

# SUPPLEMENTARY MATERIALS: A COLOR PRESERVING TONE MAPPING FRAMEWORK IN THE INTRINSIC DOMAIN

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## 1. GLOBAL TMOS PARAMETERS CHOICE

In this section, we present the parameters used for the three global tone-mapping operators (TMOs) tested in our study. For Reinhard et al.'s [1] TMO parameters,  $\alpha$  and  $L_{\text{white}}$  were estimated using Reinhard's estimation [2]. Regarding Reinhard and Devlin's TMO [3], we employed the default parameters suggested in the paper [3]:  $m = 0.3 + 0.7k^{1.4}$  (where  $k$  is the key of the image),  $f' = 0$ ,  $c = 0$ , and  $a = 1$ . Finally, for Drago et al.'s TMO [4], we employed the default parameters values as in the paper [4]:  $L_{\text{dmax}} = 100 \text{ cd/m}^2$  and  $b = 0.85$ .

## 2. HUE DISTANCE MAPS

In this section, we extend the hue distance discussion and provide visual comparisons in terms of *hue maps*, instead of an overall quality score. Figure 1 shows two examples of hue differences calculated between the HDR image and the distorted versions for each of the methods under analysis. While sometimes the differences in  $\Delta h$  scores between methods—particularly between **Artusi** and **Ours**—may appear small, perceptual differences remain. In general, our approach effectively minimizes distortions in the small portions of the images with high-saturation or high-contrast (*e.g.*, foliage and sky reflections), ensuring more natural color appearances.

## 3. EXPERIMENTAL PROCEDURE

In Figure 2 we summarize the experimental setup. In an environment deliberately darkened to minimize all light sources, participants first viewed the HDR image, which was displayed alone in full-screen mode. When the participant pressed a key, a grayscale image was projected to allow for eye adaptation. After this adaptation period, participants were asked to express their preference between two SDR images shown side by side. Since there were 4 methods to compare in total, each HDR image required 6 pairwise comparisons of tone-mapped SDR images. Participants were allowed to view the HDR image for as long as they wanted before proceeding to compare the SDR image pairs. Additionally, participants

