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7th International Conference on Knowledge Management in Organizations: Service and Cloud Computing

 Springer

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7th International Conference on Knowledge Management in Organizations: Service and Cloud Computing

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Preface

Knowledge is increasingly recognised as the most important resource in organisations and a key differentiating factor in business today. It is increasingly being acknowledged that Knowledge Management (KM) can bring about the much needed innovation and improved business performance in organisations. The service sector now dominates the economies of the developed world. Service innovation is fast becoming the key driver of socio-economic, academic and commercial research attention. Knowledge Management plays a crucial role in the development of sustainable competitive advantage through innovation in services. There is tremendous opportunity to realise business value from service innovation by using the knowledge about services to develop and deliver new information services and business services.

Although there are several perspectives on KM, they all share the same core components, namely: People, Processes and Technology. Organisations of all sizes across nearly every industry are seeking new ways to address their knowledge management requirements. Cloud computing offers many solutions to the problems facing KM implementation. Cloud computing is an emerging technology that can provide users with all kinds of scalable services, such as channels, tools, applications, social support for users' personal knowledge amplification, personal knowledge use/reuse, and personal knowledge sharing.

The seventh International Conference on Knowledge Management in Organizations (KMO) offers researchers and developers from industry and the academic world to report on the latest scientific and technical advances on knowledge management in organisations. It provides an international forum for authors to present and discuss research focused on the role of knowledge management for innovative services in industries, to shed light on recent advances in cloud computing for KM as well as to identify future directions for researching the role of knowledge management in service innovation and how cloud computing can be used to address many of the issues currently facing KM in academia and industrial sectors. This conference provides papers that offer provocative, insightful, and novel ways of developing innovative systems through a better understanding of the role that knowledge management plays.

The KMO 2012 proceedings consist of 53 papers covering different aspects of knowledge management and service. Papers came from many different countries including Australia, Austria, Brazil, China, Chile, Colombia, Denmark, Finland, France, Gambia, India, Japan, Jordan, Netherlands, Malaysia, Malta, Mexico, Netherlands, New Zeland, Saudi Arabia, Spain, Slovakia, Slovenia, Taiwan, Turkey, United States of America and United Kingdom. We would like to thank our program committee, reviewers and authors for their contributions. Without their efforts, there would be no conference and proceedings.

Salamanca
July 2012

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Contents

Section 1: Innovation in Knowledge Management

Evaluation of a Self-adapting Method for Resource Classification in Folksonomies	1
<i>José Javier Astrain, Alberto Córdoba, Francisco Echarte, Jesús Villadangos</i>	
Emerging Concepts between Software Engineering and Knowledge Management	13
<i>Sandro Javier Bolaños Castro, Víctor Hugo Medina García, Rubén González Crespo</i>	
An Ecosystem Approach to Knowledge Management	25
<i>Vanessa Chang, Amanda Tan</i>	
Discourse and Knowledge Matters: Can Knowledge Management Be Saved?	37
<i>Lesley Crane, David Longbottom, Richard Self</i>	
An Integrated Pruning Criterion for Ensemble Learning Based on Classification Accuracy and Diversity	47
<i>Bin Fu, Zhihai Wang, Rong Pan, Guandong Xu, Peter Dolog</i>	
A Process-Oriented Framework for Knowledge-Centered Support in Field Experience Management	59
<i>Wu He</i>	
Towards Cross-Language Sentiment Analysis through Universal Star Ratings	69
<i>Alexander Hogenboom, Malissa Bal, Flavius Frasinca, Daniella Bal</i>	

