Leonard Barolli *Editor*

Innovative Mobile and Internet Services in Ubiquitous Computing

Proceedings of the 18th International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing (IMIS-2024)

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Leonard Barolli
Editor

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Welcome Message of IMIS-2024 International Conference Organizers

Welcome to the 18th International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing (IMIS-2024), which will be from July 3–5, 2024, in conjunction with the 18th International Conference on Complex, Intelligent and Software Intensive System*s* (CISIS-2024).

This International Conference focuses on the challenges and solutions for Ubiquitous and Pervasive Computing (UPC) with an emphasis on innovative, mobile and internet services. With the proliferation of wireless technologies and electronic devices, there is a fast growing interest in UPC. UPC enables to create a human-oriented computing environment where computer chips are embedded in everyday objects and interact with physical world. Through UPC, people can get online even while moving around, thus having almost permanent access to their preferred services. With a great potential to revolutionize our lives, UPC also poses new research challenges. The conference provides an opportunity for academic and industry professionals to discuss the latest issues and progress in the area of UPC.

For IMIS-2024, we received many paper submissions from all over the world. The papers included in the proceedings cover important aspects of UPC research domain.

We are very proud and honored to have 2 distinguished keynote talks by Prof. Sriram Chellappan, University of South Florida, USA and Prof. Chao-Tung Yang, Tunghai University, Taiwan, who will present their recent work and will give new insights and ideas to the conference participants.

The organization of an International Conference requires the support and help of many people. A lot of people have helped and worked hard to produce a successful IMIS-2024 technical program and conference proceedings. First, we would like to thank all the authors for submitting their papers, the Program Committee Members and the reviewers who carried out the most difficult work by carefully evaluating the submitted papers. We are grateful to Honorary Co-chairs Prof. Makoto Takizawa, Hosei University, Japan, and Prof. Kuo-En Chang, Tunghai University, Taiwan, for their guidance and support.

Finally, we would like to thank Web Administrator Co-chairs for their excellent and timely work.

We hope that all of you enjoy IMIS-2024 and find this a productive opportunity to learn, exchange ideas and make new contacts.

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IMIS-2024 Keynote Talks

Integrating AI, Citizen-Science, Social-Media and Innovative Hardware Tech for Public Health

Sriram Chellappan

University of South Florida, Tampa, FL, USA

Abstract. Among many public health concerns, mosquito-borne diseases are most challenging. The problem is global now. Rising temperatures, floods and mobility are all exacerbating challenges today. Diseases like Zika fever, malaria, dengue and chikungunya have no vaccines or cures, as a result of which around a million people die each year from mosquito-borne diseases with a vast majority of them being children. In this talk, we will present our R&D on a spectrum of solutions geared to combat mosquito-borne diseases. Our technologies combine innovative/explainable AI algorithms, novel methods of citizen-science engagement and systems, social-media data mining and innovative hardware to address a range of problems in mosquito surveillance, control and disease management under outbreaks. Some results of successful deployments will also be highlighted.

Application of Artificial Intelligence and Internet of Things for Building Smart Services

Chao-Tung Yang

Tunghai University, Taichung, Taiwan

Abstract. The integration of artificial intelligence (AI) and Internet of Things (IoT) technologies has revolutionized the concept of smart services. Intelligent systems influence many aspects of daily life. Also, with the emergence of IoT, AI and machine learning (ML) opportunities have been created for smart computing infrastructure. We have proposed Intelligent Sensors, Edge Computing, and Cloud Computing (iSEC) framework. The project deploys a smart cloud edge-computing architecture to provide ML and deep learning in the cloud edge environment. By leveraging the iSEC architecture and real-time streaming services, AI and IoT can be effectively combined to enhance smart services. One prominent application is the utilization of You Only Look Once (YOLO) image recognition and object detection for intelligent service delivery. This approach enables the identification and analysis of objects in real-time, allowing for efficient and accurate decision-making in various smart service scenarios.

Contents

Pull-Type Relief Supplies Request System for Long-Term Evacuation Support

Yuta Seri and Tomoyuki Ishida[✉]

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Abstract. Herein, we proposed a pull-type relief supplies request system for long-term evacuation life. This framework consists of individual goods request and relief supplies request systems for evacuees, individual relief supplies request system for informationally disadvantaged evacuees, and individual relief supplies request management system for system administrators. The individual relief supplies request system enables the evacuees to request for relief supplies from local governments based on their circumstances. In addition, the individual relief supplies request system for informationally disadvantaged evacuees is targeted at informationally disadvantaged evacuees, such as the elderly. Furthermore, the individual relief supplies request management system for system administrators collectively manages information on relief supplies requested for evacuees and for informationally disadvantaged evacuees.

