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Framework to Manage Big Data in Smart Home Services

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ABSTRACT

In order to improve the effect of smart home control and management, a new smart home control and management method based on big data analysis is designed. The basic hardware of smart home control and management is designed, including smoke sensor hardware, temperature and humidity sensor hardware, and infrared sensor hardware, so as to collect smart home data and realize data visualization and buzzer alarm. The collected data are transmitted through the indoor wireless network of smart home gateway equipment, and the data distributed cache architecture based on big data analysis is used to store smart home data. Based on the relevant data, the hybrid particle swarm optimization algorithm is used to schedule the control and management tasks of smart home to complete the control and management of smart home.

KEYWORDS: *smart, home, framework, big data, manage, control, hardware, network, schedule, optimization*

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INTRODUCTION

There is today considerable interest in the use of information technology (IT) for collecting big data in networked communities or in domestic environments often called smart homes[1] and/or ambient assisted living in order to increase volume, variety and velocity of data and information.

Technology vendors and research groups are focused on how to produce, combine, analyze and effective use of big data from heterogeneous and distributed sources in order to provide services at home. Studies, both in the USA and in the EU, have reported that the interest in capturing the benefits of using big data increases due the expectations of its impact on quality and efficiency of health care delivery as in detecting diseases at earlier stages to be treated most successfully. There is also an expectation to be able to manage specific health populations and individuals and to detect health care fraud more quickly and efficiently.[1,2]

Big data is expected to fundamentally transform smart homes and ambient assisted living delivery of services and consequently managerial and economic aspects of health services delivery, business models and governance processes. But also to improve patient centered services, diminish costs and monitoring with real-time analysis as well as preventing potentially adverse events, such as side effects of medications, early development of infections, allergic reactions etc.

In smart homes environments, research projects and R&D ventures try to utilize consumer affordable technology to equip homes with a set of advanced electronics, sensors and automated devices specifically designed for care delivery, remote monitoring, and early detection of problems or emergency cases. Technology is also used as promotion of residential safety, increased quality of life and real-time analysis of the health conditions of individuals.

However, at the same time volumes of data are growing and the data used in health and social care are becoming more variable, complex and difficult to manage with the same tools, routines and organizational culture used in the past. In its 2011 report, Big Data: The Next Frontier for Innovation, Competition and Productivity, McKinsey estimates

that the potential value from data in US health care could be more than US$300 billion per year .[3,4]

This gives rise to a number of challenges such as:

A. the accuracy of techniques and technologies to enable the capture, storage, distribution, management and analysis of the information sampled
B. the accessibility to large volume of data from distributed sources to identify complex problems and management
C. managerial issues related to the fact that individuals change their roles from passive consumers into active participants
D. economic issues related to reimbursement policies and principles

Discussion

A 'smart home' isn't only a home outfitted with arranging associated items, however, it is an encouraging space where an individual or a gathering of individuals can make machines around them suit their particular everyday needs. Savvy home not just guarantees expanded home well-being and security, better asset the board and cost-proficiency yet additionally centers around giving improved client experience via automating everything time-bound. [5,6]

It empowers you to have the accommodation and solace you want in your home by ensuring that there are no wasted round-offs to perceive what was killed or not or going through the house to work the apparatuses. Truth be told, it controls, computerizes, and enhances capacities, for example, temperature, lighting, security via various frameworks in action either by itself or externally.

A smart home is a home that consolidates advanced automation to give the occupants modern checking and authority over the structure's capacities. Keen homes use 'home automation' advances to give mortgage holders collective feedback and data by observing numerous parts of a home.

As of late, new gadgets with well-being sensors have shown up. Every one of these gadgets is worked by the Internet and constrained by our cell phones and tablets. This point of view is known as the Internet of Things (IoT). The fundamental philosophy behind this thought is to work entirely on automation[7,8]

Home automation innovation implies that, with a framework IoT enacted, all gadgets will be controlled remotely. These associated gadgets are shrewd in light of the fact that they can decipher and investigate client information. With this information, security organizations can expand safety efforts after some

As per a report by Market Watch, the current value of the global smart home market was estimated to be around 55.65 USD around 2016 and is expected to triple by 2025 growing at a mammoth rate of almost 15 percent from 2017 to 2025.

Now that we know that the smart home market is of immense worth. Let us venture the ways in which Big Data can help in making smart home technology much more effective.[9,10]

1. Understanding the core of the data

A smart home uses several IoT devices. All the devices are connected wireless to your home's network and can communicate with each other to provide consumers with seamless user experience. A smart home uses a range of IoT devices. All these devices are connected to your home as a central configuration network unit. They communicate with each other seamlessly in order to provide an effective and enhanced user-experience. The devices have software accumulated in them in order to enhance communication with other networks and devices. In order to make sure that the service is glitch-free we have to make a concentrated effort to understand this connection.