Organisational Knowledge Integration towards a Conceptual Framework	81
<i>Kavoos Mohannak</i>	
Business Model Innovation in Complex Service Systems: Pioneering Approaches from the UK Defence Industry	93
<i>Rich Morales, Dharm Kapletia</i>	
The Role of Trust in Effective Knowledge Capture for Project Initiation	105
<i>Marja Naaranoja, Lorna Uden</i>	
TechnoStress in the 21st Century; Does It Still Exist and How Does It Affect Knowledge Management and Other Information Systems Initiatives	117
<i>Richard J. Self, Conrad Aquilina</i>	
Knowledge Elicitation Using Activity Theory and Delphi Technique for Supervision of Projects	129
<i>Sanath Sukumaran, Akmal Rahim, Kanchana Chandran</i>	
Section 2: Knowledge Management in Business	
Customer Knowledge in Value Creation for Software Engineering Process	141
<i>Anne-Maria Aho, Lorna Uden</i>	
The Influence of System Interface, Training Content and It Trust on ERP Learning Utilization: A Research Proposal	153
<i>Chris N. Arasanmi, William Y.C. Wang, Harminder Singh</i>	
Technological Tools Virtual Collaborative to Support Knowledge Management in Project Management	163
<i>Flor Nancy Díaz Piraquive, Víctor Hugo Medina García, Luis Joyanes Aguilar</i>	
Promoting Knowledge Sharing and Knowledge Management in Organisations Using Innovative Tools	175
<i>Aravind Kumaresan, Dario Liberona</i>	
Knowledge Management Model Applied to a Complex System: Development of Software Factories	185
<i>Víctor Hugo Medina García, Ticsiana Lorena Carrillo, Sandro Javier Bolaños Castro</i>	
A New Metric to Estimate Project Development Time: Process Points . . .	197
<i>Charles Felipe Oliveira Viegas, Maria Beatriz Felgar de Toledo</i>	

Intellectual Assets and Knowledge Engineering Method: A Contribution	209
<i>Alfonso Perez Gama, Andrey Ali Alvarez Gaitán</i>	
The Effect of Connectivism Practices on Organizational Learning in Taiwan's Computer Industry	219
<i>C. Rosa Yeh, Bakary Singhateh</i>	
The Impact of a Special Interaction of Managerial Practices and Organizational Resources on Knowledge Creation	231
<i>Jader Zelaya-Zamora, Dai Senoo, Kan-Ichiro Suzuki, Lasmin</i>	
Section 3: Knowledge Management in Education	
Use of Learning Strategies of SWEBOK© Guide Proposed Knowledge Areas	243
<i>Andrea Alarcón, Nataly Martinez, Javier Sandoval</i>	
Outsourcing of 'On-Site' User Support – A Case Study of a European Higher Education Centre	255
<i>Hilary Berger, Tom Hatton</i>	
Understanding Educational Administrators' Subjective Norms on Their Use Intention toward On-Line Learning	267
<i>Tsang-Kai Chang, Hsi-fang Huang, Shu-Mei Chang</i>	
An Investigation of Business and Management Cluster's Students' Motivation of Taking Technician Certification at Vocational High Schools in Central Taiwan	275
<i>Chin-Wen Liao, Sho-Yen Lin, Hsuan-Lien Chen, Chen-Jung Lai</i>	
Investigation into a University Electronic Portfolio System Using Activity Theory	283
<i>Wardah Zainal Abidin, Lorna Uden, Rose Alinda Alias</i>	
Sequence Compulsive Incremental Updating of Knowledge in Learning Management Systems	295
<i>Syed Zakir Ali, P. Nagabhushan, R. Pradeep Kumar, Nisar Hundewale</i>	
A Service Quality Framework for Higher Education from the Perspective of Service Dominant Logic	307
<i>Najwa Zulkefli, Lorna Uden</i>	
Section 4: Knowledge Management in the Internet Age	
The Use of Web 2.0 Technology for Business Process	319
<i>Aura Beatriz Alvarado Gaona, Luis Joyanes Aguilar, Olga Najjar Sanchez</i>	

