# Adaptive Appearance Manipulation for the Installation Art

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**Figure 1**: Installation art for the statue of Tennyo (Goddess of Sincerity) that was exhibited in Mitsukoshi department store in December 2016[1]. Not only huge (11meter height), the appearance of such a complex shaped and vivid colored woody sculpture has been manipulated by our projection technique.

## 1. Introduction

The optical feedback system that consists of a video projector and a camera enables appearance manipulation, which manipulates apparent color, and brightness, etc., with adaptive radiometric compensation and it affects our material perception. Its application field includes the visual inspection, assistance for visual impairment, optical illusion, and installation art.

In this talk, I will explain appearance manipulation technique using projector camera feedback. Then, I will talk about its various applications that include installation art such as a projection mapping of the statue of Tennyo (Goddess of Sincerity) shown in Figure 1.

## 2. Appearance Manipulation Technique

Figure 2 shows the appearance manipulation framework using a projector camera system that was proposed by Amano et al. [2].

The appearance manipulation technique consists of three main parts: a "controlled object," a "controller based on model predictive control," and a "reference generator". Each component can be described by transfer functions. Unlike to conventional radiometric compensation, our technique enables modification of objects' appearance by the reference image $R$ that is generated by applying user designed image processing algorithm to *Cest*.

## 3. Application to the Installation Art

When we apply proper feedback gain and image processing parameters (e.g. feasible color transform or gentle tone mapping) the system can be stable and it provides designed manipulation result. Otherwise, the system starts oscillation or saturation by excessive parameters. The excessive parameters are useless regarding stable system control. However, these control failure gives fascinating cyclic motion,

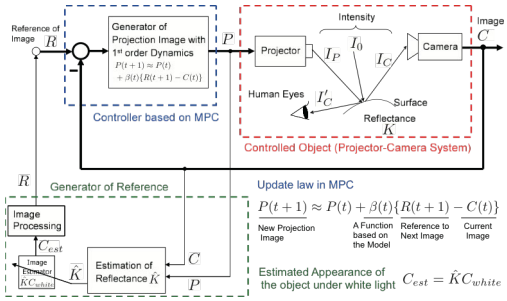


**Figure 2:** Appearance Manipulation Framework: The reference generator allows adaptive scene appearance manipulation.

or impressive blinking, and these behaviors can be used for interpretation.

For the installation art application as shown in Figure 1, we applied several types of image processing of color phase shift, saturation enhancement, edge enhancement, and other algorithms with proper or excessive parameter. Conformable parameter sets were selected along the playscript and these were sequentially switched in time to the music.

Our interpretation technique has following benefits unlike to conventional projection mapping: it does not require the shape models for the mapping; the alignment of the projected image is not required; it works in a bright room environment.

## Acknowledgements

This work was supported by JSPS KAKENHI Grant #17H01781 and MEXT KAKENHI Grant #16H01674D02.

## References

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[2] T. Amano, H. Kato, Appearance control using projection with model predictive control. In Proc. of ICPR (2010), IEEE Computer Society, pp. 2832–2835.

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