1 Introduction

Natural disasters—such as torrential rains and typhoons—occur almost every year in Japan—a country with many natural disasters because of its geographical location. During a natural disaster, local governments issue evacuation orders or advisories to residents, and their stay in evacuation centers may be prolonged depending on the situation. In such cases, in addition to the relief supplies distributed evenly by the local and national government, evacuees may require relief supplies tailored to their circumstances. For example, some information may be difficult to obtain through push-type support from local governments, such as assistive devices and nursing care supplies for the elderly during long-term evacuation life. Therefore, a system that allows evacuees to request information and relief supplies from local governments according to their circumstances and that allows local governments to immediately receive this information is necessary.

1.1 Related Works

Akasaka et al. [1] developed a refuge management system for persons requiring special care (RMS-PRBC) with the aim of smoothing the management and operation of evacuation centers during large-scale disasters. Persons requiring special care include the elderly, infants, and other individuals who require special attention. Evacuees enter their name, address, gender, age, nationality, blood type, emergency contact information, injuries, and communicate the damage to their home into this system using their

communication terminal or that installed at the evacuation center. This method enables effective management of the health status of evacuees.

Hirohara et al. [2] developed a disaster information registration and sharing system to support information sharing and decision-making. This system digitizes disaster information from the local government disaster response headquarters and reflects this information on large displays installed at the headquarters. Through the disaster information registration system, the disaster response headquarters can register disaster information on Web-GIS. Moreover, they can reflect the information in the registration system on the large display for each content through the sharing system.

1.2 Pull-Type Relief Supplies Request System Architecture

Figure 1 depicts the system architecture of the pull-type relief supplies request system. The system architecture consists of an evacuee agent, an informationally disadvantaged evacuee agent, a system administrator agent, an application server, and a database server.

1.3 Evacuee Agent

The evacuee agent encompasses the following:

- Evacuee Agent User Interface

    It is a component of the interface for the individual relief supplies request system for evacuees, which involves registering the name, age, gender, evacuation center, email address, password, managing relief supplies, and login/logout functions.

- User Information Registration Manager

    It provides a function to register the evacuees' name, age, gender, evacuation center, email address, and password.

- Evacuee Relief Supplies Registration Manager

    It provides a function for evacuees to request relief supplies and others from the disaster response headquarters.

- Evacuee Relief Supplies Management Manager

    It offers a function to view the history of relief supplies requested by evacuees, estimated arrival dates, and notifications from the system administrator.

- User Information Update Manager

    It presents a function to update the user information of evacuees.

1.4 Informationally Disadvantaged Evacuee Agent

The informationally disadvantaged evacuee agent consists of the following:

- Informationally Disadvantaged Evacuee User Interface

   It is a component of the interface for the individual relief supplies request system for informationally disadvantaged evacuees. The interface comprises relief supplies registration/management functions.

- Informationally Disadvantaged Evacuee Relief Supplies Registration Manager

   It contains a function for informationally disadvantaged evacuees to request relief supplies and others from the disaster response headquarters.

- Informationally Disadvantaged Evacuee Relief Supplies Management Manager

   It provides a function to view the history of relief supplies requested by informationally disadvantaged evacuees and estimated arrival dates.

1.5 System Administrator Agent

The system administrator agent consists of the following:

- System Administrator User Interface

   It is an element of the individual relief supplies request management system for the system administrator. The interface entails registering administrator information and notifications to evacuation centers, and login/logout functions.

- Announcement Information Registration Manager

   It provides a function for system administrators to record announcements to be sent to the evacuee agent.

- Evacuee Request Reception Manager

   It offers a function to receive relief supplies and other requests registered by evacuee agents and informationally disadvantaged evacuee agents.

- Relief Supplies Management Manager

   It provides a function to register/update the estimated arrival dates of relief supplies recorded by evacuee agents and informationally disadvantaged evacuee agents.

1.6   Application Server

The application server consists of the following:

- Database Edit Manager

  It operates on the database according to the information registered from the evacuee agents, informationally disadvantaged evacuee agents, and system administrator agents; moreover, it returns the execution results.

- Database Output Manager

  It provides information stored in the database to the evacuee, informationally disadvantaged evacuee, and system administrator agents.

