

Original Article: An Augmented-Agent Framework for Disaster Response (AADR) in Academic Community



Ayeni A. Gabriel¹, Onuodu F. Eleonu²

¹Ph.D scholar, Department of Computer Science, Faculty of Natural and Applied Science, School of Post Graduate Studies, Rivers State University of Education, Port Harcourt, Nigeria

²Department of Computer Science, Faculty of Natural Sciences, University of Port Harcourt, Port Harcourt, Rivers State, Nigeria



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ABSTRACT

Academic community is a citadel environment, and needs adequate protection with responsive guard to forestall disastrous incidence or in emergency situation which may be disturbed by nature or human circumstance. Meanwhile, disaster control and emergency recovery require timely information and proactive measures to augment human effort. Conceptual explorations for disaster response and model design for augmented-agent were provided in this work. Augmented reality framework is a functional machine aid, whenever a danger or disastrous incidence is perceived from strategic places and critical locations within academic community.

Introduction

Reality technologies are really trending, as emanated by technological advancement for enhancing the physical environment [8, 10]. They work by contacted or non-contacted manner of real world with automated signal sensor and Global Positioning System, in contrary to virtual reality

that produces completely new scenarios, because augmented reality only overlays an improved content [5]. In reality, technologies, interaction and users' view with the real environment is made possible through digitalization and machine synchronization [11]. Emanation of digital content and AR system now pave ways for phone users with tendency to explore synthetic creatures on their smart devices.

*Corresponding Author: Ayeni A. Gabriel(ayeni4great@yahoo.co.uk)

Completing the existing environment to enhance the physical world by overlaying the virtual objects comes with more acceptances in formation and decision support [11]. It has also given room for a lot of improvements in games development, yielding better leisure, tourism and entertainment delights by integration on common computing platform [1]. At the moment, augmented reality helps to share experiences among people who are geographically dispersed in real time for increase knowledge and information [5]. The most recent development in reality technologies had envisaged the integration or incorporation which allows user with full immersion in the synthetic environment and interactive multimedia experience [10].

In the same vein, effective communication for societal co-existence is quite germane for disaster response and emergency recovery. Communication is very important in this era of digitalization and knowledge economy, so that group of people within and outside a settlement could share updates and live report to avert hazards with urgency [2], [3]. In disaster situation, information and concurrent interactions with first responders in any learned society and/or academic community is essential. Members of academic community can sustain physical injuries during crises; as it is applicable to the campuses for tertiary institutions where critical facilities and buildings are located [2].

Extensive review of recent and relevant literature has unveiled few works on process awareness and emergency management, without consideration for mixed reality and intelligent agent which can augment the sensory view of real time scenarios in real world and physical environment. Few studies previously carried out in this research area only concentrated on comparative study of reality trends. Futility in disaster recovery process and awareness channel is peculiar to inept surveillance and communication infrastructure.

The aim is to provide an augmented reality framework for disaster response with agent support in citadel environment, and to be accomplished by exploring the 'rule of thumb' in reality technologies as well as to design an architectural model for augmented-agent.

Literature Review

Smart community had earlier associated with 'augmented virtuality' (AV), with the tendency to have a platform independent mobile application for live incidence reporting by geographical dispersion [7]. It came into being by curiosity for mixed reality as a way of depicting interactively virtual element received from the real world. Mapping virtual element with physical environment is possible from optical device like webcam for physical objects, with utmost scalability [8].

Organizations, institutions and other large-scale environment with critical locations needs continuously monitoring for emergency and preventive measures [4]. Protecting academic environment to avert any hazardous situation and to exert rescue and recovery measures could be difficult for human personnel without complementary activities by synthetic entity [6]. Intelligent agent or supportive entities should be devised and mounted to corroborate security agents' efforts in ensuring adequate protection; preventive steps help in line with global best practices for hazard management and control when timely information is provided for rescue [6].

A functional smart city rests so much on communication infrastructure and technological innovation across the facet of lives; machine-aid transformation is indispensable for smart cities [7].

