Security Camera Network, Privacy Protection and Community Safety

Security of communities based on the e-JIKEI Network with information technology and altruism

Koichi Marua a,*, Yusaku Fujiia, Yoichi Sugita a, Naoya Ohtab, Noriaki Yoshiurac, Hiroshi Uedad, Shinya Shirakia

aDepartment of Electronic Engineering, Gunma University, Kiryu Gunma 376-8515, Japan
bDepartment of Computer Science, Gunma University, Kiryu Gunma 376-8515, Japan
cArea of Informatics, Division of Mathematics, Electronics and Information, Saitama University, Kiryu Gunma 376-8515, Japan
dLibrary and Information Technology Center, Gunma University, Kiryu Gunma 376-8515, Japan

Received October 23, 2009; revised November 29, 2009; accepted December 10, 2009

Abstract

Attempts on the introduction of systems of the e-JIKEI Network, a novel concept on operating security camera system, are reviewed. The concept of the e-JIKEI Network is that a community will have a strong ability to prevent crime only if some residents keep watch their surroundings. Community safety would be realized by the voluntary cooperation and altruism of citizens. Before introducing the systems, altruistic mind of the citizens has been enhanced, and consequently, the systems have been successfully introduced to residential districts and schools. The prospects for the concept of the e-JIKEI Network are discussed.

© 2009 Published by Elsevier Ltd. Open access under CC BY-NC-ND license.

Keywords: Security; crime prevention; information technology; autonomic system; e-JIKEI Network

1. Introduction

Recently, many serious crimes such as kidnapping, burglary and murder have occurred in Japan. In 2007, the number of reported cases of penal code offenses was 2,690,883 and the clearance rate of the penal code offenses was 51.6% in Japan (The Ministry of Justice, 2008). In these crimes, the problem of a lack of witnesses has been pointed out recently. In the United States, for national security against terrorists, a project for developing a security system has been pursued (US Home Guard, n.d.). In this project, registered ordinary citizens watch critical infrastructure facilities in the United States from their houses through the Internet. In London, about 800 thousands of security cameras are used. Most of people think that the security cameras are very effective to prevent crimes and to identify criminals. Especially, these cameras contributed to identifying suspects of the London bombings occurred on 7th July, 2005. However, many people also think, from the viewpoint of the violation of privacy, that the existence of many security cameras is stressful.

* Corresponding author. Tel.: +81-277-30-1748; fax: +81-277-30-1675.
E-mail address: maru@el.gunma-u.ac.jp.

© 2010 Published by Elsevier Ltd. Open access under CC BY-NC-ND license.
10.1016/j.sbspro.2010.01.019
This is the fact that there is a psychological burden on the general citizens, who may be the subjects of security cameras, from the viewpoint of privacy violation. However, using security cameras has been spread throughout the world in the present situations of decreasing witnesses of crimes related to individualism, degrading public security, and increasing the number of terrorisms. Hence, it is very important to reduce potential disadvantages such as the stress caused by the existence of security cameras and to enhance potential advantages of installing cameras.

The authors have proposed a novel concept on operating a security camera system named “e-JIKEI Network” (Fujii et al., 2004; Fujii et al., 2005a; Fujii et al., 2005b). The authors have also established “the Society for the e-JIKEI Network” (Yoshiura et al., 2005; The e-JIKEI Network Promotion Institute, 2003) in 2003 to promote and realize the proposed concept nationwide and worldwide. Based on the Society, the incorporated nonprofit organization (NPO) “the e-JIKEI Network Promotion Institute” has been established in 2009. The e-JIKEI Network Promotion Institute has proposed an inexpensive system based on a personal computer (PC) with which residents can keep watch on what happens around their houses. The Institute has also provided the free software which is suitable for the concept on the web site (www.e-jikei.org) (The e-JIKEI Network Promotion Institute, 2003). The concept has been discussed in the Institute from the viewpoints of the social science (Fujii et al., 2005a; Fujii et al., 2005b), the function of free software (Fujii et al., 2004), the homeland security (Yoshiura et al., 2005) and the bottom-up approach to achieving e-Government (Ueda et al., 2006). We have introduced the systems based on the concept of the e-JIKEI Network in many residential and school districts (Maru et al., 2009, in press).

In this paper, the attempts on the introduction of the system of the e-JIKEI Network and prospects for the concept are reviewed. In Section 2, the concept of e-JIKEI Network is reviewed. In Section 3, the development of the system for realizing this concept is described. In Section 4, some attempts for the introduction of the system are described. In Section 5, the prospects for the concept are discussed.