Applying Social Networks Analysis Methods to Discover Key Users in an Interest-Oriented Virtual Community	333
<i>Bo-Jen Chen, I-Hsien Ting</i>	
The Framework of Web 3.0-Based Enterprise Knowledge Management System	345
<i>Hongbo Lai, Yushun Fan, Le Xin, Hui Liang</i>	
Customer Knowledge Management in the Age of Social Networks	353
<i>Dario Liberona, Manuel Ruiz, Darcy Fuenzalida</i>	
Can a Wiki Be Used as a Knowledge Service Platform?	365
<i>Fu-ren Lin, Cong-ren Wang, Hui-yi Huang</i>	
Understanding and Modeling Usage Decline in Social Networking Services	377
<i>Christian Sillaber, Joanna Chimiak-Opoka, Ruth Breu</i>	
Connecting Customer Relationship Management Systems to Social Networks	389
<i>Hanno Zwikstra, Frederik Hogenboom, Damir Vandić, Flavius Frasinčar</i>	
Section 5: Knowledge Management and Service Science	
Advances in Intelligent and Soft Computing: Potential Application of Service Science in Engineering	401
<i>Norsuzailina Mohamed Sutan, Ibrahim Yakub, Siti Nor Ain Musa, Asrani Lit</i>	
Entropy- and Ontology-Based E-Services Proposing Approach	409
<i>Luka Pavlič, Marjan Heričko, Vili Podgorelec</i>	
Why Projects Fail, from the Perspective of Service Science	421
<i>Ronald Stanley, Lorna Uden</i>	
Section 6: Technology Applied to Knowledge Management	
A System for Cyber Attack Detection Using Contextual Semantics	431
<i>Ahmed AlEroud, George Karabatis</i>	
Collaborative Network Development for an Embedded Framework	443
<i>Jonathan Bar-Magen Numhauser, Antonio Garcia-Cabot, Eva Garcia, Luis de-Marcos, Jose Antonio Gutierrez de Mesa</i>	
A User-Centric Approach for Developing Mobile Applications	455
<i>Aleš Černezal, Marjan Heričko</i>	

A Novel Agent-Based Framework in Bridge-Mode Hypervisors of Cloud Security	467
<i>Maziar Janbeglou, WeiQi Yan</i>	
Points or Discount for Better Retailer Services: Agent-Based Simulation Analysis	481
<i>Yuji Tanaka, Takashi Yamada, Gaku Yamamoto, Atsushi Yoshikawa, Takao Terano</i>	
Cloud-IO: Cloud Computing Platform for the Fast Deployment of Services over Wireless Sensor Networks	493
<i>Dante I. Tapia, Ricardo S. Alonso, Óscar García, Fernando de la Prieta, Belén Pérez-Lancho</i>	
Personalization of the Workplace through a Proximity Detection System Using User's Profiles	505
<i>Carolina Zato, Alejandro Sánchez, Gabriel Villarrubia, Javier Bajo, Sara Rodríguez, Juan F. De Paz</i>	
Section 7: Applications of Knowledge Management	
A Visualization Tool for Heuristic Algorithms Analysis	515
<i>Laura Cruz-Reyes, Claudia Gómez-Santillán, Norberto Castillo-García, Marcela Quiroz, Alberto Ochoa, Paula Hernández-Hernández</i>	
QuPreSS: A Service-Oriented Framework for Predictive Services Quality Assessment	525
<i>Silverio Martínez-Fernández, Jesús Bisbal, Xavier Franch</i>	
A Knowledge Management Model Applied to Health Tourism in Colombia	537
<i>Luz Andrea Rodríguez Rojas, Giovanni M. Tarazona Bermudez, Alexis Adamy Ortiz Morales</i>	
Adopting a Knowledge Management Concept in Securing the Privacy of Electronic Medical Record Systems	547
<i>Suhaila Samsuri, Zuraini Ismail, Rabiah Ahmad</i>	
Special Session on Cloud Computing: Advances and Applications	
An Overview on the Structure and Applications for Business Intelligence and Data Mining in Cloud Computing	559
<i>A. Fernández, S. del Río, F. Herrera, J.M. Benítez</i>	
RESTful Triple Space Management of Cloud Architectures	571
<i>Antonio Garrote Hernández, María N. Moreno García</i>	

Analysis of Applying Enterprise Service Bus Architecture as a Cloud Interoperability and Resource Sharing Platform	581
<i>Amirhossein Mohtasebi, Zuraini Ismail, Bharanidharan Shanmugam</i>	
The Role of Knowledge in the Value Creation Process and Its Impact on Marketing Strategy	589
<i>Anna Závodská, Veronika Šramová, Anne-Maria Aho</i>	
Author Index	601

