RESEARCH PAPER

Conceptual Model Of Web-Agent System For Campus Security And Emergency Communication

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Abstract

Campus is a large-scale environment which embodied the main buildings of a university or other higher institutions of learning with residential programmes and academic activities. Every campus should be properly secured to protect lives and properties through instant response to criminal or violence perpetration and natural disasters. Recently, agent-based systems and/or web-based systems are often integrated as automaton mechanism in the design and implementation of campus security and emergency communication systems.In this paper, we present a conceptual exploration and modelling approach of web-agent system for securing, monitoring and to alert people in an institution whenever a danger or disastrous incidence is perceived from strategic places and critical locations on campus using functional models in harnessing the communication lapses for safety on our campuses.

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1.INTRODUCTION.

The need for effective communication in any society can not be overemphasized, particularly in the twenty-first (21st) century where the whole world had transformed to a global village. Communication is an act, a process or means of interaction among people living in a geographical area at a particular period of time. Communication can take two major forms which are verbal and non verbal; verbal form of communication is an oral pattern of dispersing information, exchanging ideas and pleasantries such as speech making, telephone conversation, public speaking, group deliberation and so on. On the other hand, non verbal communication is usually created with ink, written or printed as the mode of discourse attributed to formal settings. Modern methods of communication evolve around multimedia and/or mass media. Mass media is concerned with the dissemination of information and crucial message to the people residing in a community, city or society at large. Alese, Thompson, Iwasokun & Omoniyi (2013, p.2) 'interpersonal communication is the communication where two or more people transactional influence one another, or have a mutual and simultaneous effect on one another'.

In emergency situation, communication plays a vital role in averting danger and disastrous incidences that could cause loss of lives, and as well as properties and community damages. Emergency communication is the exchange of information on emergency related ev vs such as fire outbreak, arm robbery, violence or accident which may require medical need for ambulance (Nada, Myung, Gaynor & Moulton, 2005). An emergency springs-up unplanned event that can cause death or significant injuries to employees and employer in an organization or customers in public places (Garda, 2010; Nada, Myung, Gaynor & Moulton, 2005). Alese, Thompson, Iwasokun & Omoniyi (2013) emergency could also result in shutting down of business, disruption of operations, and physical destruction in public places or environmental damages such as fire explosion, flood, hurricane and earthquake.

In university, polytechnic and colleges of education campuses where critical positions and buildings such as administrative blocks, faculties, departments, laboratories, lecture theatres, health centres, staff quarters, cafeteria, students' hall of residence, library and learning infrastructure are located; security control and monitoring are germane to planning, awareness and quick response to hazardous incidences in academic community.

This research explores ubiquitous technologies or solutions provided through intelligent information systems, and also depict their conceptual comparativeness through model which determines the preference for suitability, adequacy, efficiency, usability, rationality and functionality to support campus security and emergency notification.

In developing countries, information dispersal on emergency and hazardous events is quite poor, thereby causing untimely deaths, destruction of structures and basic infrastructures. Inability to discover, respond and intensify recovery efforts during violence, riot, attack, abduction, massacre, robbery, fire explosion; and to prepare adequately with possible restoration from natural disasters on our campuses are attributed to the inept and inconsistency of communication channels. Hence, the need for conceptual explorations of sustainable framework and solutions in

harnessing the communication lapses for safety.

2.RELATED LITERATURE

Most organizations and institutions containing critical locations need to be secured and monitored continuously for safety and preventive measures (Alkhateeb, Al-fakhry, Maghayreh, Aljawayr & Al-taani, 2010). Securing a campus to forestall any stampede and prepares for unforeseen circumstances may not be adequately achieved by security guards alone. Chakraborty (2010); Rovatsos (2015) opined that security agents ensure the safety of lives and properties in the campus; having stationed them in strategic places to watch over the main gates, inner offices and critical infrastructures. Preventive measures could help to avert dangers and to manage emergency that unavoidably emanates. Alkhateeb, Al-fakhry, Maghayreh, Aljawayr & Al-taani (2010) argued that traditional campus security can only be monitored by a person on fly, foot or vehicle; whereas an attacker may be dressed as a security personnel or officer on patrol to avoid being suspected.

