

Security Camera Network, Privacy Protection and Community Safety

## Social experiment for security camera which protects privacy embedded in vending machine

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### Abstract

With the cooperation of Gunma Prefecture Police Department and Mikuni Coca-Cola Group, e-JIKEI Network started Experiment of Security Camera Embedded in Vending Machine on 19th June 2007. In this experiment, the system of e-JIKEI Network is embedded in a vending machine to develop a new experiment environment. In this new development, our watch over system will not be restricted to residential area, but can also be used widely even in suburb area. Up until now, the camera has been working perfectly and the experiment progressed as expected. The authors are hoping that this system work perfectly without problems for 1-year cycle.

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*Keywords:* e-JIKEI Network; network camera; vending machine; watch over; Dairi EYE Lock; encode

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### 1. Introduction

In former times, citizens watched their own properties, and also their neighbours' in Japan. From the above facts, the authors proposed "e-JIKEI Network" (The e-JIKEI Network Promotion Institute, 2003; Fujii et al., 2005a; Fujii et al., 2005b; Fujii et al., 2006; Fujii et al., 2008; 2003; Ueda et al., 2006; Yoshiura et al., 2005). The concept of e-JIKEI Network is reproducing the old community's mutual watching system at now. We will realize the system with the aid of the information technologies. The project is discussed from the viewpoint of social dimension (Fujii et al., 2005a; Fujii et al., 2005b), security of residential area (Yoshiura et al., 2005), and national security (Fujii et al., 2006). The Society of e-JIKEI Network has been established since 2004 and started free download service for Dairi EYE Standard on 16th September 2004. It is able to download on e-JIKEI Network homepage. In 2005, with the cooperation from Kiryu City Hall, the system of e-JIKEI Network was introduced to 4 kindergartens and elementary schools in Kiryu City. After a year experiment, the system proves to be effective. So the system start being used in all 42 kindergarten and elementary schools in Kiryu City. In May 2007, the 243 systems has been experimentally used in Kiryu Shopping Area with the cooperation from Kiryu Citizen Activities Promotion Center "YUI". Dairi

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EYE software had been upgraded several times since the first edition. e-JIKEI Society has developed Dairi EYE Lock of the latest edition. Dairi EYE Lock's concept is to protect pedestrians' privacy in all times. And on 19th June 2007, the system of e-JIKEI Network started an experiment by using the Dairi EYE Lock and embedded this system inside a vending machine. This experiment defined stable working for a year as the objective. On the same day, the Society of e-JIKEI Network introduced an Experiment of Security Camera Embedded in Vending Machine with cooperation of the Gunma Prefecture Police Department and MIKUNI COCA-COLA BOTTLING CO., LTD. The number of vending machine is about the same as number of residential houses in recreation areas, camping sites and mountain areas. The system of e-JIKEI Network has been limited at residential area. Hence, the experiment under other situations is desirable to investigate the effectiveness of the system of e-JIKEI Network. Secondly, every vending machine is installed with a florescent light. And, we embedded security camera in a vending machine. So, the florescent light could be supporting light at night. With this, cost of this system can be reduced further more. Addition to this, the authors are hoping that criminals who target vending machine also can be reduce by installing camera in vending machine. Below is the system that we used at this experiment.

## 2. Experimental methodology

As shown in Fig. 1 and Fig. 2 this experiment is using Dairi-EYE Lock and embedded that system into vending machine. The system can be monitor using a computer and pictures recorded by network camera will be sent via a router. In the operation of the Dairi-EYE Lock, only the picture that has some differences from the picture of the previous frame is saved. The amount of change from previous picture is counted by using Dairi EYE Lock. We call the value "Threshold value". If "Threshold value" becomes more than a value set by user, a picture is saved. Dairi-EYE Lock encrypts the pictures before saving them. When pictures are encrypted, they cannot be easily viewed by anybody. When someone wants to see the recorded pictures, he must decode the encrypted pictures by special software. The special software is installed in a specific computer. And, everyone except police can not access. If an incident happens near the camera, the recorded images can serve as useful evidence. If the owner of the picture wants to view the picture, he has to bring the encrypted data files to police station. And, he has police decode it. In addition, as shown in Fig. 3 mosaic hangs at the running screen of Dairi-EYE Lock. So the owner of the images cannot see images in real time. All of this process is important to protect privacy in all time.