Personalization of the Workplace through a Proximity Detection System Using User's Profiles

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Abstract. This article presents a proximity detection prototype that will be included in the future in an integral system primarily oriented to facilitate the labor integration of people with disabilities. The main goal of the prototype is to detect the proximity of a person to a computer using ZigBee technology and then, to personalize its workplace according to his user's profile. The system has been developed as an open MultiAgent System architecture using the agent's platform PANGEA, a Platform for Automatic coNstruction of orGanizations of intElligent Agents.

Keywords: proximity detection, Zigbee, RTLS, open MAS, agent platform, personalization, user's profiles, disabled people.

1 Introduction

Due to the advance of the technologies and communications, intelligent systems have become an integral part of many people's lives and the available products and services become more varied and capable, users expect to be able to personalize a product or service to meet their individual needs and will no longer accept "one size fits all". Personalization can range from simple cosmetic factors such as custom ring-tones to the complex tailoring of the presentation of a shopping web site to a user's personal interests and their previous purchasing behaviour [15]. It is expected to expand these innovative techniques to a wide range of fields. One of the segments of the population, which will benefit with the advance of personalized systems, will be people with disabilities [16], contributing to improve their quality of life [17]. Considering the near future, public and private companies will be provided with intelligent systems specifically designed to facilitate the interaction with the human users. These intelligent systems will be able to personalize the services offered to the users, depending on their concrete profiles. It is necessary to improve the services' supply, as well as the way to offer them [18]. Technologies such as Multiagent Systems and Ambient Intelligence based on mobile devices have been recently explored as a system of interaction with the

dependent people [19]. These systems can provide support in the daily lives of dependent people [20].

This article presents a multi-agent based proximity detection prototype, specifically developed for a work environment, which can facilitate tasks such as activating and personalizing the work environment; these apparently simple tasks are in reality extremely complicated for some people with disabilities.

The rest of the paper is structured as follows: The next section introduces the detection proximity prototype, the technology used and how it works. Section 3 presents MAS in which the prototype is included. Section 4 explains the case study and finally, in section 5 some conclusions and future work are presented.

2 Detection Proximity Prototype

In this section we revise the proposed proximity detection prototype, focusing on the technology used and on the functioning of the prototype.

2.1 Technology Used

ZigBee sensors are used to deploy the detection prototype. ZigBee is a low cost, low power consumption, two-way wireless communication standard that was developed by the ZigBee Alliance [5]. It is based on the IEEE 802.15.4 protocol [2], and operates on the ISM (Industrial, Scientific and Medical) band at 868/915MHz and a 2.4GHz spectrum. Due to this frequency of operation among devices, it is possible to transfer materials used in residential or office buildings while only minimally affecting system performance [1]. Although this system can operate at the same frequency as Wi-Fi devices, the possibility that it will be affected by their presence is practically null, even in very noise environments (electromagnetic interference). ZigBee is designed to be embedded in consumer electronics, home and building automation, industrial controls, PC peripherals, medical sensor applications, toys and games, and is intended for home, building and industrial automation purposes, addressing the needs of monitoring, control and sensory network applications [5]. ZigBee allows star, tree or mesh topologies. Devices can be configured to act as network coordinator (control all devices), router/repeater (send/receive/resent data to/from coordinator or end devices), and end device (send/receive data to/from coordinator) [6]. One of the main advantages of this system is that, as opposed to GPS type systems, it is capable of functioning both inside and out with the same infrastructure, which can quickly and easily adapt to practically any applied environment.

Our prototype must allow performing efficient indoor locating in terms of precision because computers are very close one each other, for these reason the Real-Time Locating Systems (RTLS) Model was chosen. The infrastructure of a Real-Time Locating System contains a network of reference nodes called *readers* [12] and mobile nodes, known as *tags* [12][13]. Tags send a broadcast signal which includes a unique identifier associated to each tag. Then, readers obtain the identifier, as well as specific measurements of the signal. These measurements

give information about the power of the received signal (*e.g.*, RSSI), its quality (*e.g.*, LQI, Link Quality Indicator), the Signal to Noise Ratio (SNR) or the Angle of Arrival (AoA) to the reader, amongst many others. These signals are gathered and processed in order to calculate the position of each tag.