At about a decade back, the efficacy and reliability of campus security system was quite questioning, when one experiences a situation where terrorist wore a mask to disguise and eventually launched an attack that caused serious atrocities on campus (Nada, Myung, Gaynor & Moulton, 2005). Often times, inadequate communication contributes to the intensity of common emergencies like fire outbreak, motor Alkhateeb, Al-fakhry, Maghayreh, Aljawayr & Al-taani (2010) multi-agents based system for securing university campus was built using intelligent agents and wireless sensor

accidents, bank robberies and natural hazard (Amarande, 2007). Lack of sensitisation and ineffective communication channel are the broken links between emergency victims and the rescuers. Emergency services provider must be contacted in timely manner in order to put a disastrous incidence under control. Alese, Thompson, Iwasokun & Omoniyi (2013) presented a web enabled emergency communication system; it is an internet-based solution to emergency management in tertiary institutions. It addressed a communication and interoperability problem through information exchange via browser supported mobile devices among staff/student, resident/internal security officers and external security/emergency agency with accessibility and availability considerations. Garda (2010); Nada, Myung, Gaynor & Moulton (2005) emergency response and recovery may require multi-organizational efforts involving government, volunteer and media organizations. Voice over Internet Protocol (VoIP) also allows an institution to integrate phone service into its emergency notification plan, along with other network resources such as e-mail, text messaging, networked signs, and alarms. In addition, cell networks are often overloaded in emergency situations, and a VoIP phone system provides an institution with additional capacity to make and receive calls even if cell service is disrupted. In these ways, the institution can effectively communicate with constituents in the event of an emergency (Amarande, 2007).

network. It detects security attack and any hazardous incidence through environmental monitoring across faculties and residential buildings using physical conditions such as

motion, temperature, vibration, sound, pressure and smoke at different locations, in order to alert the nearest and available security guard to the scene of incidence. Wireless Sensor Network (WSN) is a wireless network consisting of spatially distributed autonomous devices that jointly monitor environmental conditions using sensor (Arango, Dugan, Elliot, Huitema & Pckett, 2008).

An agent-based system implemented by (Rovatsos, 2015), is a location-aware, automated ubiquitous commerce using mobile agent interaction facilitated by wireless radio transmission medium. Amarande (2007) networked micro-sensors are deployed in natural space to enable long-term data collection at scales and resolutions that are difficult. The relevance and adequacy of agent-based architecture in (Chakraborty, 2010), wireless sensor network also has a significant application in commercial lighting control, which can benefit directly from artificial intelligence techniques. "This application requires decision making in the

3.CONCEPTUAL FRAMEWORK
Agent-Based Systems
Agent-based system is a technological artefact resulting from computer science research and artificial intelligence techniques. An intelligent agent perceives its environment and takes some actions that maximize its chances of success using rules based on reasoning and past experience. Chakraborty (2010) described intelligence as the computational part of the ability to achieve goals. It relate to tasks or behaviours involving higher mental processes such as perceiving, thinking, reasoning, learning, knowledge, creativity and communication.

face of uncertainty, with needs for system self-configuration and learning".

Securities systems are commonly equipped with distributed sensors and are used to retrieve incidence notification; it communicates with emergency dispatcher which assist in determining the appropriate emergency personnel (Nada, Myung, Gaynor & Moulton, 2005). Frameworks provided for emergency response and recovery in (Arango, Dugan, Elliot, Huitema & Pckett, 2008; Amarande, 2007; Garda, 2010) delivers safety, security and information services using wireless technology and Global Positioning System (GPS) satellite network. It helps in stolen vehicle location assistance, emergency services, roadside assistance with location, automatic airbag deployment and remote door unlock. However,
existing systems for campus security and emergency have limited usage and high cost of installation and maintenance thereby requiring conceptual exploration of selected systems.

