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Applicability of Big Data Techniques to Smart Home

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Abstract:
This paper presents the main foundations of Big Data deployment in smart homes. The proposed architecture can be applied to different smart cities applications. We describe multiple objectives of smart cities based on big data analysis. This approach is to analyze potential of the applicability of IoT techniques to provide profitable services of smart cities, such as the management of the energy consumption and comfort in smart buildings, and the detection of travel profiles in smart transport. Applications of big data analysis are in two scenarios, both dealing with sensed data coming from both static and dynamic sources. Among other objectives, the first scenario intends to create a distributed framework to share large volumes of heterogeneous information for their use in smart building applications.

Index Terms: Internet of Things; Smart homes; Big Data; Cloud computing

I. INTRODUCTION

The term domotics is building automation for a home, called a smart home or smart house. It involves the control and automation of lighting, heating such as smart thermostats, ventilation, air conditioning (HVAC), and security such as smart locks. Wi-Fi is often used for remote monitoring and control. Home devices, when remotely monitored and controlled via the Internet, are an important constituent of the Internet of Things. Modern systems generally consist of switches and sensors connected to a central hub sometimes called a "gateway" from which the system is controlled with a user interface that is interacted either with a wall-mounted terminal, tablet computer or a web interface. A Smart home emerges when the infrastructure is evolved through the Information and Communication Technologies (ICT). The paradigm of Internet of Things (IoT) has enabled the emergence of a high number of different communication protocols, which can be used to communicate with commercial devices using different data representations. In this context, it is necessary an IoT-based platform to manage all interoperability aspects and enable the integration of optimal Artificial Intelligence (AI) techniques in order to model contextual relationships. We propose a architecture for smart home using Big Data techniques.

II. IOT GENERAL DESCRIPTION

The **Internet of things** (**IoT**) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure. IoT has evolved from the convergence of wireless technologies, micro electromechanical systems (MEMS) and the Internet. The concept may also be referred to as the Internet of Everything. The internet of things (IoT) is the internetworking of physical devices, vehicles, buildings and other items— embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. 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 manmade object that can be assigned an IP address and provided with the ability to transfer data over a network.

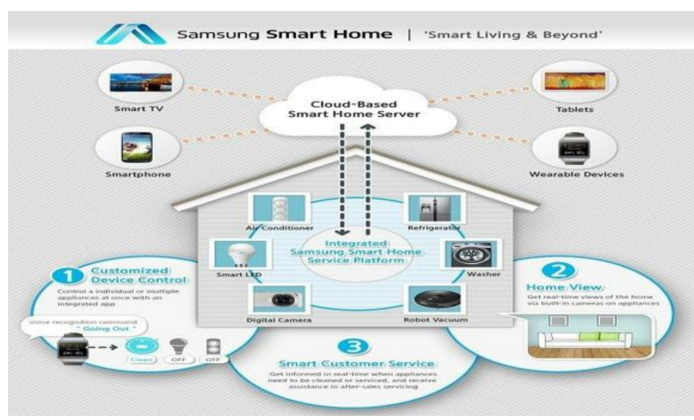


Figure.1. IoT architecture

III. IOT BASED ARCHITECTURE

Internet of Things (IoT) is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. IoT board featured with SIM900 GPRS modem to activate internet connection also equipped with a controller to process all inputUART data to GPRS based online data. Data may be updated to a specific site or a social network by which the user can able to access the data.

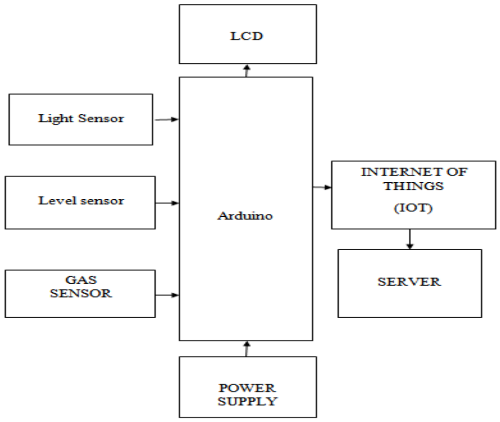


Figure.2. Block diagram

PRODUCT DESCRIPTION

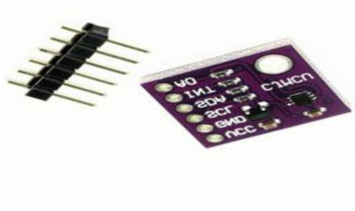
DS18B20 for arduino was quickly ported because of open source development to a new version that helped developers to integrate DS18B20 with Linkit one. Understanding these things become crucial as IoT tends to evolve continuously and having an equally responsive platform makes it business safe to proceed.

Figure.3.IoT Controller

Power Supply: DC +12v 1Amp. Auto data updating: 30sec Digital Output port Pins: +5V DC, Message Format: *message or Data # (Start with * and End with #), Provided with 3 links, Data updating to a specific web site♣ Device controlling web site.Data updating to a social network♣WEB SERVER

AMBIENT LIGHT SENSOR

The APDS-9930 provides digital ambient light sensing (ALS), IR LED and a complete proximity detection system in a single 8 pin package. The proximity function offers plug and play detection to 100 mm, thus eliminating the need for factory calibration of the end equipment. The wide dynamic range also allows for operation in short distance detection behind dark glass such as a cell phone.