RTLS can be categorized by the kind of its wireless sensor infrastructure and by the locating techniques used to calculate the position of the tags. This way, there is a range of several wireless technologies, such as RFID, Wi-Fi, UWB (Ultra Wide Band), Bluetooth and ZigBee, and also a wide range of locating techniques that can be used for determining the position of the tags [14].

2.2 How the Prototype Works

The proposed proximity detection system is based on the detection of presence by a localized sensor called the control point (where the ZigBeeReaderAgent is deployed), which has a permanent and known location. Once the Zigbee tag carried by the person has been detected and identified, its location is delimited within the proximity of the sensor that identified it. Consequently, the location is based on criteria of presence and proximity, according to the precision of the system and the number of control points displayed.

The parameter used to carry out the detection of proximity is the RSSI (Received Signal Strength Indication), a parameter that indicates the strength of the received signal. This force is normally indicated in mW or using logarithmic units (dBm). 0 dBm is equivalent to 1mW. Positive values indicate a signal strength greater than 1mW, while negative values indicate a signal strength less than 1mW.

Under normal conditions, the distance between transmitter and receiver is inversely proportional to the RSSI value measured in the receiver; in other words, the greater the distance, the lower the signal strength received. This is the most commonly used parameter among RTLS.

RSSI levels provide an appropriate parameter for allowing our system to function properly. However, variations in both the signal transmission and the environment require us to define an efficient algorithm that will allow us to carry out our proposal. This algorithm is based on the use of a steps or measurement levels (5 levels were used), so that when the user enters the range or proximity indicated by a RSSI level of -50, the levels are activated. While the values received are less than the given range, each measurement of the system activates a level. However, if the values received fall outside the range, the level is deactivated. When the maximum number of levels has been activated, the system interprets this to mean that the user is within the proximity distance of detection and wants to use the computer equipment. Consequently, the mechanisms are activated to remotely switch on both the computer and the profile specific to the user's disability.

The system is composed of 5 levels. The tags default to level 0. When a user is detected close to a reader, the level is increased one unit. The perceptible zone in the range of proximity gives an approximate RSSI value of -50. If the user moves away from the proximity area, the RSSI value is less than -50, resulting in a

reduction in the level. When a greater level is reached, it is possible to conclude that the user has remained close to the marker, and the computer will be turned on.

On the other hand, reaching an initial level of 0 means that the user has moved a significant distance away from the workspace, and the computer is turned off.

The system uses a LAN infrastructure that uses the wake-on-LAN protocol for the remote switching on and off of equipment. Wake-on-LAN/WAN is a technology that allows a computer to be turned on remotely by a software call. It can be implemented in both local area networks (LAN) and wide area networks (WAN) [4]. It has many uses, including turning on a Web/FTP server, remotely accessing files stored on a machine, telecommuting, and in this case, turning on a computer even when the user's computer is turned off [7].

3 System Architecture

This proximity detection prototype is integrated within a open MAS that includes all the agents and information needed to create an integral system for helping disabled people in the workplace.

The open MAS has been created using PANGEA. There are many different platforms available for creating multiagent systems that facilitate the work with agents [8][9][10][11]; however our aim is to have a tool that allows users to create an increasingly open and dynamic multiagent system (MAS). PANGEA is a service oriented platform that allows to the implemented MAS to take the maximum advantage of the distribution of resources. To this end, all services are implemented as Web Services.

The own agents of the platform are implemented with Java, nevertheless the agents of the detection prototype are implemented in .NET and nesC.