An agent is anything that can perceive its environment through sensors and act upon that environment through its effectors (Rovatsos, 2015). Agent-based system is a computer system that is positioned in some environments with autonomy to meet its design objective. An agent is only autonomous and rational if it does not depend on the prior knowledge of its designer, but could adjust its behaviours by experience and percept sequence that makes it to be successful. Thus, agent-based architecture is synonymous to heuristic system or intelligent agent system. In system engineering, pre-execution review in software design ensures that functional requirements are met according to the methods, tools, techniques, approaches, methodologies, processes,

standards and quality assurance implored during software project.

Sometimes, operating environment of an agent may not be the real world because it could be programmed to simulate a natural incidence, though in artificial and complex environment. This type of agent is called software agent. Software agents are developed as the solutions in task

environments where problems exist. The practical application of agents' technology is found in distributed systems, personal software assistants, process aware systems, electronic commerce, virtual environments, security or safety systems and accident reporting systems. The proposed structure of an agent and autonomous entity is shown in figure 1.
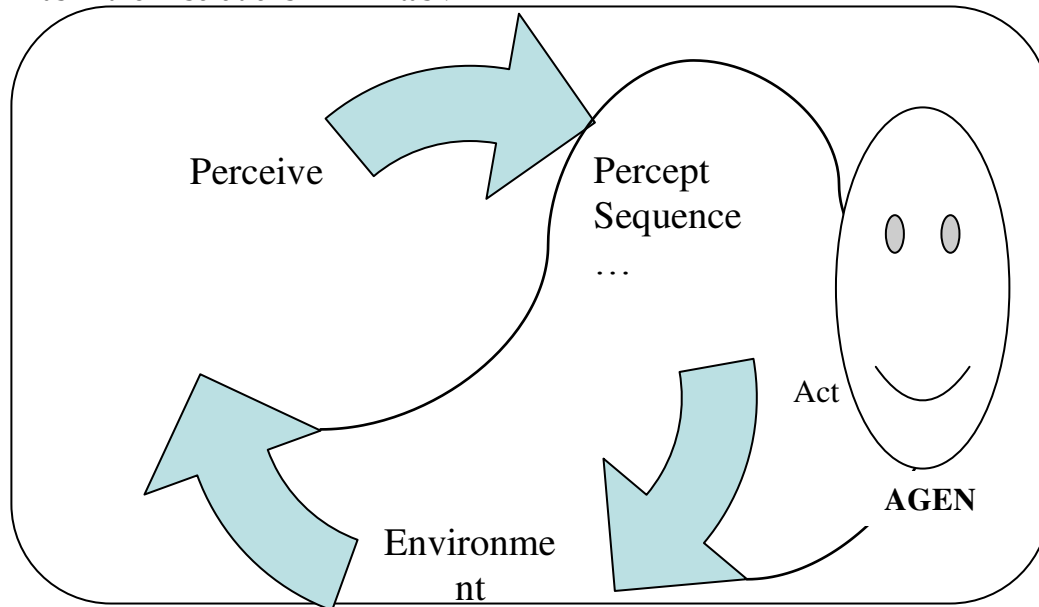

Fig. 1 Generic Architecture for Autonomous Agent

Multi-agent systems can be used to solve problems which are difficult for an individual agent to solve. Alkhateeb, Al-fakhry, Maghapreh, Aljawayr & Al-taani (2010) multi agent system (MAS) is a system composed of multiple interacting intelligent agents. These agents interact with one another representing terminal users or components with different goals in multi-agent systems (Rovatsos, 2015). Nada, Myung, Gaynor, Moulton (2005) agents manage and maintain a context that
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Web-Based Systems
In web development, internet application has real-time functionality for computation and information processing on web platform. The

constitutes mobile users, and then seeks to adapt and personalize content based upon perceived individual user needs. Context-aware services provide quick information that characterizes the state of an entity such as a person, building, infrastructure, location and so on. Agent-based system is quite open and extensive for deploying autonomous and proactive software and/or hardware components

design of a web enabled or web based information processing system usually adopts a three-tier architecture involving web server, database server and the client. Web server is

the domain name server/system (DNS) that hosted the web directory; it is an identity of the computer that accommodates the website or portal URL on the international network called INTERNET. URL means Uniform Resource Locator simply referred to as the address to a web page directory or website address. Network Operating System (NOS) like Microsoft Windows Server is a control program required on the server, also uses any of Apache, XAMPP, WAMP, IIS to transverse data and information. Database Management System (DBMS) like MySQL, SQL Server, Microsoft Access or Oracle is conveyed on Database server as software component at the back-end where information relating to system context is stored and retrieved at both client and server sides.