1.7   Database Server

The database server stores account information, information on requested relief supplies, and other requested information registered by evacuee agents. Additionally, it saves relief supplies and other request information registered by informationally disadvantaged evacuee agents. Furthermore, it records the evacuation center name, account information, evacuation shelter notification information, and estimated arrival date of relief supplies registered by system administrator agents. The database server operates on the stored information in response to requests from the application server and returns the execution results.
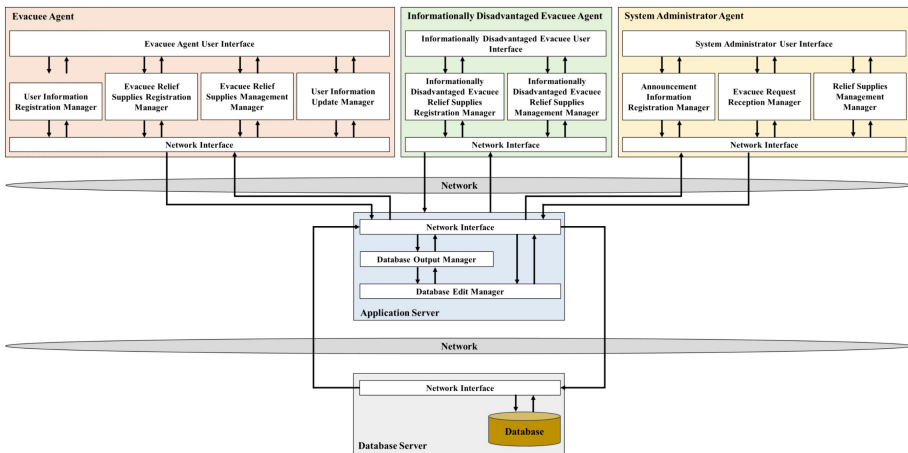

Fig. 1. Pull-type relief supplies request system architecture.

2   Prototype System

2.1   Individual Relief Supplies Request System for Evacuees

The login screen for the individual relief supplies request system for evacuees is shown to the left of Fig. 2. When the evacuee reads the QR code installed at the evacuation center, the login screen is displayed. The evacuee uses the registered email address and password to log in. The new user registration screen for the individual relief supplies request system for evacuees is shown to the right of Fig. 2. The evacuee enters their name, sex, age, email address, evacuation center, and password on the new user registration screen.

Fig. 2. Login screen and new user registration screen for the individual relief supplies request system for evacuees.

The home screen from when an evacuee selects the hamburger menu of the individual relief supplies request system for evacuees is shown on the left of Fig. 3. The hamburger menu consists of *Home*, *Change Profile*, and *Sign Out*. When an evacuee selects the

Relief Supplies item on the home screen, the screen transitions to the relief supplies request form shown to the right of Fig. 3.
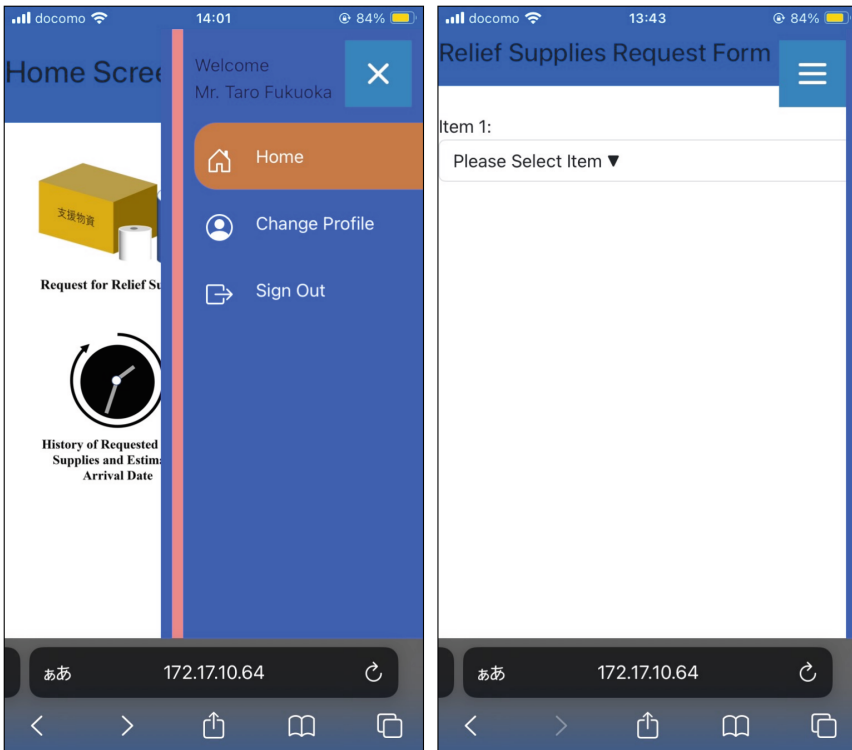

Fig. 3. Home screen and relief supplies request form for the individual relief supplies request system for evacuees.

2.2 Individual Relief Supplies Request System for Informationally Disadvantaged Evacuees

When the informationally disadvantaged evacuee selects Request for Relief Supplies, the following options are displayed: *Medical/Nursing Supplies*, *Food*, *Infant Supplies*, and *Others*. Furthermore, when the informationally disadvantaged evacuee selects *Others*, the following options are displayed: *Clothes*, *Shoes*, *Toilet paper*, *Blanket*, *Portable toilet*, and *Text input* (Fig. 4).