

CosmicAI: Generating Sky Backgrounds Through Content-Based Search and Flexible Composition

Takanobu MITANI and Issei FUJISHIRO
Keio University[†]

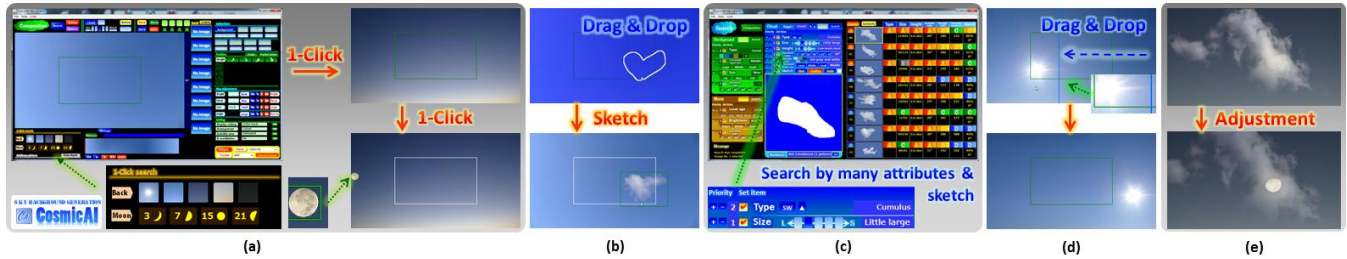


Figure 1. (a) 1-Click search (with 1 attribute). (b) Active composition (sketch-based search and automatic arrangement). (c) Attribute- and sketch-based search. (d) Background generation from panorama pictures. (e) Adjustment of size, brightness, and thickness.

1 Introduction

In film and game production, sky images are frequently changed to fit a given situation. *SkyFinder* [Tao et al. 2009] and *A System for Editing Sky Images Using an Image Database* (Ono2011 for short hereafter) [Ono et al. 2011] allow the users to generate sky images efficiently without three dimensional computer graphics software such as *Vue* and *Terragen*. *SkyFinder* users specify related attributes (category, layout, horizon height, sun position, and richness) so as to easily search sky images downloaded from Flickr.com. *Ono2011* lets the users to take two steps. The first step is to generate a background with atmospherically-distributed sky color through an intuitive user interface. The second step is to compose clouds using a collection of real photographs downloaded from Flickr.com. The detailed user actions are to specify related features (sky color, cloud shape, amount of edges, and sun position); to select clouds in the search results by a paint-like operation; and to compose them into the original background. It looks like the quality of sky images generated by these two systems becomes unstable, because many public photographs are unsuitable for composition (See Fig. 2(a)).

In this study, we have developed a system called *CosmicAI* (Content-based Search and Myriad Image Composition with Acquired Information for sky background generation) (The official web site address: <http://cosmicai.com/>), which utilizes a collection of proprietary sky part images including backgrounds, clouds and the moon, with the following six advantages in comparison with the use of public image collections:

- Ad1. Fine-grained image parts purely related to sky can be treated.
- Ad2. Prior part photographing can be optimized.
- Ad3. Image resolution can be highly and steadily maintained.
- Ad4. The elevation angle of each image's center is known.
- Ad5. The focal length can be confined.
- Ad6. The developer holds copyright of all pictures.

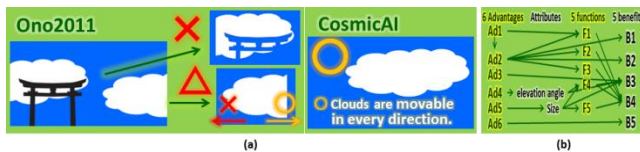


Figure 2. (a) *Ono2011* v.s. *CosmicAI*: The difference in usage of photographs. (b) The summary of relationships among advantages, functions, and benefits to use *CosmicAI*.

[†] e-mail: {mitani@fj., fuji@}ics.keio.ac.jp

2 Our Approach

CosmicAI allows the users to replace sky background images efficiently through searching for sky parts by combining the following attributes. Note that the priority of them can be adjusted.

- Backgrounds: Type, chromatic dispersion, location of the sun, and elevation angle.
- Clouds: Type, size, height, elevation angle, average color, and chromatic dispersion.
- The moon: Lunar age, brightness, and elevation angle.

The users are allowed to control the trade-off between work speed and detailed setups (See Fig. 1(a), (b), (c)).

CosmicAI provides the users with various functions:

- F1. To acquire backgrounds with various configurations through the use of panoramas (See Fig. 1(d));
- F2. To use arbitrary pictures which the users own as a background and to arrange clouds in the picture;
- F3. To generate a long sequence of time-varying images to export to other available animation generators;
- F4. To select cutout or depth-aware arrangement which transforms clouds in an optically-correct manner; and
- F5. To adjust the size, brightness, and thickness of clouds and the moon (See Fig. 1(e)).

We can find five benefits to use *CosmicAI*, which are not seen when using *Ono2011* (See Fig. 2(b)):

- B1. There is no need to specify the domain of clouds.
- B2. The users can freely move clouds and the moon.
- B3. They can generate sky images with a sense of reality including clouds whose size and elevation angle are correct.
- B4. They can generate desirable sky images.
- B5. They can use the system without regard for copyright.

References

- ONO, A., DOBASHI, Y., AND YAMAMOTO, T. 2011. A System for Editing Sky Images Using an Image Database. In *Proceedings of SIGGRAPH Asia 2011 Sketches*, Article 38.
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