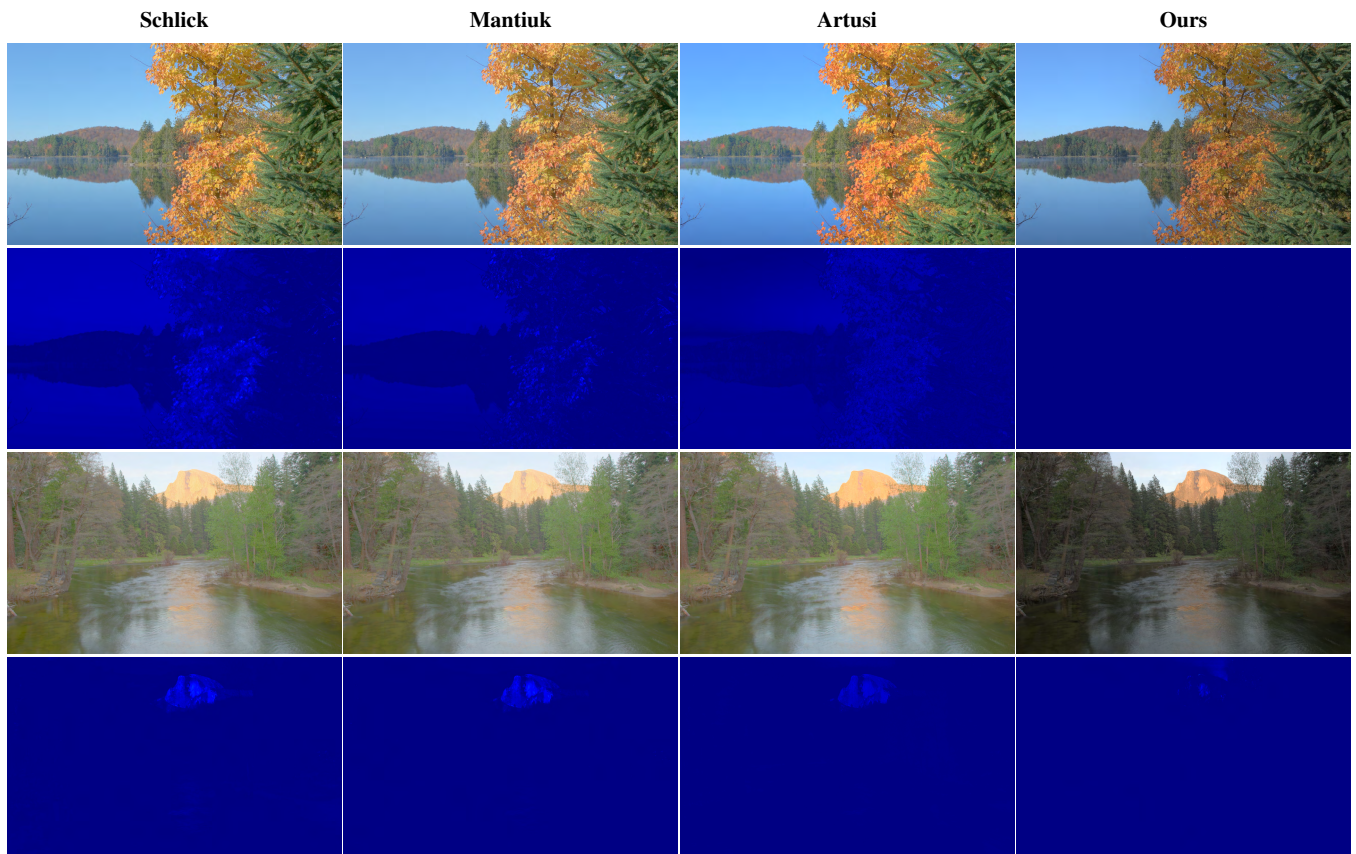
could bring up the HDR image again at any time before making their final choice. The frequent switching between HDR and SDR modes was facilitated using custom software. Participants viewed the images at a fixed distance of 80 cm from the monitor, with all images displayed in full-HD resolution. Figure 3 shows the 25 "baseline" images selected from the *HDR Photographic Survey* [5], which were used to generate all the variations for the 4 methods analyzed in this study. This resulted in a total of 100 ( $25 \times 4$ ) test images as experimental stimuli. However, due to space constraints, only the 25 baseline images are shown.

## 4. ADDITIONAL RESULTS

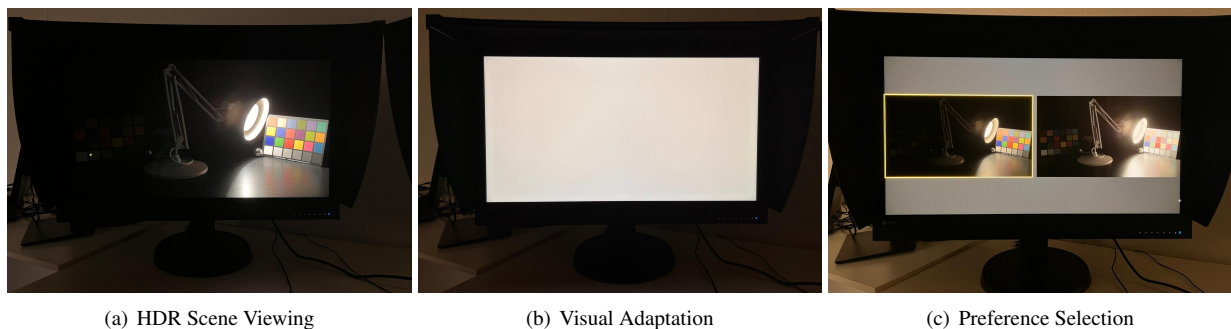
In Figures 4, 5 and 6, we provide more visual comparisons between the proposed method and the others, showing the results for all tested TMOs. Note that these images represent additional examples of visual comparison from the 106 tested images of the *HDR Photographic Survey* [5] but not all of them were randomly selected for the experiment, except for *LabBooth*, *WaffleHouse* and *Zentrum*, which also appeared in the experiment.