2. Track user behavior

Big data can be used to track user behavior on a daily basis. This helps to analyze a particular customer's predominant routine. This not only helps us in tracking the first thing they use the device for, how they interact with the device, to what degree they interact with the devices, etc. Analytics-based coffee makers transmit the necessary information as to how much pots of coffee should be brewed as per the consumer's interest. Analytics gives complete and functional access to the consumer's mindset, behavior, and consumption patterns.[11,12]

3. Big Data in smart homes enhances security

Big data analytics in home security systems enhances their functionality. It makes sure that the system is equipped to provide security as per the previous records of any recognizable thefts, robbery, etc.

Smart home systems achieved great popularity in the last decades as they increase the comfort and quality of life. Most smart home systems are controlled by smartphones and microcontrollers. A smartphone application is used to control and monitor home functions using wireless communication techniques. We explore the concept of smart home with the integration of IoT services and cloud computing to it, by embedding intelligence into sensors and actuators, networking of smart things using the corresponding technology, facilitating interactions with smart things using cloud computing for easy access in different

locations, increasing computation power, storage space and improving data exchange efficiency.

Results

he internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data over a network.[13,14]

Increasingly, organizations in a variety of industries are using IoT to operate more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase the value of the business.

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data.

Devices in the home are now getting increasingly connected to a cloud service, with access to controls and content from anywhere. These connected devices become smart when they are able to analyze and act upon consumer data for interpreting consumer behavior and enhancing comfort, convenience, and safety. Smart home technology generally refers to any suite of IoT-enabled devices, appliances, or systems that connect into a common network and can be independently controlled.[15,16]

The convenience factor that smart home technology provides is enormous. Being able to keep all of the technology in your home connected with IoT is a massive step forward for technology and home management. Also, smart home systems tend to be wonderfully flexible when it comes to accommodating new devices, appliances, and other technology.

As smart home technology aims at providing customers with connected products that are loaded with possibilities to make a person's life easier, more convenient, and more comfortable, we have listed down few smart home applications that can make your house the ultimate smart home.

SMART LOCKS
Smart locks connect to the home network and facilitate homeowners to grant access remotely, view images from the door lock's point of view, and even schedule access for various users and various times.

SMART LIGHTS
Smart lights offer energy efficiency and come with high efficiency fixtures and automated controls to make adjustments based on conditions such as daylight availability or occupancy.

SMART BULBS
Smart bulbs can be wirelessly connected to phone apps or a home automation hub that you can control from anywhere. With smart bulbs you can not only dim them using the corresponding app on your mobile, but you can also change their colors, listen to music on their in-built speakers, and even help you sleep better.

HOME SECURITY
The homes security system connects to your home Wi-Fi network, helping you monitor and control your security devices using an app on your smartphone. It helps build a comprehensive system that includes sensors and detectors installed in different parts of your home.

SMART DOORBELLS
A smart doorbell notifies the owner of the house, via her smartphone, whenever a guest arrives at the doorstep. The built-in sensors of the smart bell get activated when a guest approaches, and the bell rings.[17,18]

TEMPERATURE CONTROLS
Smart temperature control devices are programmed to increase comfort and save energy in homes. They detect factors like number of occupants, time of the day, and outside weather to adjust the temperature conditions inside the home accordingly.

SMOKE DETECTORS
A smart smoke detector alerts you anywhere your mobile has an Internet connection. Its biggest advantage comes with the fact that it warns you against a potential danger even when you're not home.

SMART SHADES
Smart shades can be conveniently opened and closed using a remote, button, or an app on your phone. They minimize the amount of energy your HVAC system uses and know when to open or close, sensing the temperature within and outside the house.[19,20]

BABY MONITORS
Baby monitors help parents or guardians attend to their kids whenever they need them. A baby monitor transmits any sound made by the baby to its attendant. It also allows two-way communication between the guardians and the child.[21,22]

SMART SPRINKLERS
Smart sprinklers take care of your gardens and lawns, while reducing water consumption. They can also draw data from sensors to determine the watering needs of your plants.

SMART GARAGE
Smart garage offer you both convenience and security. You can open and close your garage doors using a simple app on your phone or a button or remote. While at the same time, with a smart garage you can ensure you have an eye on activity taking place in your garage or if you've left its door unlocked.

SMART ENVIRONMENT (MULTIPLE USES)
There players, both and small, that offering a whole range of products that cover almost every corner of your smart home, making it truly smart. The Amazon Echo, Mother Sen.se or Philips Hue are few of the many products that can will add the smartness of your home.[23,24]

CONCLUSIONS
While some smart home technologies are only in early development, the future is already here. Some elements of smart home equipment may require significant investment with long-term rewards. Others are simple and affordable. Thus, making small changes to your home's functionality can help you in enjoying the advantages of these smart devices and can result in potential savings.[25,26]

Smart homes are considered effective solutions for home health care for the elderly, as smart home technologies can reduce care costs and improve elderly residents' independence. To develop a greater understanding of smart homes for health care services (SHHSs), the necessity of ecological approaches with an emphasis on environmental constraints. 2 rationales: (1) users are inclined to perceive the service quality and service experience from environments (ie, servicescape) owing to the intangibility of health care and the pervasiveness of smart home technologies, and (2) both service domains are complex adaptive systems in which diversified and undefined service experiences—not only a few intended service flows—can be generated by complex combinations of servicescape elements.[27]

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