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SMART CITY TO INTELLIGENT HOUSES: FUTURISTIC SUSTAINABILITY APPROACH

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Abstract:

Human comfort is the key factor in all kind of developments, for this natural resources are exploitation is being continued. Though energy production have increased tremendously, but population growth rate is more than the development rate. Hence there is always scarcity of the electricity, safe drinking water. Intelligent houses with smart traffic, smart irrigation can make smart city and provide some solutions for these problems. In these review paper solutions of some common society problems with sensor based automation in infrastructure has been discussed. Major areas of overview are intelligent buildings, smart ventilation of buildings, integration of solar panels with smart roof, smart traffics control, and smart irrigation system etc. These smart systems not only saving energy, and water but also reducing the cost hence desirable. Though this arrangement need so many sensors, control system, management system, computer internets network hence complicated but solving our problems smartly. The future time will be of smart infrastructure.

Keywords: Sensors; Intelligent Buildings; Smart City.

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1. Introduction

The world is moving toward the atomisation of every work that is called Smart World. But the natural resources are limited. Two things are always in the scarcity in the world: safe drinking water and energy. That is why the peoples are trying to find the solution of this scarcity of electricity, and safe drinking water. People are searching alternatives every day by their innovative ideas. From individual house to house-environment that is city. Efforts are working for the saving energy, saving water and other natural resources. Maximizing the use of renewable energy like solar energy, wind energy and by reducing use of conventional source of energy that is electricity, gases etc. For making a city smart people are working for smart house with automated facilities, making smart energy supply system, by making smart roads and traffic system, by smart irrigation system, by making smart ventilation system. By smart irrigation we can irrigate the fields with the automated system which will sprinkle the water in the fields with only the required amount of water and according to the types of crop and weather and demand of

soil type. This will save the electricity and water. Green and sustainability are important topics these days. Traffic problems and air pollutions are big hurdles against smart city concept.

1.1. Intelligent Buildings

A building which is having such operational features which can change according to the need and demand of the user easily and economically according to the no. of persons and environmental conditions till building's life. It requires a centralised system for monitoring and control.

Many engineering operations, security and life safety systems are performed. These systems are integrated together by computers. These kind of automated systems not only increase the human comfort but also reduce the persons required to operate. These automated systems also reacts any malfunction very quickly so that user can take corrective actions. For automation of functions integration of so many sensors and actuators, controllers is required. Automation depends on the need of the occupants or the benefits which occupants will drive. The word intelligent buildings are generally used for automated performance buildings. Automation of functions are generally controlled by computers. In smart buildings user's comforts automatically controlled like temperatures, humidity, and brightness. Light can be turning on, turnoff automatically when room is in use or empty. It can adjust room temperature according to the weather. Intelligent buildings or smart places such as residential buildings, hospitals, offices, public places shopping complexes, malls, colleges etc which are having sensing and self-managing capabilities in the favour of occupants-comforts and energy saving both. The design of smart and intelligent building is very completed in nature. As it contains too many sensors, devices, computers, actuators, controllers etc. Since they manage comforts, energy and safety systems efficiently hence getting much attention of the people. Thermal -trends, power consumption, heating ventilation, air-conditioning (HVAC), lighting, fire safety, security systems, and many other functions that have to be managed by intelligent building's management system, hence they are very complex system. It may contain many sub system, and many interconnected devices, which compute, gather and distribute huge information. Energy box work as embedded system gather data from sensors and actuators for actuation of response. (1, 2,3,4,5,6)

1.2. Integration of Solar Energy System in Buildings

Generally solar panels are used for heating water and for generating electricity. For development of renewable energy sources, building integrated photo voltaic can play important role in energy generation. Solar cell panel array can be replace the traditional slope roof top. it will not only improve the roof aesthetic but also may beneficial economically. Roof top photovoltaic panels have been demonstrated in china successfully. It is constructed in such a way that it saves materials and labour required for making roof top, but also acts as quality roof with saves from rain water and they are also helpful in controlling inside room temperature. When solar panels are used as roof or any building component they joined in such a way so that rain water cannot leak through them. (7, 8)

1.3. Smart Grids: Future's Cities Requirement

Electricity is very essential service to our society, but there is always shortage of this energy as per need. Hence for manage this energy all energy sources should be interconnected and fluctuation should be managed by making smart grid. In future all kind of energy (electricity, gas, heat) whether government, private or personal, will be interconnected and maintained by smart grids. Every energy point home, office, transport, will be connected together and will be handled by data handling and telecommunication system. City will become energy efficient by interlinking of all energy sources and distribution by intelligent energy management system. All locations where energy produced, stored and exchanged will be interlinked by energy management system. All data will be centrally controlled and managed with the help of appropriate telecommunication infrastructure which is essential part of this Smart Grid. (9)

1.4. Smart Irrigation System

Traditionally farmers water the field or in garden manually at regular interval, quantity of water used in irrigation is generally more than required hence much water is wastage. In smart irrigation system water wastage can be reduce up to 75-80 % by providing water to plants automatically as per their requirement. And constant supervision is not required. This will conserve our water resources and reduce man power deployed in field for irrigation work. This can be done by application of Embedded and micro controller system. This provision is by installing sensors in the field to monitor soil conditions of moisture and temperature. These data are transferred to microcontroller which estimates the demand of water to soil for that condition. (10, 11, 12, 13, 14, 15)

1.5. Bus Rapid Transit (BRT) System

With the increase of population, no of vehicles are also increasing rapidly. Hence in big cities traffic problem and traffic Jams are very common. it is advanced bus operator system, which is centrally controlled for their dispatch and assist by GPS system. All controllers are done by advanced communication system and computer, network system and GPS. Then in different slots of roads and rotary signals the intelligent operation can be performed. Traffic jams also producing air pollution and reducing road efficiency. Traffic problems increasing day by day road accidents also. By signal control and inputs from GPS these jam can be controlled by controlling traffic signals. This advanced system reducing bus delays and accidents .by knowing the situation in the bus headways by advance system bus time fluctuations, and scheduled deviations, delays reduced. (16, 17)

1.6. Ventilation Control in Intelligent Buildings

These days green buildings are becoming very popular, in which indoor air quality is important factor. These days in intelligent buildings with special sensors and automation systems ventilation and air quality can also be controlled. The optimal ventilation rate can be controlled by setting the sensors of air quality and permissible range of CO₂ and particulate concentration. High rate of carbon dioxide concentration affect the health and working efficiency. Natural

ventilation and mechanically controlled ventilation can effectively supply of fresh air. But sensor based air quality can prove the energy efficient and quality service.(18,19)

2. Conclusion

Intelligent Building maximising comfort level and managing energy effectively and reducing the cost of the comfort. Though it requires sensors, actuators, controllers, and may other ICT systems. Today Smart cities are new concept and for making smart cities various components of cities: home, traffic, irrigation of fields, must be smart. And building must save energy, and use renewable energy like wind energy, solar energy. Smart irrigation can save water by reducing wastage of water. Building automation can save electricity.

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