## 5. REFERENCES

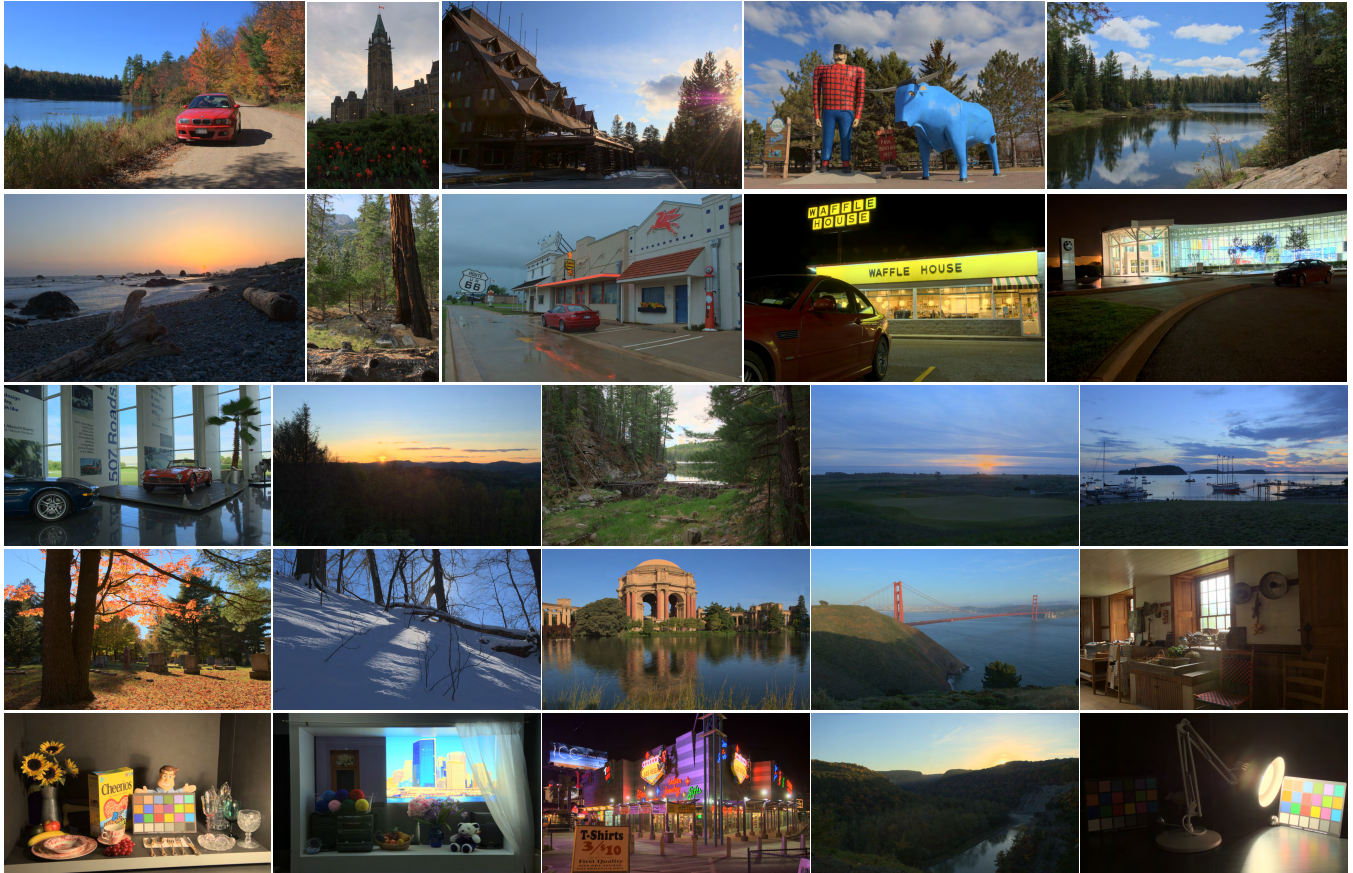
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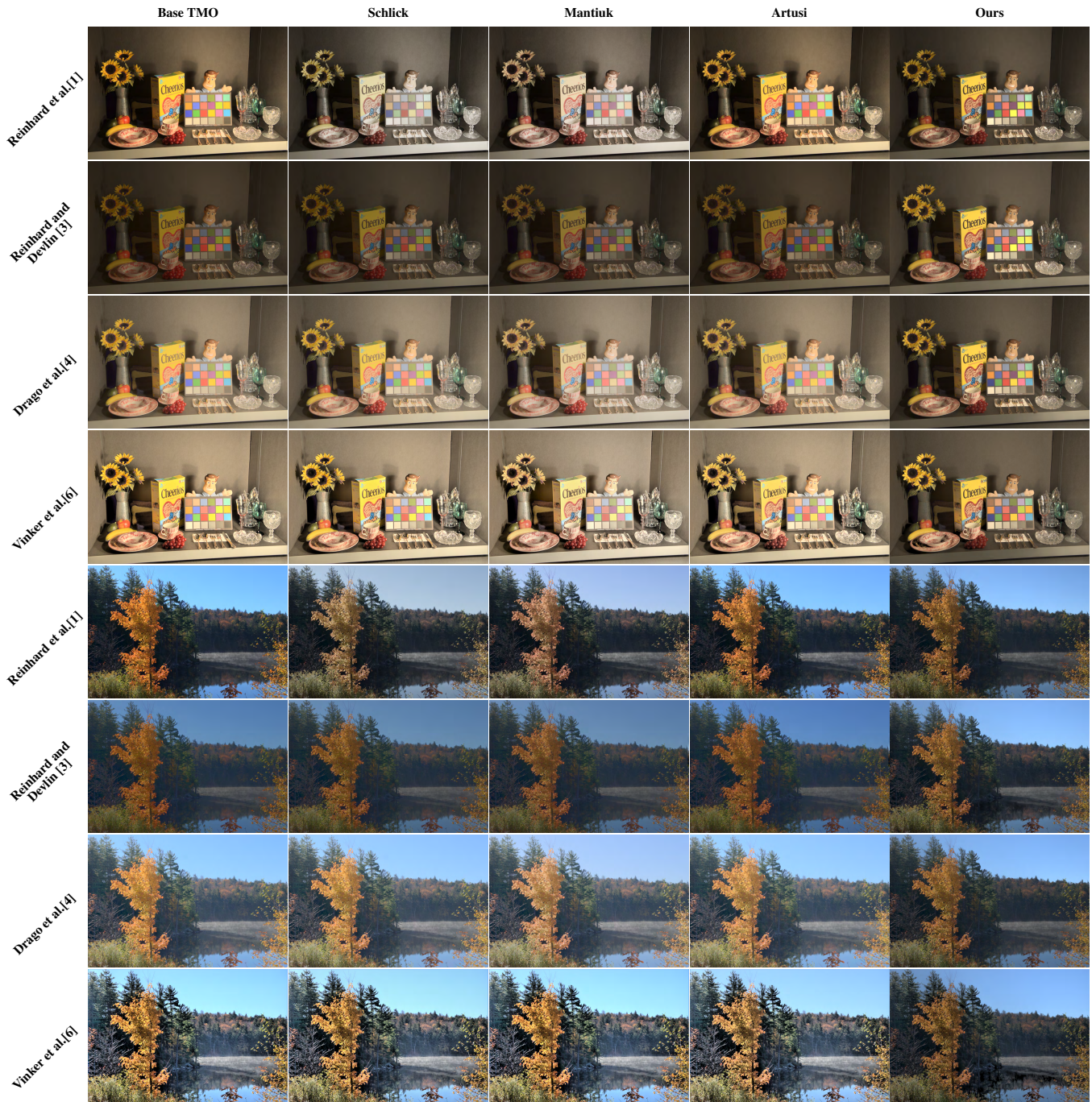
**Fig. 1:** An example of hue distance maps comparison of our method against the state-of-the-art. Images are tone mapped with Reinhard and Devlin [3] TMO. In this figure, *MasonLake(1)* and *HalfDomeSunset* images from the *HDR Photographic Survey* [5] have been used from top to bottom respectively.



