Safety Management and Crime Prevention by IC Tags
–Cases of practical use of IC tag in medical and welfare fields –

Ashida N.[1], Ashida Y.[1] Sagawa S.[1], Suto S.[2], Higashi T.[2], Makimoto K.[2] and Kawahara T.[3]

1. Koshien University, Department of Medical and Welfare Management
2. Osaka University, School of Allied Health Sciences
3. Matirix inc.

ashida@koshien.ac.jp

Abstract

Incidents and accidents are occurring frequently all over the world. The system for keeping safety and crime prevention is required. Also the ubiquitous technology is developing. We tried to construct some systems with IC tag about crime prevention and disaster prevention and put in practical use. We introduce our systems with IC tag for crime prevention and disaster prevention such as monitoring of human behavior, baby abduction prevention, prevention of kidnapping and survivor search etc.

1. Introduction

Terrorism and atrocious crimes are increasing on a world-wide scale. Moreover, natural disasters, such as an earthquake and tsunami, have also occurred frequently. Our safe and comfortable life is threatened by the disaster caused by man and the natural disaster. Even in Japan, the incidents, such as crime targeted the schoolboy and girl, and baby abduction from a hospital, have arisen. On the other hand, an aged society has started and elderly living alone is increasing. The population required care service is also increasing. Elderly people tend to cause accidents, such as a fall.

In order to protect a safe and comfortable life, the policy which prevents an incident and an accident is needed. And the device which prevents an incident and an accident with ICT technology is tried by various maters.

We tried to construct some IC tag systems about crime prevention and disaster prevention and put in practical use, which is pay attention as a fitted technology to ubiquitous society realization among ICT technology. In this paper, we will report our IC tag technology for crime prevention and disaster prevention.

2. Method

Structure of IC tag

The IC tag is made of IC chip and an antenna. IC chip consists of memory, a radio circuit, a control circuit, and a decoding circuit. IC tags are divided roughly into a passive type without a battery and the active type having a battery. A passive type IC tag, since energy is supplied from the magnetic field, it is used in communication in a short distance about several centimeters. Since a battery is not necessary, the price down and miniaturizing are possible, and the IC tag which is several millimeters in size is already developed. As it becomes small, including in various goods is possible. In the field of the distribution, traceability is securable by accumulating record in each trigger installation position. It is observed as a system replaced with a bar code.[1][2]

We have developed the battery drive type IC tag of 1 inch size. When the trigger field (RF magnetic field) is installed in a certain point and an IC tag goes into this area, the tag can emit a signal and a tag receiver can catch that signal, we can get tag ID, trigger ID, and time, and those signals transfer the information of "what (who), where, and when." by PC processing. (Fig. 1)[3]

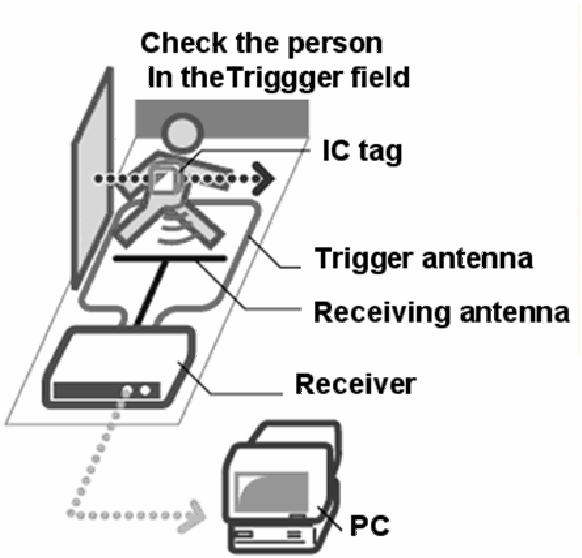

Figure 1. Structure of IC tag system

Monitoring of human behavior

The people's movement can also be grasped by an IC tag which acts as a tracer. Moreover, the peculiar service in the place can also be provided to the peculiar people.

For example, an audio assist is performed to people with visual impairment. It seems that it is not suitable for action observation of people by a passive type IC tag, since a strong magnetic field for power supply is needed in order to communicate certainly in several meters distance. If it is an active type, a magnetic field strong of the trigger field will not be required, and the influence on a human body will also become decrease. It seems that there is no influence. The IC tag which we developed is usually in a sleep state in order to prevent battery consumption, when the tag detects the magnetic field of the trigger field, it will be in a power supply ON state, and will send ID code of the trigger field, and its ID code. The signal is received by the receiving antenna attached near the trigger field, and the signal sent from the IC tag is given time information by the receiver with a built-in timer. These data is sent to PC by wireless LAN, and is saved as log data. It is important to give the functions to indicate the information for performing line-of-flow management of people, such as "where is now", "tracking (pursuit)", and "a fixed point observation". And the alarm function is also necessary for the system.