Rationale for agent-based and intelligent response

An intelligent agent operates as software, hardware or both with design specification to sense and exhibits cognitive behavior due to experience [3]. Emergency management encompasses awareness, rescue, or recovery with adequate collaboration involving human, machine, volunteer or eye witness to initialize necessary notification by technological aid [2], [9]. Improved multi-agents-based network could be implemented for detecting and escalating unplanned incidence relating to violence or disaster [6]; using sensorial notification and visual surveillance in surroundings and around the

residents when augmented agents are being leveraged upon. Structural artifact provided for disaster response and rescue support can ensure safety, and rapid monitoring using reality technology and Global Positioning System (GPS) as shown in Figure 1.

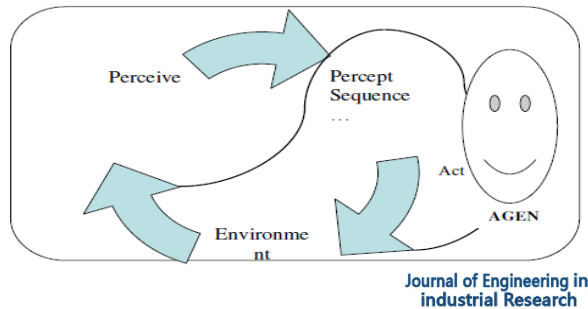


Figure 1. Generic Autonomous Agent Block [2]

Augmented-Agent Overview

Augmented-agent system is majorly characterized by combined real and virtual, interactive interface, and monitoring [8].

Multiple agents usually optimize the rationality and intelligent reasoning, by collective efforts to delegate the control and task accomplishment for complex task [4]. These ‘multi-agents’ are quite complex and by interaction among intelligent entities, inculcating communication with one

another represent remote users’ complementary entity in agent-based system [12]. Intelligence is the computational task in actualizing goals, concerning cognitive processes and mental activities [6].

Process-aware mechanism provides fast information that broadcast entity’s location and condition to all the concerned parties. Agent-based communication is very supportive and adaptive for environmental deployment and proactive reaction; surveillance gadgets are commonly embedded with signal sensors and perceive incidences, communicating with dispatcher to determine appropriate rescue agent [2].

Intelligent and rational agent is a machine dependent computer program or auxiliary device placed in special places or equipment to sense situation and exhibit actions. The rationale behind agent construction and control in system integration lies in self-reliance and control independence. The display technologies for Augmented Reality can be classified into two (2) groups: (i) Marker-based (ii) Location-based

The technical features of augmented-agent has been enumerated to include client application as AR software, host layer, back-end database, GIS server and others as used for functional specification in Figure 2.

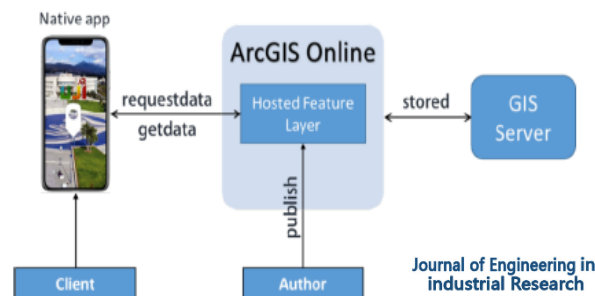


Figure 2. Conventional Smart City Architecture [7]

Model Design

Reality technology allows digital synchronization with agent-based programs for notification enhancements in environmental chaos and the likely scenario. Advancement in technology helps to visualize remote incidences in real time. Augmented-agent model was designed

to provide development framework as a benchmark for partial immersion in citadel environment to synchronize reality technologies for modern interaction in physical world. Its interdependent and scalability helps to mitigate coordination and control exertion in man-machine communication and/or human computer interaction in disastrous situation.

