Paper Title: Recent issues and challenges in Internet of things: A smart city application perspective

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ABSTRACT

A city comprises of residents, many gadgets and framework. An essential consideration of a smart city is for making a smart livelihood surrounding whether it is control of waste or conveyance or widespread work or healthcare. To illustrate, instantaneous diagnosis of a heart attack will not be adequate to rescue the survival of a person, however, extra steps like instantaneous attainment of an ambulance, escalating an urgent problem at the nearby convenient hospital, issuing support from a doctor at a hospital are unavoidable actions to rescue the survival of a person. These needs coordinated surroundings in which a lot of operations are elaborated where the diagnosis of a condition of a patient with the help of IoT sensing elements plays a vital role. Instead, smart energy systems can be utilized in the form of smart meters and smart billings for overcoming the limitations of the regular procedures. In reality, an interaction among the dissimilar level, namely, IoT-Fog-Cloud is utilized for productively sensing, analysing, and storing data individually. Moreover, sensing elements can be appropriately utilized in telemetry systems for detecting floods, earthquakes and landslides automatically. There are a lot of fields like extensive geospatial sensing networks, big data analytics, recognition of deviating and dangerous incidents, identification of actual incidents that can be taken into consideration as inherent fields that can be attached to the IoT spectrum. Artificial intelligence plays a significant part in these applications.

One of the fundamental applications of IoT is smart city. A smart city is a built-up establishment perspective for integrating information and communication technology and Internet of Things technology in a protected way for managing the city's resources.

Government bodies direct the smart cities as they want to issue satisfactory assistance to the citizens or enlarging productivity in widespread assistance. Smart city can launch a lot of benefits in the optimization and supervision of normal widespread assistance such as conveyance system, observation and subsistence of city areas, system of radiance in the city, safe-keeping and preserving of cultural heritage, collection and discarding of waste, management of energy and power grid system.

Dissimilar categorization of data is obtainable that can be taken advantage of for increasing the clearness in the controlling of localized management and inspire the citizen for dynamically take part in a more appropriate supervision of widespread management in smart city. Public Private Partnership (PPP) model is very much essential for smart city. The most significant technological problem in the prosperity of the idea of smart city project is the interactivity of the diversified gadgets and technologies utilized.

Certain possible tasks which would have been entitled in the smart city theories are smart parking, supervision of noise, structural health, smart lighting, management of waste, supervision of status of air, obstruction of traffic, public contribution automation, utilization of city energy, etc.

The smart parking application in IoT needs utilization of smart road sensing elements and smart displays which can lead commuters along the most appropriate parking space present in the city.

Smart roads enabled with sensing elements will be able to issue information on status of driving, estimation time taken to travel and attentiveness if there is an imperfect condition of driving, traffic obstructions and collisions. That information will assist to make the roads secure and assist to reduce traffic jams.

I. INTRODUCTION

Smart city provides a map of noise pollution in space-time for any city location.

Appropriate structural monitoring of historical monuments and buildings are done by identifying areas which has high impact of the external agents in smart city.

IoT systems are utilized to monitor the significant framework in cities likes premises, gas and water channels, communal conveyance and power sub-stations. IoT systems to detect fire, leakage of gas and water help to generate alerts and reduce their effects on significant framework.

Smart lighting for routes, public gardens and premises assist to save. Smart lighting permits lighting to be supervised with great effort and also adjust to the atmospheric surroundings.

The IoT-enabled smart waste containers send information to the control center to process data with the help of certain distinctive optimization software and determine the optimal management of the fleet of the collector task.

Smart city can issue methods for measuring the air quality in the city central, city parks and other crowded places of the city for decreasing emissions from greenhouse gases,

City Energy Consumption is utilized to identify main energy consumption sources and areas.

In this topic, we will explain the issues and the challenges to face those issues in these potential services which are enabled in smart city concepts.

II. SMART PARKING:

To find a space for parking at the crowded hours in very crowded cities consumes a lot of time. Moreover, when drivers search for parking slots blindly, that will cause more traffic congestion. With the help of smart parking, to search parking slots has become very feasible and advantageous for drivers. Smart parking is connected by IoT systems which can find the number of unoccupied parking slots and transmit the information via the Internet to back-ends of smart parking application. Drivers can access these applications through tablets, in-car navigation systems and smart phones. Sensing elements are utilized for every parking space for finding whether the slot is unoccupied or not in smart parking. Localized controller aggregates this information and send to database via the Internet.

Noise monitoring: Noise is taken into consideration as a type of audible pollution in current days especially at the time of traffic congestion because of horns. Local governing bodies issue certain principles to decrease the noise pollution in specific parts of city at the time of peak hours of the day. Smart city issues the noise monitoring solution by estimating the noise at any time in the city. It gives a noise pollution map in space-time for any location of the city. The demanding part of this task is the security concern of the citizens because of the sound detector and micro-phones instalment in the city. IoT can vary driving practice by spontaneously deactivating horn at traffic junctions or highways.

Smart Lighting: Smart lighting systems for routes, public gardens and premises assist for saving energy. Smart lights which are linked to the Internet can be remotely supervised for forming plans of lighting and power of lighting. Tradition lighting arrangements can be set for dissimilar circumstances like a misty day, a festival etc. Smart lights provided with sensing elements can be transferred with other lights and interchange information on the sensed atmospheric surroundings for adapting the lighting.