We have developed the software, which shows the trigger area on the map of institutions. According to the stored log data, it displays people with IC tag graphically on a screen. We tried to use and to modify this IC tag system for crime prevention and disaster prevention.

3. Result

Case reports of construction of IC tag systems

3-1. Monitoring of senile dementia wandering in a nursing home

Since danger, such as a fall, is high, dementia elderly people's wandering has a large burden also for a care worker. The monitoring method using IC tag was developed and dementia elderly people's wandering action was watched by day-and-night in order to grasp the relation between a factor and the pattern of wandering. This method decreased the influence of monitoring on elderly people. The action monitoring of nursing home residents and care workers was performed. In the nursing homes with dementia elderly people's exclusive floor (Osaka, Hamamatsu and Seoul), after obtaining permission of informed consent by dementia elderly people's decision-making representative, action observation was performed for nursing home residents and care workers using IC tags. Trigger areas were installed at some points, such as a bed room, a toilet, a passage and a relaxing place, the continuation monitoring was carried out for day-and-night 24 hours. (Fig. 2) [4][5][6]

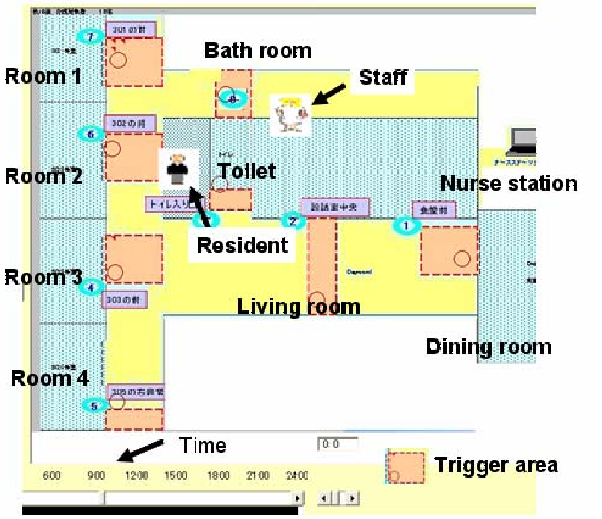

Figure 2. Display of Monitoring system for wandering

3-2. Baby abduction prevention

The wristband type IC tag attached to baby's ankle in order to prevent mistake picking and to prevent kidnapping. This tag is a waterproofed type and always attached from childbirth to the time of leaving hospital. The trigger areas were installed in the entrance of a room, the entrance of a ward, and the hospital door. If an IC tag passes without procedure through these areas (abduction is assumed), an alarm will become and a report signal will send to a building safety control center. (Fig. 3)

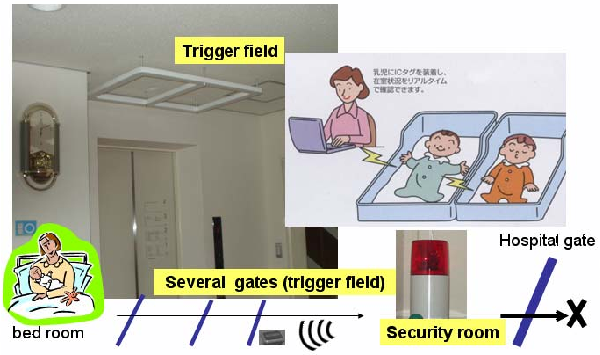

Figure 3. Baby abduction prevention system

3-3. Checking of going to school and coming back to home for schoolboy and girl for prevention of kidnapping.

Trigger areas are set at the gate of a school, or some points of school zone. Passage information is sent to school and parents' cellular phone by E-mail also, and can check safety. (Fig. 4)

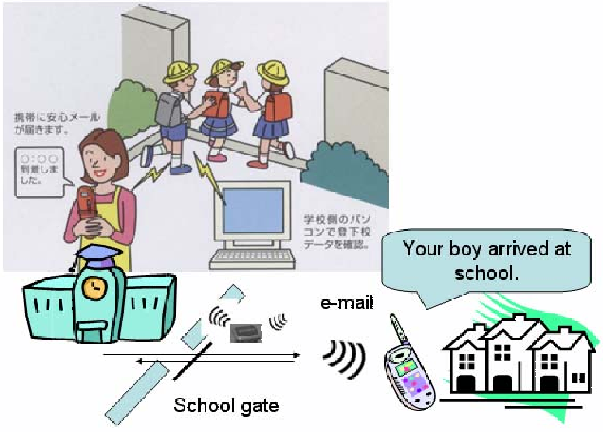

Figure 4. Checking system for prevention of kidnapping.