Using PANGEA, the platform will automatically launch the following agents:

- **OrganizationManager:** the agent is responsible for the actual management of organizations and suborganizations. It is responsible for verifying the entry and exit of agents, and for assigning roles. To carry out these tasks, it works with the **OrganizationAgent**, which is a specialized version of this agent.
- **InformationAgent:** the agent is responsible for accessing the database containing all pertinent system information.
- **ServiceAgent:** the agent is responsible for recording and controlling the operation of services offered by the agents.
- **NormAgent:** the agent that ensures compliance with all the refined norms in the organization.
- **CommunicationAgent:** the agent is responsible for controlling communication among agents, and for recording the interaction between agents and organizations.
- **Sniffer:** manages the message history and filters information by controlling communication initiated by queries.

These agents interact with the specific agents of the detection prototype:

- **ZigbeeManagerAgent:** it manages communication and events and is deployed in the server machine.
- **UsersProfileAgent:** it is responsible for managing user profiles and is also deployed in the server machine.
- **ClientComputerAgent:** these are user agents located in the client computer and are responsible for detecting the user's presence with ZigBee technology, and for sending the user's identification to the ZigbeeManager Agent. These agents are responsible for requesting the profile role adapted for the user to the ProfileManagerAgent.
- **DatabaseAgent:** the detection proximity system uses a database, which stores data related to the users, sensors, computer equipment and status, and user profiles. It can also communicate with the InformationAgent of PANGEA.
- **ZigBeeCoordinatorAgent:** it is an agent included in a ZigBee device responsible for coordinating the other ZigBee devices in the office. It is connected to the server by a serial port, and receives signals from each of the ZigBee tags in the system.
- **ZigBeeReaderAgent:** these agents are included in several ZigBee devices that are used to detect the presence of a user. Each ZigBeeReaderAgent is located in a piece of office equipment (computer).

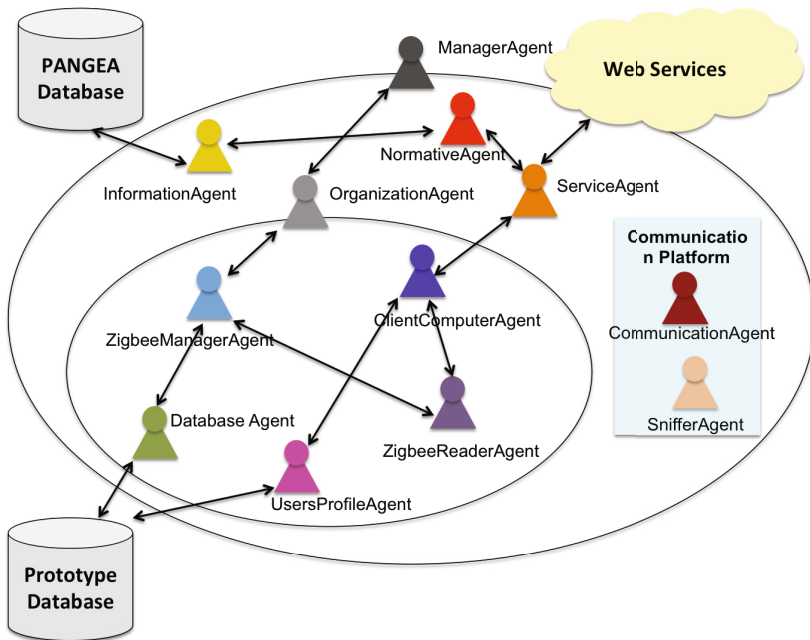


Fig. 1 System architecture

Every user in the proposed system carries a Zigbee tag, which is detected by a ZigBeeReaderAgent located in each system terminal and continuously in communication with the ClientComputerAgent. Thus, when a user tag is sufficiently close to a specific terminal (within a range defined according to the strength of the signal), the ZigBeeReaderAgent can detect the user tag and immediately send a message to the ClientComputerAgent. Next, this agent communicates the tag identification to the UsersProfileAgent, which consults the database to create the xml file that is returned to the ClientComputerAgent. After,, the ClientComputerAgent interacts with the ServiceAgent to invoke the Web Services needed to personalize the computer according to his profile.