2. Concept of the e-JIKEI Network

Figure 1 shows the concept of the e-JIKEI Network. The basic concept is that a community will have a strong ability to prevent crime only if some residents keep watch on what happens around their houses. Thus, community safety would be realized by the voluntary cooperation and altruism of ordinary citizens. The concept intends to recreate the mutual watching system, which had usually functioned in old communities, in a much more powerful and flexible form with the aid of the information technology. In this concept, ordinary individual persons install, possess, and operate a security system consisting of their PC, cheap cameras and free software. The system is placed in each house and networked via the Internet or human communication.

In this concept, each person owns each system and captured images. It means that the each person autonomously operates the system and owns captured images, rather than a specific organization such as the police or nation controls entire system and owns all the images. In such system, it is inevitable for many persons to cooperate with the police when the police intend to pursue a criminal because each person just watches the front of his/her house, and therefore, the information owned by each person is not so large. It means, in this concept, only the incidents on
which many persons think to cooperate are effectively observed. If the concept spreads out in the community within an altruistic community-minded framework, the effectiveness of the watching system on community security will be much more significant.

However, due to the lack of the experience of having such a strong ability of sensing, this might result in the unexpected and unnecessary troubles. Especially, concern about privacy is a serious and delicate issue in promoting the concept. Therefore, the rule and guidelines are necessary for avoiding these troubles. Hence, user guidelines have been made by the e-JIKEI Network Promotion Institute as a part of the conditions of the use of the software, in which a careful consideration on privacy protection is required. The users of the software are asked not to watch the captured images without appropriate reasons, so as to prevent them from knowing unnecessary information of neighbors’ behaviors.

On the other hand, if ordinary citizens were prohibited from watching outside of their houses, the significant problem that no witnesses may appear when a serious crime occurs would be raised, whereas the risk of the privacy violation would be eliminated. We think that, for ordinary citizens, the problem of missing criminals around their houses will be more serious than that of watching outside of their houses while accompanying with the possibility of privacy violation if watching their surroundings is easy with the aid of the information technology. Based on this consideration, before the introduction of the systems, altruistic mind of the citizens has been enhanced by holding some meetings where we explained the concept of the e-JIKEI Network to residents.

As well as general network sensing systems, the system of the e-JIKEI Network is to sense a subject (i.e., a criminal) by measuring data (i.e., images) with sensors (i.e., cameras) placed over wide area. On the other hand, the e-JIKEI Network is different from general network sensing as the following points:
- Sensors (cameras) are voluntarily installed, owned, and operated by individual persons.
- Individual persons have all the right and responsibility accompanied with data (images) measured with sensors (cameras).
- Each person pays for small amount of installation cost: the societies receiving the benefit of security can reduce the investment for the installation and operation.

At the end of 2008, household penetration rate for PCs was 85.9% (The Ministry of Internal Affairs & Communications, 2008). If a few percents of households that have PCs voluntarily watch their surroundings in a community, the community would have some witnesses for most of crimes.

3. System for the e-JIKEI Network

Figure 2 shows the system of the e-JIKEI Network. A security system consisting of his/her PC, cheap cameras, and free software is formed in each house. The images are stored in the PC by using the software only when some movements are detected in images.

The e-JIKEI Network Promotion Institute has provided free software since December 2004 on the web site (The e-JIKEI Network Promotion Institute, 2003). The following functions are implemented to the software “Dairi-EYE Standard”. Fig. 3 shows the window of the software “Dairi-EYE Standard”. The software has the minimum necessary function watching around the house 24 hours a day, i.e., taking care around the house 24 house not for the security of his/her house itself but for the security of surrounding community. The main functions of the system and software are as follows:

1. Continuous operation over the period more than a year is achieved under usual conditions.
2. The images are stored in the PC only when some movements are detected in the images. Some parameters, such as the threshold of the detection of movement, the position of detection, etc., can be set by the user.
3. The following functions are included for long-period operation:
   - The saved picture files have time and location information as attributes. For example, the time and location information are appeared in the file name and its path.
   - When the number of the images saved in a day exceeds a set value, the system shows the warning message.
   - The saved images are automatically erased at the time which the user sets.
   - The software monitors remaining disk space. When the disk space becomes below a set value, the system shows the warning message.
4. The software can command two or more cameras with one PC.
5. The system can use two kinds of cameras; VFW cameras and network cameras (FTP mode and HTTP mode).
6. All the setup can be done by home carpentry. In our concept, the low cost and easy operation are the essential factors for spreading the system based on the concept to ordinary citizens worldwide. Hence, it is important to develop easy and low-cost way of realizing the home system for ordinary citizens.

7. As a part of the conditions of the use of the software, users of the software are asked to keep the user guidelines, in which a careful consideration on privacy protection is required.