Ambient light sensor

Figure.4.Light sensor

PRODUCT DESCRIPTION

The APDS-9930 is particularly useful for display management with the purpose of extending battery life and providing optimum viewing in diverse lighting conditions. Display panel and keyboard backlighting can account for up to 30 to 40 percent of total platform power. The ALS features are ideal for use in notebook PCs, LCD monitors, flat-panel televisions, and cell phones. The ALS features are ideal for use in notebook PCs, LCD monitors, flatpanel televisions, and cell phones. The proximity function is targeted specifically towards near field proximity applications. In cell phones, the proximity detection can detect when the user positions the phone close to their ear. The device is fast enough to provide proximity information at a high repetition rate needed when answering a phone call. This provides both improved “green” power saving capability and the added security to lock the computer when the user is not present. In addition, an internal state machine provides the ability to put the device into a low power mode in between ALS and proximity measurements providing very low average power consumption.

FEATURES: Supply voltage: (3.3v-5v) DC• I• 2C interface compatible Programmable wait timer• 16-bit resolution• Low lux performance at 0.01 lux•

TEMPERATURE SENSOR LM 35

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy.

PRODUCT DESCRIPTION

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in oC). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 oC temperature rise in still air. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 µA from the supply, it has very low self-heating of less than 0.1°C in still air. The LM35 device is rated to operate over a −55°C to 150°C temperature range.

LEVEL SENSOR

Level sensors detect the level of liquids and other fluids and powders that exhibit an upper free surface. Substances that flow become essentially horizontal in their containers (or other physical boundaries) because of gravity whereas most bulk solids pile at an angle of repose to a peak. There are many physical and application variables that affect the selection of the optimal level monitoring method for industrial and commercial processes. The selection criteria include the physical: phase (liquid, solid or slurry), temperature, pressure or vacuum, chemistry, dielectric constant of medium, density (specific gravity) of medium, agitation (action), acoustical or electrical noise, vibration, mechanical shock, tank or bin size and shape.

PRODUCT DESCRIPTION

Level sensors detect the level of substances that flow, including liquids, Slurries, granular materials, and powders. The substance to be measured can be inside a container or can be in its natural form. The level measurement can be either continuous or point values. Continuous level sensors measure level within a specified range and determine the exact amount of substance in a certain place. While point-level sensors only indicate whether the substance is above or below the sensing point generally the latter detect levels that are excessively high or low. Selection of an appropriate type of sensor suiting to the application requirement is very important.

Figure.5. Level sensor

IV. IMPLEMENTATION OF SMART HOME USING ARDUINO

In arduino kit temperature sensor, water level and gas sensors are interfaced and controled by the controller. Each sensor senses the respective specification and provides the result. Temperature sensor senses temperature of the room very accurately, gas sensor detects the gas leakage in home, level sensor measures the level of water with specified range and then indicate the result to personal computer, every sensor has its own characteristics. The output of these sensors are send to the IoT controller and then to the server. The server collects several data which is monitored in pc can be viewed by the human. And the data's are well secured and safe; it cannot be hacked by the hackers.

SPECIFICATIONS

SOFTWARE **:** Embedded 'C'
TOOLS **:** Keil uVision, Flash magic
TARGET DEVICE **:** Arduino

V.CONCLUSION AND FUTURE WORK

A smart home is any structure that uses automated processes to automatically control the operations including heating, ventilation, air conditioning, lighting, security and other systems. A smart home uses sensors, actuators and microchips, in order to collect data and manage it. This infrastructure helps owners, operators and facility managers improve asset reliability and performance, which reduces energy use, optimizes how space is used and minimizes the environmental impact of buildings. It enables high level of security and safety. Future works can be carried by including peoples behaviour patterns as input of the energy management of buildings.

VI.RESULTS

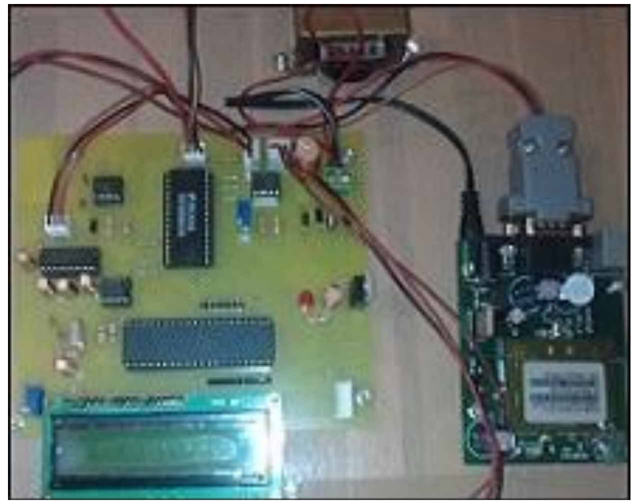


Figure.6.Implementation results

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