3-4. Correspondence to an earthquake disaster of building collapse and survivor rescue

The greatest disaster prevention is to construct an earthquake resistance building. However, if hits by the earthquake beyond an anti-earthquake design standard, it will collapse. Although many victims come out by collapse, there is possibility of survival also under rubble and the pressing subject after suffering a calamity is rescue of survivors. It is important to grasp situation who is surviving in the collapse building.

It can use for management of the entrance and leaving at certain building. (Fig. 5) And additional functions of IC tag system are designed as follows.

1. It will operate automatically when signals from trigger could not catch after disaster.
2. It will operate by the special trigger for a survivor search.
3. Moreover, when the survivor has consciousness, it will operate with the switch for emergencies. [7]

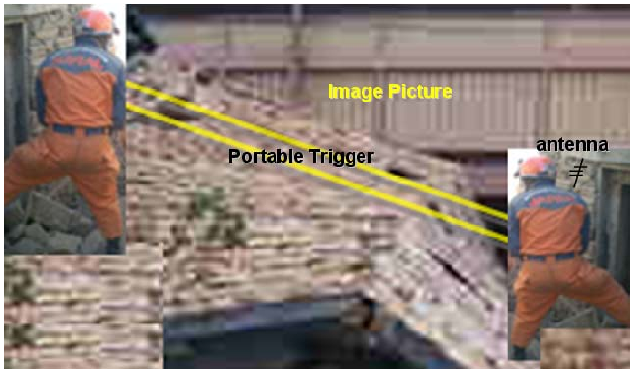

Figure 5. Survivor search system

4. Discussion

Ubiquitous society has coming. The IC card and an IC tag is convenience to perform individual identification without conscious. It is hopeful in all fields such as delivery, traffic, circulation, and banking. Although ubiquitous technology is the technology which may make controlled society, the application for "relief and safety" is tried in the medical and welfare field. The service which searches wandering elderly by the position information search engine by GPS or a cellular phone is already commercialized.

The traceability of the IC tag which can be used also in the outdoors and indoor, is effective in the distribution management of a thing. And it is used for proper inventory management also. The IC tag as technology for relief and safety is going to be used for misuse prevention of medical implements and medical supplies

On the other hand, traceability of the IC tag seems to be effective also in action observation for people. Although the method of action observation for people that chronicler follows a candidate and records it serially, and the method of monitoring with a video camera has been used, there is a problem of an operating excess strain or invasion of privacy. IC tag method may be used for monitoring and the job analysis. A passive type IC tag with small size, a lightweight and cheap and is effective in misuse prevention of medical implements and medical supplies. However, it seems that a battery drive type active type IC tag is effective in distance with a detector, or the safety of magnetic field strength when equipping with an IC tag and trying to perform action observation of people.

5. References

[1] ICT Policy Outline in the Heisei 17 Fiscal Year) http://www.soumu.go.jp/s-news/2004/040827_7.html

[2]Yoshizaki Masahiro: Japan in U-Japan 2010, New Media (2005. 1),
[3]Matrix inc. http://www.matrix-inc.co.jp/index.html

[4]Ashida N., Makimoto K. Nozaki C., Nakagawa M., Suzuki M. and Kawahara T. A Monitoring of Wandering Behavioral Pattern of Senile Dementia with IC Tag. 3rd APT TELEMEDICINE Workshop 2005, Proceedings p80-84,2005

[5] Nobuyuki Ashida, Kiyoko Makimoto, Mizue Suzuki, and kawahara T.; The Monitoring of wandering elderly using a IC tag, the 1st ubiquitous medical symposium (May, Tokyo)
[6]Ashida N., Makimoto K., and Ashida Y. et al. The action monitoring of the user and care worker in the Nursing home using IC tag (In Japanese), medical information union convention 2005. November Yokohama
[7] Ashida N. ,Ashida Y., Takagishi Y. and Kawahara T. :The Survivor Search System using an IC Tag,4th APT Telemedicine Workshop 2006 p220-224,Pakistan 25-26, Jan 2006
.