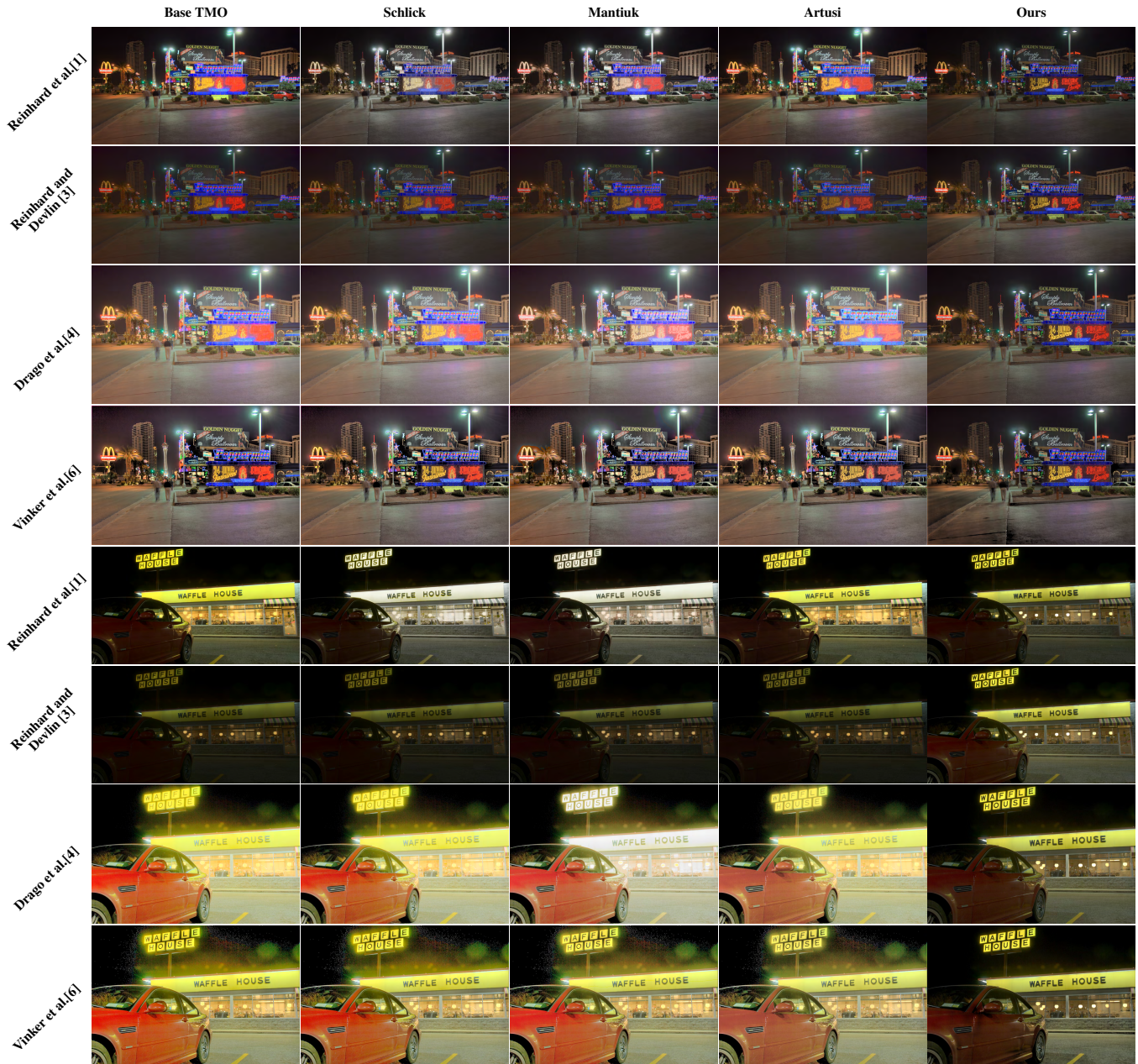
**Fig. 2:** Experimental setup. The subject looks at the HDR image first. Then a gray scale image is projected for an adaptation time for the eyes. Finally, the subject is asked to express a preference between 2 options and for 6 times for each test image.