Therefore, process mapping concerns data for human entity or people, just as it is in Internet of Everything (IoE); the first responder could either be human (like an eye witness) or machine (like signal sensor). Basically, the incidence alarm is resulting from multi-agents and/or augmented agent to enable decision making and response

support for control and rescue efforts. Client's device like smart phone triggers escalation agent by providing eye witness report as input for augmented-agent system or proprietary AR application on mobile device through hosted layer by host /service provider as depicted in Figure 3

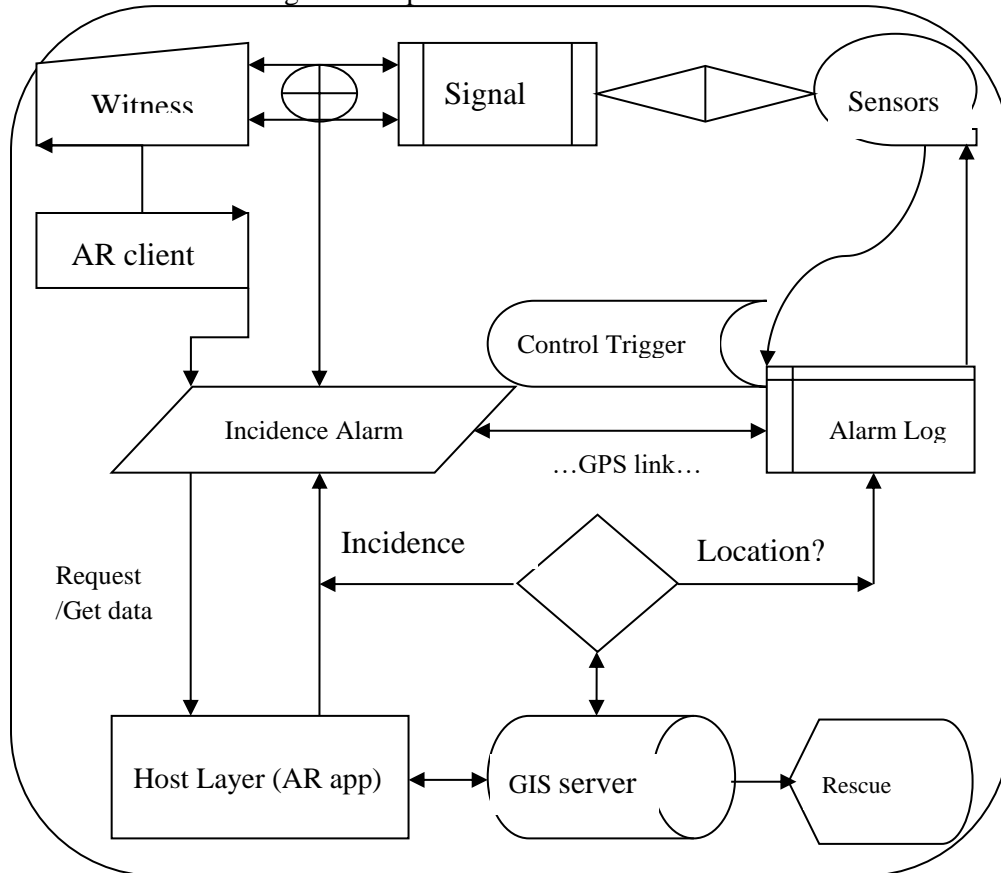


Figure 3. Proposed Augmented-Agent model for Disaster Response (AADR)

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Conclusion

AR technology is quite evolving to accommodate system synchronization for computational consciousness in physical environment through virtual aid, for hybrid development in surveillance and emergency response, particularly suitable for supporting the decision-making. Nevertheless, mobility and interoperability with similar systems and multimedia technologies is a considerable factor, because escalation could come from eye witness or by signal from intelligent agents when the need arises. Augmented solution is robust and fused in man-to-man communication for emergency management and critical circumstances. An

augmented-agent response support system is actually cost-effective for educational enterprise with operational expenditure to support response decision, which will spring up necessary and timely action to any unforeseen situation based on self-control.

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