![Figure 2. System of the e-JIKEI Network.](image)

![Figure 3. Window of “Dairi-EYE Standard”.

4. Attempts for introducing e-JIKEI Network system

4.1. Introduction to residential district

The NPO “HIGUMI” (NPO HIGUMI, n.d.) has been making continuous efforts to prevent crimes in local communities of a residential district having about 380 households in the Maebashi city, Gunma. From 2004, HIGUMI has introduced the system based on the e-JIKEI Network to the residential district in cooperation with the e-JIKEI Network Promotion Institute. This is the first attempt to introduce the system of the e-JIKEI Network to a local community. Before installation, we made a guideline on the operation of the security cameras and notified the residents of the guideline. Moreover, altruistic mind of the citizens was enhanced by holding some meetings. As the result of this introduction, the number of reported cases of penal code offences can be reduced in this area (Mainichi Shinbun, 2006, March 3).

HIGUMI received official commendations for their activities including this attempt from the Prime Minister in 2007 and the Minister of Internal Affairs and Communications in 2006 and 2007 (The Ministry of Internal Affairs & Communications, 2007). HIGUMI has also been introduced by the National Police Agency at the web site as a voluntary group for crime prevention activity (National Police Agency, 2005).

4.2. Introduction to residential section

The Gunma Housing Supply Corporation has introduced the system of the e-JIKEI Network (Fujii et al., 2006). The e-JIKEI Network and the Gunma Housing Supply Corporation have decided to conduct an attempt to introduce the e-JIKEI Network in a residential section with 200 new houses. The targets of the attempt are to develop the procedure of forming the consensus of introducing the e-JIKEI Network within an altruistic community-minded framework and to improve the system in conveniences for the developers of the residential district to introduce it and for the users to operate it. Before the introduction of the systems, altruistic mind of the citizens has been enhanced by installing a sample of the system to a model house and holding 2 meetings. As a result, many residents have cooperated to install the system.
4.3. Introduction to schools

Operation tests of the system based on the e-JIKEI Network were conducted at 4 public schools (two elementary schools, a junior high school and a kindergarten) in the Kiryu city, Gunma. Before installation, we conducted meetings and demonstrations of the system.

Four months after installing the systems, the questionnaires were sent to the schools to investigate the effect of the introduction of the system of the e-JIKEI Network. Table 1 shows the result of the reply to the questionnaires from 14 staffs of the schools. From the result, we found that many persons thought the system is effective for preventing crimes and specifying criminals. We also found that introducing the system is effective to give relieved feelings to many persons.

| Table 1. Result of questionnaires. |
|-----------------------------------|
| **Question:** What do you think about after installing the system? | **Numbers** |
| The system is effective for preventing crimes. | 5 |
| The system is effective for specifying criminals. | 4 |
| I feel relieved after installing the system. | 4 |
| Usually I’m not aware of existing cameras. | 1 |
| When an incident or accident occurs, we need to cope with it immediately. | 1 |

The system also contributed to identifying the suspect of property damage (Jomo Shinbun, 2004, August 14). After these confirmations of the effect of the system as cues, the Kiryu city decided to introduce the system of the e-JIKEI Network to all the public schools in the city in 2006, and has introduced to all the public schools by 2007. The system has also been introduced to the Junior High School of attached to Faculty of Education of Gunma University. Until now, this has helped the police identify suspected persons in much cases happened in these schools. We think this attempt is very important to realize the security of children, which is one of the aims of the e-JIKEI Network.

5. Discussion

In all cases, the systems have been successfully introduced by the residents or the school staffs of their own free will. It indicates that altruistic mind of citizens has been successfully enhanced on the introduction of the systems.

In the framework of the e-JIKEI Network, each citizen should observe their surroundings from a sense of responsibility as a citizen of the society. A community where many citizens watch and observe their surroundings may have the strong ability of crime prevention. The e-JIKEI Network has been successfully introduced in residential areas and schools in Gunma, Japan.

However, a large number of people are concerned about the risk of privacy violation. The problem of privacy violation has been often pointed out when arbitrary persons are taken by security cameras. For example, Tesco Company, major merchandising retail chain in the UK, was blamed for taking pictures of customers by using IC tags (Mori, 2005).

On the other hand, the current software used for the system of the e-JIKEI Network has only minimum necessary functions. The risk of causing serious privacy violation with the system of the e-JIKEI Network is considered to be very low as the following reasons:

1. Scenes captured by the system in each house are limited to just the surroundings of the house. These scenes are just the same as the scenes viewed by a resident when the resident is assumed to be present at the camera.
2. Because the captured images are owned and managed by individual citizens, the risk of privacy violation is considered to be lower than the case of a conventional system in which the images captured by many security cameras are owned and managed in an integrated manner by an organization such as the police.
3. Conventional security cameras also often observe outside of owners’ properties in their sight.
However, the anxiety about privacy violation actually becomes a psychological barrier to introduce security cameras. Recently, we have developed software based on a new concept (Fujii et al., 2008) to prevent privacy violation.