III. WASTE MANAGEMENT

The IoT solutions utilization in the waste management will give remarkable surroundings profit-making benefits. The smart waste containers which are IoT-enabled send the information to the control center to process the data

using certain typical optimization software and to decide the optimal management of the fleet of the collector truck. It also assists to establish processing centers with suitable capability for that specific area or community.

Air quality: To reduce the greenhouse gas emission, smart city may provide the means to measure the quality of the air in the city central, city parks and other crowded places of the city. Certain types of frameworks need to be built using IoT-enabled devices for issuing healthful route to the citizens when they go for a morning walk or the workplace. Air quality and pollution sensing elements are utilized to strengthen this kind of framework and the processed data has to be obtainable to all citizens worldwide.

IV. SMART ROADS:

Smart roads provided with sensing elements can issue information on conditions of driving, estimated time for travel and warnings if there are accidents and traffic congestion and conditions of driving are bad. Such information assists to develop safe routes and assist to reduce traffic jams. Information felt through roads can be transmitted through Internet to applications based on cloud and societal channel and circulated to the drivers who support those applications. An allocated and independent system of sensing elements network junctions to improve driving carefully on public routes is recommended. This system can issue the drivers and commuters with a well-organized perspective of the road condition a few hundred meters ahead of them or a few dozen miles away, so that they can respond to possible risks much before.

V. STRUCTURAL HEALTH MONITORING

Structural health monitoring systems utilize a network of sensing elements for monitoring the levels of vibrations in the structures like bridges and buildings. The data which the sensing elements collect is analyzed for assessing the structures' health. It is feasible to find breaks and mechanized malfunctions, detect destructions in the structure and compute the persisting life of structure by analyzing the data. Utilizing such systems, early alerts can be given if there is impending faultiness of the structure. As structural health supervision systems utilize vast range of wireless sensor nodes which are charged by conventional cells, researchers explore energy harvesting technologies to harvest atmospheric energy, like mechanical vibrations, sunlight and wind.

In smart city, proper structural monitoring of the historical monuments and buildings are done through the identification of areas having high impact of the external agents. Vibration and deformation sensing elements are used to supervise the stress of the building, bridges and roads. Chemical sensing elements in the nearby places utilized to verify the levels of pollution and the conditions of surroundings are characterized using the temperature and humidity sensing elements. These three parameters affect the longevity of any structure and in smart city, the complete database of the buildings is prepared for further study and research. Initial investment is required for creating smart IoT-based system to measure the structural health of the buildings.

VI. SURVEILLANCE

Observation of framework, public conveyance and incidents in cities is needed for ensuring safety and protection. City wide observation framework consists of large number of allocated and video supervision cameras linked with Internet can be treated. The video feeds from supervision cameras are grouped in compliant storage solutions on the basis of cloud. Video analytics applications based on cloud can be established for searching patterns or particular incidents through the video feeds.

VII. EMERGENCY RESPONSE

IoT systems are utilized to supervise the crucial framework in cities like buildings, gas and water channels, public transport and power sub-stations. IoT systems for fire detection, detection of gas and water leaking assist to generate warnings and minimize their actions on the critical infrastructure. IoT systems for critical infrastructure supervision permit aggregation and information collected through many sensing elements are shared. Using cloud-based architectures, multi-modal information like sensor data, audio, video feeds can be

analyzed in near real-time to detect adverse events. Replies to warnings produced by such systems can be in the form of warnings sent to the public, traffic re-routing, evacuations of the affected areas, etc.

VIII. THREAT MODEL

The aim of the opponent is to sacrifice the smart energy meters and steal the electricity for getting monetary benefits. The opponent launches the energy theft attack in a way that the control center will not raise a flag. One of the most common types of energy theft attack is to steal the energy at the night-time because of low-inspection probability at night. Here, the consumer utilizes the legal energy in daylight and obtain the financial advantage by decreasing the consumption of total energy. Energy theft techniques can be broadly categorized into three types:

i. Physical attack

ii. Cyber attack

iii. Data attack

Physical attack: Traditional mechanical and digital meters along with the latest smart energy meters are vulnerable to physical attack. In this type of attack, adversary gets the financial benefit by reporting malicious energy consumption data using physical customization of the meters. Some of the classic examples of the physical attack are meter tampering, reversing or disconnecting the meter and bypassing the meter to remove the load. Meter tampering is done using strong magnet for causing interference with meter instruments. Tamper event detection is one of the solutions for detecting physical attack but the opponent can easily defeat the tamper event detection seal.

Cyber-attack: This type of attack is launched by sacrificing the smart energy meter through remote network exploits, intercepting the communication among the meter and the control center and interrupting the measurements sent by the energy meters to the utility or by modifying the storage of the meter. These attacks are carried out over the communication channel among the meter and the control center or inside the meter.

Data attack: Here, opponent targets the energy consumption data using physical attack or cyber-attack or both. Some general cases of data attack include reporting zero energy consumption, disconnecting the high consumption appliances from the measurement and altering appliance load profile.

Energy theft detection methods: These methods can be categorized into three types:

i. State-based method
ii. Game theory-based method
iii. Classification-based method

In state-based method, certain additional gadgets like RFID tags and wireless sensing elements are utilized for detecting the energy theft. In game-theory based method, the problem of detection is framed as a game among the energy utility and energy thief. The challenge in the game-theory based method is the formation of the utility function for all the players. In classification-based method, different methods are used like Support Vector Machine (SVM), neural network, fuzzy classification. One of the drawbacks of classification-based methods is imbalance in data. Other drawback is that the classification-based methods are exposed to contamination attacks.

REFERENCES

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