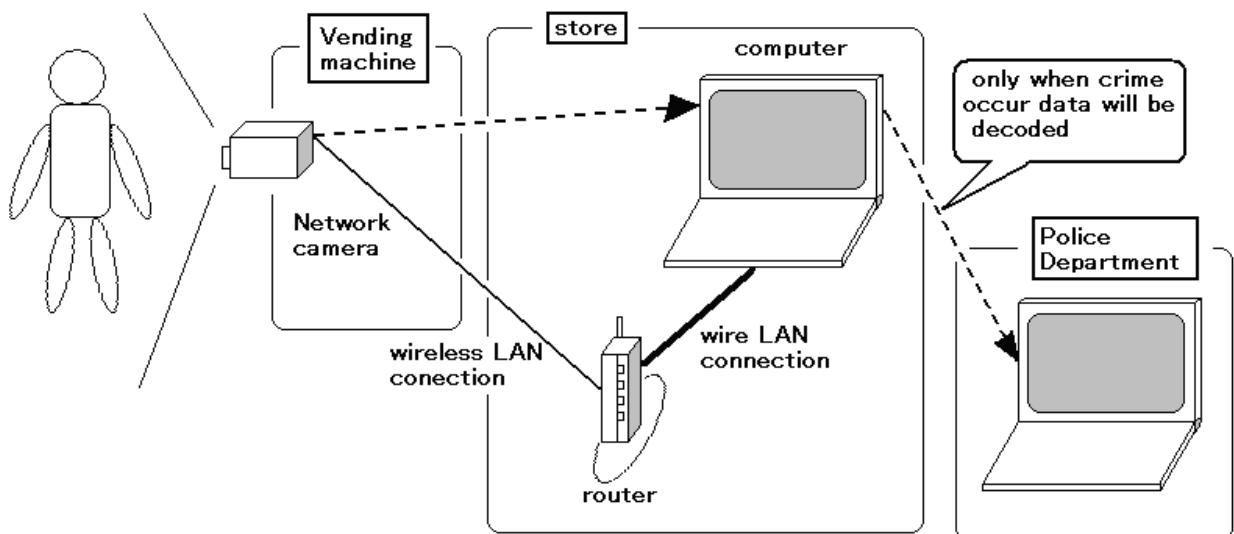


Figure 1. The system of e-JIKEI Network embedded in vending machine.

Below is equipment list that we used in this experiment.

- Personal Computer which installed with Dairi EYE Lock (estimate around 80000 yen)
- Network Camera: Panasonic BL-C20 (estimate around 25000 yen)
- Router: NEC AtermWR6600H (estimate around 15000 yen)

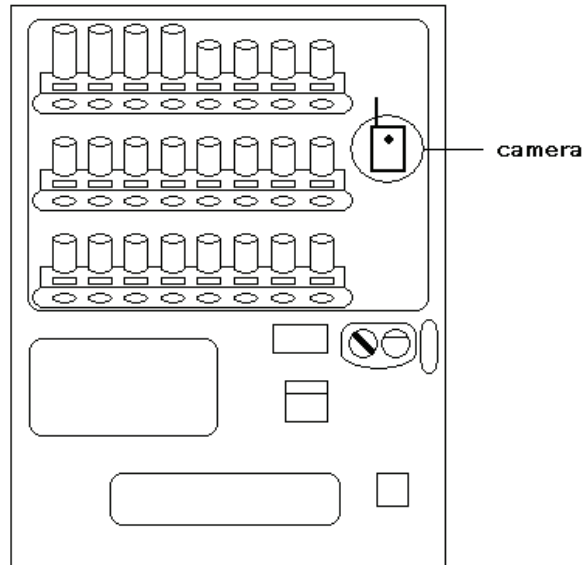


Figure 2. The Camera embedded in vending machine.



Figure 3. The screen of Dairi EYE Lock in running.

e-JIKEI Network started this experiment on 19th June 2007 by installing a camera inside MIKUNI COCA-COLA BOTTLING CO., LTD's vending machine in Suehiro-cho, Kiryu City. The vending machine is placed outside a store, next to the vending machine. With cooperation from the owner of the store, a computer, which operates the camera, also had been installed in the store. Below is setting of Dairi EYE Lock.