Comparing the usual security camera system, the system based on the e-JIKEI Network is very low cost. To introduce security camera system to a district with many houses, a building for placing the controlling and monitoring facilities for the security cameras spread inside the district is necessary. On the other hand, the system of the e-JIKEI Network is owned, operated and maintained by the voluntary effort within an altruistic community-minded framework. This results in extremely low cost for intruding, operating and maintaining the system.

6. Conclusion

The attempts on the introduction of the system of the e-JIKEI Network and prospects for the concept are reviewed. The basic concept of the e-JIKEI Network is that a community will have a strong ability to prevent crime only if some residents keep watch on what happens around their houses using the information technology. Thus, community safety would be realized by the voluntary cooperation and altruism of ordinary citizens. Before introducing the systems to residential districts and schools, altruistic mind of the citizens has been enhanced. Consequently, the systems have been successfully introduced.

Acknowledgment

This study was supported by the research aid fund of the Secom Science and Technology Foundation and the Grant-in-Aid for Scientific Research (B) 21300268 (KAKENHI 21300268). The authors thank Kiryu Police Department, NPO HIGUMI, Kiryu City Office, Gunma Housing Supply Corporation, Gunma Prefectural Police Department, Kuwabara Denkikyo Corporation, Matsuda Syouji Co. ltd, e-JIKEI System Corporation, and Junior High School of attached to Faculty of Education of Gunma University for their help. The authors thank all the members of the e-JIKEI Network Promotion Institute.

References

Fujii, Y., Kumakura, S., Yoshiura, N., Ohta, N., & Otsuka, H. (2006). Residential District Security Using Home Computers. Proc. VXIII IMEKO World Congress, 2006.
Fujii, Y., Ohta, N., Ueda, H., & Sugita, Y. (2008). New Concept Regarding Management of Security Cameras. Journal of Community Informatics, 4(3).
Fujii, Y., Yoshiura, N., Chigira, Y., & Hagiwara, K. (2004). Community security platform for individually maintained home computers: The e-Vigilante Network Project. Proc. IEEE IMTC 2004, 891-894.
Fujii, Y., Yoshiura, N., & Ohta, N. (2005a). Creating a Worldwide Community Security Structure Using Individually Maintained Home Computers: The e-JIKEI Network Project. Social Science Computer Review, 23(2), 250-258.
Fujii, Y., Yoshiura, N., & Ohta, N. (2005b). Community security by widely available information technology. Journal of Community Informatics, 2(1), 68-70.
Jomo Shinbun (2004, August 14). (in Japanese)
Mainichi Shinbun (2006, March 3). (in Japanese)
Maru, K., Fujii, Y., Sugita, Y., Ohta, N., Yoshiura, N., Ueda, H., & Shiraki, S. (2009, in press). Community security by widely available information technology with altruism: introduction of system and prospects for realizing e-JIKEI Network. Architectural Institute of Japan, Sougou-Ronbunshi (in press) (in Japanese).
Mori, T. (2005). Have the Internet made us happy?. Tokyo: Aspect. (in Japanese)
National Police Agency (2005). Support site of volunteers for crime prevention. URL http://www.npa.go.jp/safetylife/seianki55/katsudo_jirei/list_of_katsudojirei.html
NPO HIGUMI (n.d.). URL http://www16.ocn.ne.jp/~higumi/top.html
The e-JIKEI Network Promotion Institute (2003). URL http://www.e-jikei.org/
The Ministry of Internal Affairs & Communications (2007). Official commendations from the Minister of Internal Affairs and Communications. URL http://www.soumu.go.jp/s-news/2005/051222_7.html
The Ministry of Internal Affairs & Communications (2008). Information & Communications Statistics Database. URL http://www.johotsusintokei.soumu.go.jp/index.html
The Ministry of Justice (2008). White Paper on Crime. URL http://www.moj.go.jp/HOUSO/2008/
Ueda, H., Fujii, Y., Kumakura, S., Yoshiura, N., & Ohta, N. (2006). e-JIKEI Network Project/Japan: Enhancing community security. *eGov*, 11(12), 9-11.

US Home Guard (n.d.). URL http://www.ushomeguard.org

Yoshiura, N., Fujii, Y., & Ohta, N. (2005). Using the Security Camera System Based on Individually Maintained Computers for Homeland Security: The e-JIKEI Network Project. *Proc. IEEE IMTC 2005*. 