

# Development of a Method to Render Panoramic Images Even at Night Using the Function of Devices Equipped with CCTV Cameras (Research Period: 2014–2018)

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*Keywords: CCTV cameras, understand damages to infrastructure, image processing*

## 1. Introduction

Almost 20,000 closed circuit television (CCTV) cameras managed by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) are deployed on roads and rivers. When a natural disaster occurs, we utilize them to understand the damage to the infrastructures, such as bridges, pavements, slopes, and so on. To complete the checking of all images obtained by cameras in disaster areas, it takes time because each camera must be being panned individually. Especially, the larger the scale of the earthquake, the longer it takes to complete the checking of all images.

The National Institute for Land and Infrastructure Management (NILIM) has been studying an automatic system to select CCTV cameras in municipal areas where seismic intensity detected by the Japan Meteorological Agency (JMA) exceeds a preset level and to render panoramic images by stitching together camera images obtained during panning CCTV cameras.

In this paper, we report the outline of a method to render panoramic images even at night based on the study results up to the year 2015.

## 2. Outline of the method

In the earlier method, we extracted multiple still images from a movie taken by CCTV cameras that were automatically panned, while making approx. 30 percent of the overlapping ratio between adjacent images (Figure-1: upper row). Panoramic images are rendered based on invariant features between adjacent images. Extracting invariant features at night is difficult because bands of light (tails of residual image) are observed in images resulting from the electron multiplier tube to acquire light.

In our newly developed method, we extract still images while panning and stopping little by little. The bands of light in the images vanish when we stop panning CCTV cameras (Figure-1: lower row). This makes it easier to extract invariant features.

We conducted an experiment to validate the effectiveness of the new method in which a number of CCTV cameras managed by the Keihin River Office are tested by obtaining panoramic images at four different times during the night of February 9, 2017. We show an example of panoramic images in figure 2. We confirmed that we can render panoramic images at night with the bands of light by iterating panning and stopping.

## 3. Conclusion

In FY 2017, we worked to establish a method to render panoramic images using CCTV cameras that are deployed in high places, such as a tower of each Regional Development Bureau.

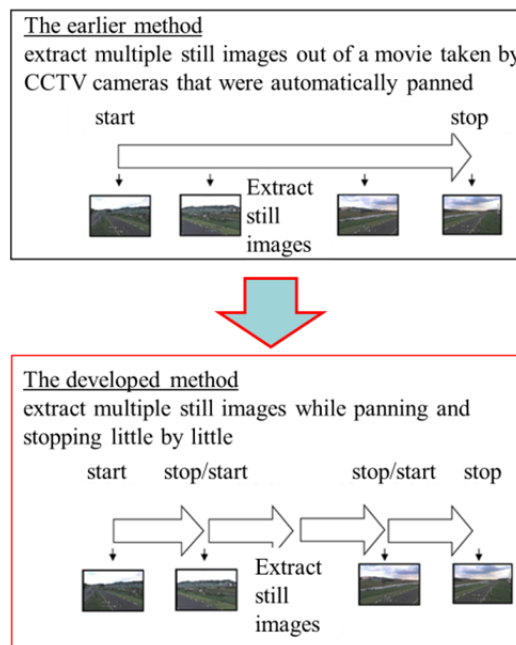


Figure-1: Difference between the earlier method and the developed method



Figure-2: An example of panoramic images