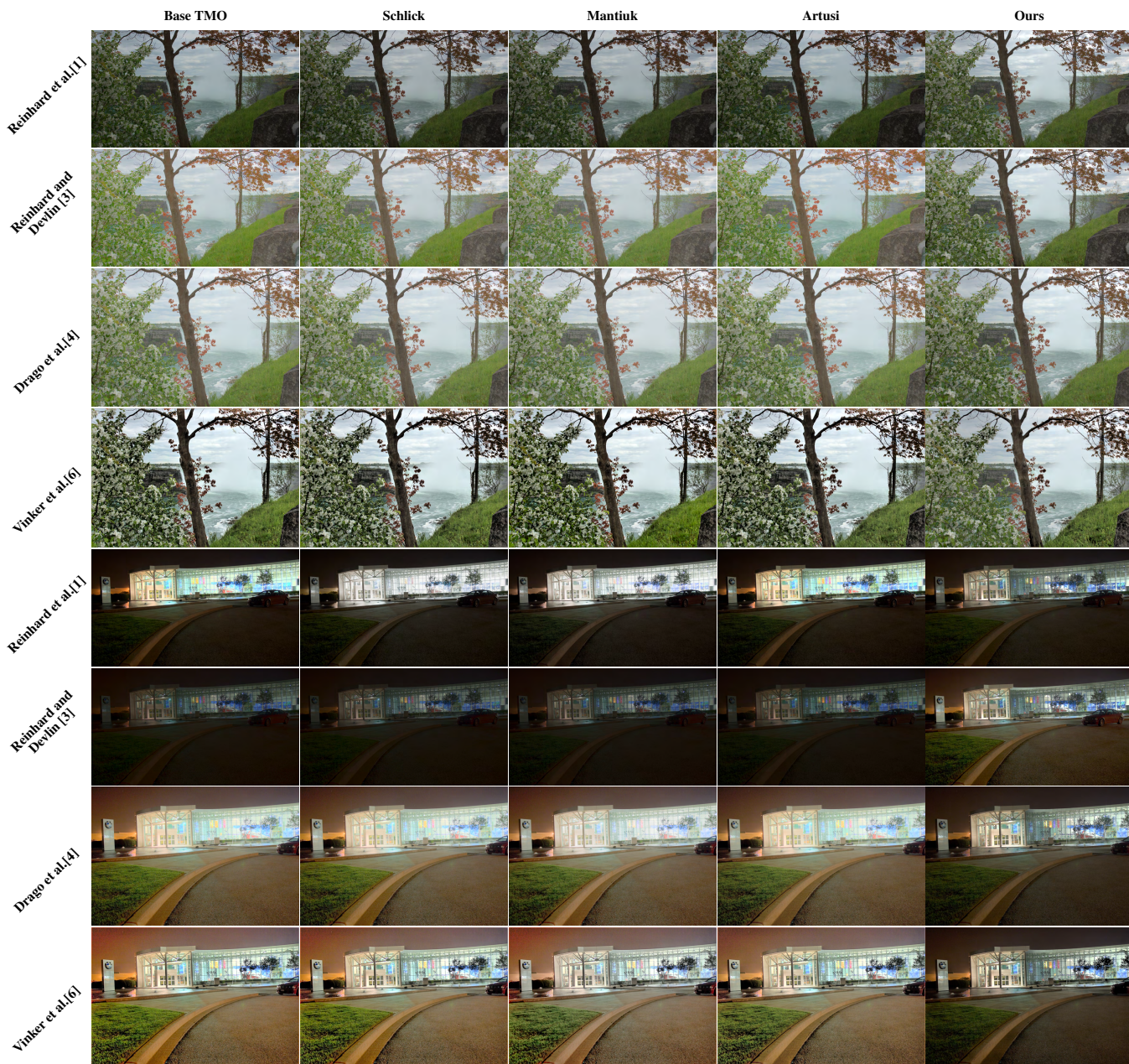
**Fig. 3:** The 25 randomly selected images from the *HDR Photographic Survey* [5] for the experiment. Note that we show the "baseline" images tone mapped for visualization purpose using Reinhard et al.'s TMO [1], and not the versions obtained following each of the tested methods.



**Fig. 4:** An example of visual comparison of our method against the state-of-the-art. The first column represents an HDR image respectively tone mapped using all the tested TMOs. Remaining columns represent the result obtained when each specific method is employed. In this figure, *LabBooth* and *MasonLake(2)* images from the *HDR Photographic Survey* [5] have been used from top to bottom respectively.



**Fig. 5:** An example of visual comparison of our method against the state-of-the-art. The first column represents an HDR image respectively tone mapped using all the tested TMOs. Remaining columns represent the result obtained when each specific method is employed. In this figure, *Peppermill* and *Waffle House* images from the *HDR Photographic Survey* [5] have been used from top to bottom respectively.



**Fig. 6:** An example of visual comparison of our method against the state-of-the-art. The first column represents an HDR image respectively tone mapped using all the tested TMOs. Remaining columns represent the results obtained when each specific method is employed. In this figure, *Canadian Falls* and *Zentrum* images from the *HDR Photographic Survey* [5] have been used from top to bottom respectively.