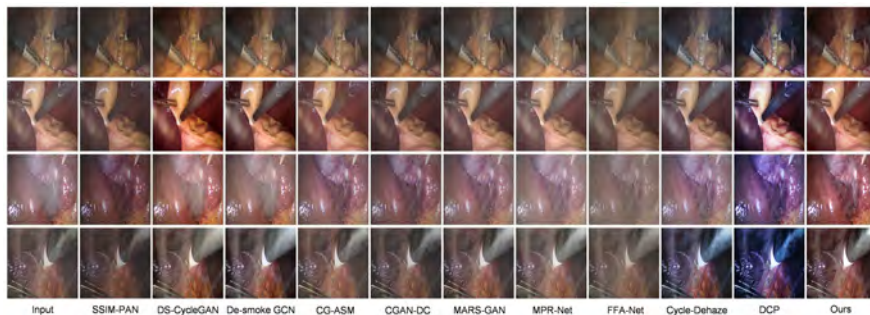


Appendix 1: The structure of the generative model.



Appendix 2: The architecture of the smoke segmentation network and the CBAM module.



Appendix 3: The comparison of the proposed model with the comparative models originally used for de-smoking and de-hazing on the Cholec80 dataset, and some randomly selected subjects are shown.

Appendix 4: PSNR/SSIM of the synthesized smoke-less images to the parameters $\lambda_1, \lambda_2, \lambda_3$. The bold denotes best results.

| λ_1 | PSNR/SSIM | λ_2 | PSNR/SSIM | λ_3 | PSNR/SSIM |
|-------------|---------------------|-------------|---------------------|-------------|---------------------|
| 0.01 | 26.537/0.809 | 0.01 | 26.781/0.839 | 0.01 | 26.702/0.846 |
| 0.02 | 26.624/0.816 | 0.02 | 26.876/0.846 | 0.02 | 26.936/0.852 |
| 0.1 | 26.762/0.842 | 0.1 | 27.338/0.878 | 0.1 | 27.561/0.887 |
| 0.2 | 27.018/0.856 | 0.2 | 27.521/0.899 | 0.2 | 27.963/0.908 |
| 0.4 | 27.569/0.862 | 0.4 | 27.726/0.902 | 0.4 | 27.548/0.893 |
| 0.6 | 27.912/0.887 | 0.6 | 27.231/0.865 | 0.6 | 27.182/0.882 |
| 0.8 | 28.004/0.915 | 0.8 | 27.003/0.853 | 0.8 | 26.956/0.852 |
| 1.0 | 27.823/0.854 | 1.0 | 26.987/0.822 | 1.0 | 26.894/0.836 |

Appendix 5: Comparison of our proposed method with 10 methods with the real surgical dataset.

| Method | BRISQUE | FADE | CEIQ |
|--------------|---------------------|--------------------|--------------------|
| SSIM-PAN | 19.324±2.245 | 0.544±0.259 | 2.843±0.095 |
| DS-CycleGAN | 17.459±2.153 | 0.577±0.275 | 2.961±0.208 |
| De-smoke GCN | 16.434±1.781 | 0.420±0.209 | 3.244±0.143 |
| CG-ASM | 17.945±1.762 | 0.495±0.267 | 3.035±0.185 |
| CGAN-DC | 17.323±1.255 | 0.501±0.242 | 2.967±0.178 |
| MARS-GAN | 15.209±2.552 | 0.353±0.180 | 3.467±0.105 |
| MPR-Net | 16.642±1.384 | 0.431±0.247 | 3.164±0.121 |
| FFA-Net | 18.324±1.849 | 0.641±0.162 | 2.788±0.239 |
| Cycle-Dehaze | 17.785±2.371 | 0.559±0.173 | 3.108±0.124 |
| DCP | 21.954±2.641 | 0.694±0.244 | 2.542±0.128 |
| Ours | 13.768±1.725 | 0.351±0.182 | 3.482±0.113 |