In the architecture, web browsers like Firefox, Opera, Chrome or Explorer operates as the user software or functional component of the client which forms the interface between web user and the server. Ekpenyonga & Chinyio (2013) emphasized the major tasks of a web browser in converting the web addresses or

URLs to Hyper Text Transfer Protocol (HTTP) requests. Like a stand-alone system or every other software development project, the quality of a web software or web-based system can be measured at every phase of development life cycle. Productivity of software is partially determined by factors like tools, methods, project speed and so on (Ekpenyonga & Chinyio, 2013).

Nowadays, technology driven approaches and cross platform compatible tools like HTML5, CSS3, JavaScript/VBScript, Jquery, PHP, Dream weaver, Adobe CS6 suite, Macromedia Flash are all attributed to web authoring practice. The complexity of a software product or web application could effectively predict its maintainability especially in distributed systems. Thus, flexibility is of concern when designing a web-based system. (Ekpenyonga & Chinyio, 2013) recommended careful considerations of design and choice which is understandable to the involved parties, when communicated by the key actors in web development project.

4.FUNCTIONAL MODEL

In this paper, use-cases model was proposed for functional exploration of web-agent system using Unified Modelling Language (UML). UML was used to describe the functional behaviour and operational scenarios of the selected systems which extend relationship in use-cases. Use-cases model describes functionality of the system from users' point of view. The proposed use-cases model of web-agent system with abstraction layer is depicted in figure 2.
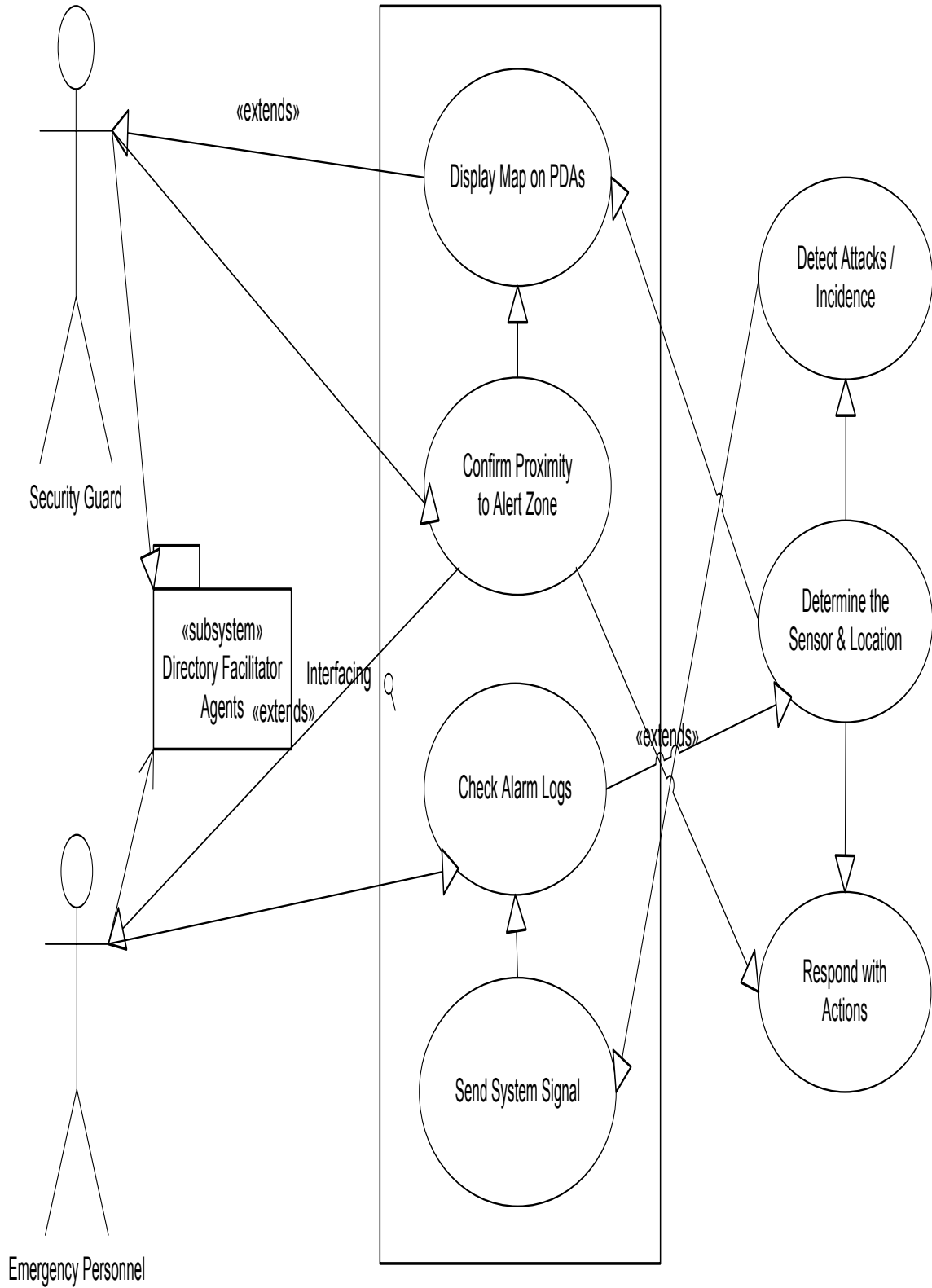
Fig. 2   A conceptual model of web-agent system in use-cases