- Threshold value: 250
- Picture rate: 500 ms
- File save days: 30 days

Routine checks were done every 4 weeks to check the condition of the camera. But for the coming summer season, routine checks are schedule for every 2 weeks. In addition, the camera monitors the range that following Fig.4 shows.

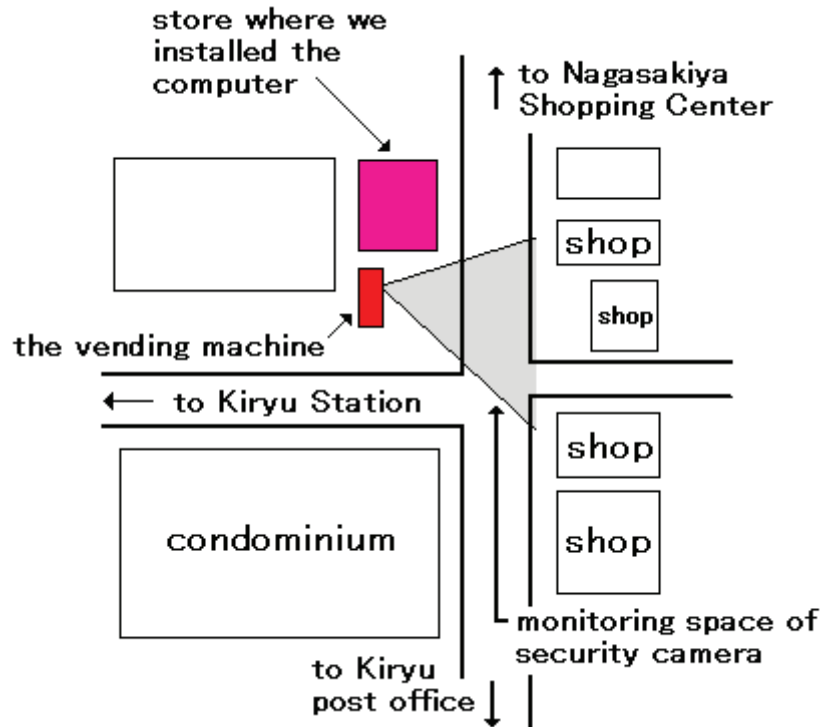


Figure 4. The space monitored by security camera.

### 3. Results

The experiment began on June 19, 2007. This system and camera could work continuously for a year. So, this experiment was success. The system's operating condition was very good and the system never stopped. According to the operating manual of the camera, the operating temperature for the camera is between 5 °C to 40 °C and the operating humidity is between 20 to 80 percent. Based on the information retrieved from MIKUNI COCA-COLA BOTTLING CO., LTD, the temperature inside the vending machine can reach up to 80 °C under the blazing sun during summer. And, because the vending machine is placed outdoor, the condensation process that takes place during winter could condensation occur. However, we understood that the system and security camera can continue to function normally with under the above-mentioned condition by this experiment.

### 4. Discussion

By the success of this experiment, we experimented in other kinds of situations about the system of e-JIKEI Network after this experiment. Described experiment's content later. If this system is used in much kind of situations not only each house, we can hope high security effect. If an incident happens near the camera, the

recorded images can be solid information to capture the criminal and investigate what really happened. In addition, this system protects privacy by encrypting the recorded pictures. After this experiment, the component for wireless communication in the network camera which we used by this experiment has been broken because of severe temperature changes in the vending machine. We embedded a new network camera into the vending machine and are continuing this experiment. Below is the camera we embedded in the vending machine.

- Camera: PLANEX CS-W04G (estimate around 15000 yen)

From now on, we will investigate when the new camera stop good working. Appearing below is experiment which we have done after this.

- On 21th December 2007, we installed next generations of security cameras at Isesaki station.
- On 2008, we installed 21 security cameras that installed the system of e-JIKEI Network at the private houses in Tunatoricyo, Isesaki city.
- On 30th May 2009, we installed 11 all-in-one cameras that installed the system of e-JIKEI Network to pole of crime prevention light in Higashi area, kiryu city and started experiment.

## 5. Conclusion

This system had been working for a year. So, we achieved the original objectives. This experiment succeeded. We think this system could be used in many kind of situation. And, we introduced many kind of place after this experiment.

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