4 Case Study

This paper presents a proximity detection system that is used by people with disabilities to facilitate their integration in the workplace. The main goal of the system is to detect the proximity of a person to a computer using ZigBee technology. This allows an individual to be identified, and for different actions to be performed on the computer, thus facilitating workplace integration: automatic switch on/off of the computer, identifying user profile, launching applications, and adapting the job to the specific needs of the user. Thanks to the Zigbee technology the prototype is notably superior to existing technologies using Bluetooth, infrareds or radiofrequencies, and is highly efficient with regards to detection and distance. Additionally, different types of situations in a work environment were taken into account, including nearby computers, shared computers, etc.

In our Case Study we have a distribution of computers and laptops in a real office environment, separated by a distance of 2 meters. The activation zone is approximately 90cm, a distance considered close enough to be able to initiate the activation process. It should be noted that there is a “Sensitive Area” in which it is unknown exactly which computer should be switched on; this is because two computers in close proximity may impede the system’s efficiency from switching on the desired computer. Tests demonstrate that the optimal distance separating two computers should be at least 40cm.

Figure 2 shows two tools that the system provides in the main server, where the ZigbeeManagerAgent is running. The screen shown above allows tracking the flow of events and controlling which computers are on and who are the users, identifying their tags and consulting the UsersProfileManagerAgent. Moreover, this tool allows executing applications or programs remotely. Figure 3 shows the screen that appears in the user’s computer when someone with a tag is close enough to it. The ClientComputerAgent running in this computer detects his presence and then, the computer is switched on with all the personal configurations.

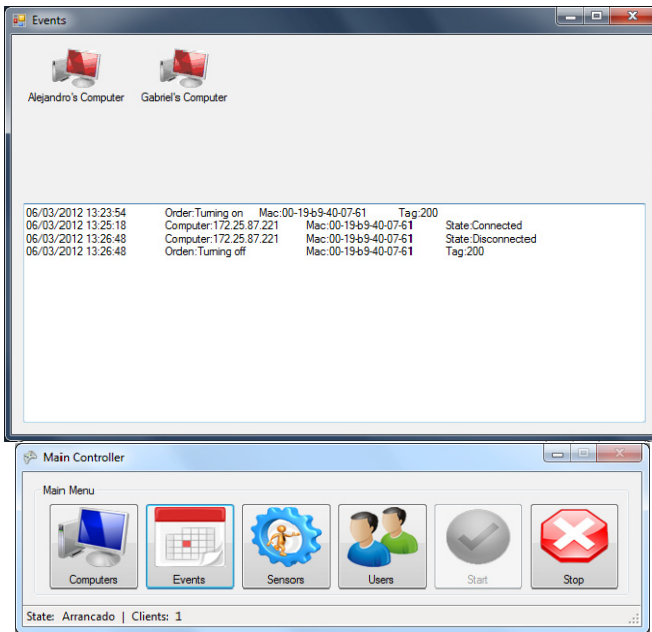


Fig. 2 Screenshot of the prototype in the main server

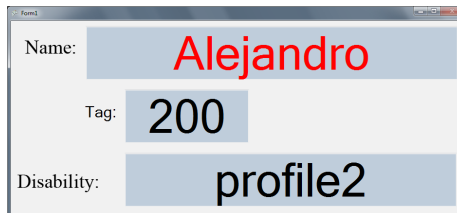


Fig. 3 Screenshot of the prototype in the main server

5 Conclusions

This prototype allows the detection and identification of a user making possible to detect any special needs, and for the computer to be automatically adapted for its use. This allows the system to define and manage the different profiles of people with disabilities, facilitating their job assimilation by automatically switching on or off the computer upon detecting the user's presence, or initiating a procedure that automatically adapts the computer to the personal needs of the user. This prototype is specifically oriented to facilitate the integration of people with disabilities into the workplace.

The prototype is part of complete and global project in which different tools for helping disabled people will be included. Using the PANGEA, that models all the services as Web Services and promotes scalability, the addition in the future of all those services that conform the global project will be easier. Some of these future services include pointer services, predictive writing mechanisms, adaptation for alternative peripheral, virtual interprets in language of signs, identification of objects by means of RFID, etc.

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