5.DISCUSSION

Autonomy and rationality of web-based system is rarely determined as judged by comparative parameter; other issues emanating from web platform is the usability and design principles. Web development is a practice of designing for the unknown, in terms of users, device, platform, configuration, browser and so on. Web system could not be independently operational because it relies on the signal prompt by an eye witness when emergency situation or security attack arises. In addition, lack of training and funds may impede its success; if the security /emergency personnel are not ICT compliant in using the modern technology and gadgets which provide multimedia features and web/mobile browsers that can connect the internet application in order to report an incidence for quick response. Nonetheless, its suitability and interoperability are worthy of consideration; Amarande (2007) also proved the efficacy of IP Telephony to incorporate voice and video data with traffic intensity in web/internet enabled system for emergency notification via calls, SMS, emails.

Though, an agent may not completely control its environment but, it influences a control measure when abrupt changes and unplanned events arise. The environments are not fixed neither do the constituents or habitants of any environment static. Agent-based system can responds quickly to current circumstance due to autonomy. Sensors and effectors forms the perceptive and reactive components in agent-based system. Therefore, lack of fault tolerance would result in delay or inability to exert the expected actions in emergency situations.

6.CONCLUSION AND FUTURE WORK

The engineering approach to the development of intelligent information systems particularly in multi-agents perspective for distributed systems that operates independently and cooperatively with one another to achieve their design objectives had replaced control with communication. Rovatsos (2015) also agreed that individual agents are capable of autonomous action because they don't need to be told exactly what to do before they exhibit intelligence. Meanwhile, pervasive issues emanating from the design process of agent-based or multi-agents system generates questions like how should agents act and interact to carry out tasks; what language should agents used to exchange information; how should agents coordinate the activities of autonomous components from the users.

In view of the proposed Agent and Web-based Model for Campus Emergency Communication, we hope to design a simulation program possibly with real wireless sensors to experiment with the model in distributed environment. Quantitative data would be collected from the experiment through Participant Observation and Thurston Rating scale; thus, qualitative analysis of the observed data would be used to verify the performance.

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