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INFRASTRUCTURE MANAGEMENT OF CITIES THROUGH AUTOMATION

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ABSTRACT

Exponential expansion of cities posses' significant challenges in Infrastructure. Hence Management of Infrastructure in conventional ways are time consuming, wastage of resources, consuming manpower, costlier and can result in poor efficiency. The key is towards achieving efficiency in infrastructure with respect to all the constraints by employing smarter means of automation.

Increased availability of technology, newer innovations, flexibility of systems and easier access to products at an affordable cost are changing the conventional way of planning and managing the infrastructure of cities.
The objective of this paper is to highlight few escalating technological inventions that has enormous potentials to change the perspective of planning and managing cities more effective in achieving a better quality of life, more energy efficient, safety and security, easier disaster management, reduced stress, manpower and reduced operation cost.

KEYWORDS: Infrastructure Management, Smart Cities, Automation, Demand driven distribution.

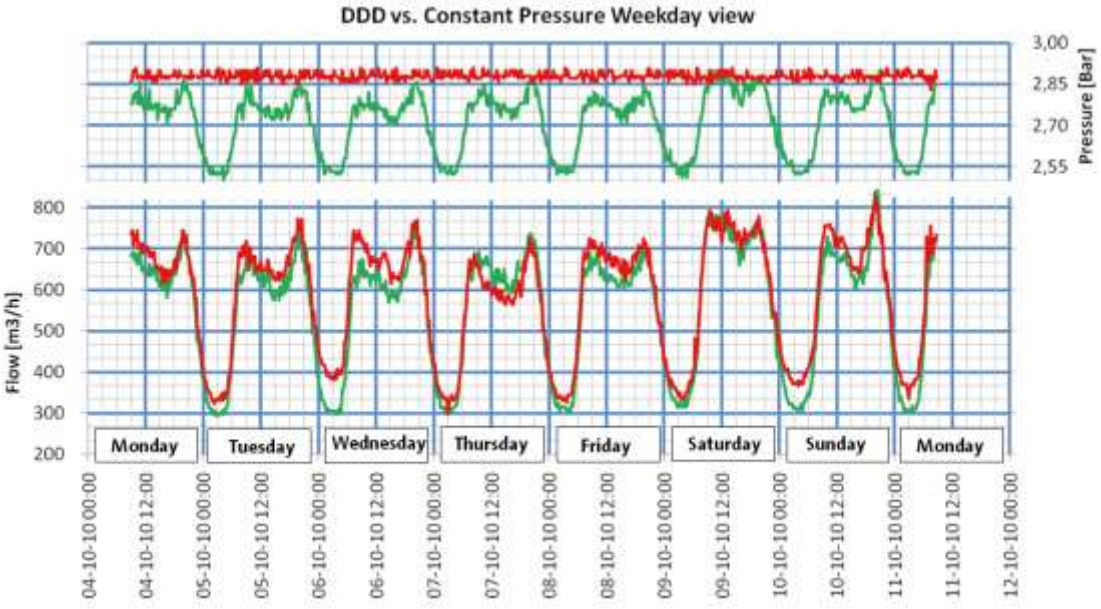
INTRODUCTION

The urban population 340 million is India's urban population by a 2008 estimate. It is projected to grow to 590 million in 2030 according to McKinsley Global Institute report. The figure was 290 million in 2001. The task and responsibility of city planners and government agencies in increasing and involves time and cost consuming conventional practices in managing the growing cities. Technology driven approach in planning and management is the need of the day to cope up the increasing demand due to rapid urbanisation.

Indian government has outlined its vision of building a network of 100 smart cities. Smart cities are expected to involve the state of the art information, technology and automation to achieve a better quality of life for the citizens. Technological growth in Information , Communication and Automation has abundant scope in changing the perspective of city planning, managing cities and converting existing cities to smarter cities.

DEMAND DRIVEN DISTRIBUTION

Water supply management at city level is another challenge for any municipality.
"45 million cubic meters are lost daily through water leakage in the distribution networks - enough to serve nearly 200 million people." (World Bank 2006) Handling the loss of water due to leakage and achieving the required flow at peak hour and avoiding high pressure flow at off peak can reduce water loss and energy loss. This is made possible with an automation system which can deliver based on demand. (Graph.no.1) The city of Ploesti, just 60 km from the city of Bucharest capital of Romania, has implemented a Grundfos Demand Driven Distribution solution for proportional pressure management of their water supply. The result clearly showed a saving of 50,000 KWH per year and the leakage loss reduced by 150000 m3 / year (0.4 MLD)



Graph.no.1 (source:Grundfos)

Daily comparison of the 2 modes of operation clearly show how the Demand Driven Distribution solution (green curve) follows actual increases and decreases in demand, as opposed to the constant pressure curve (red). The lower and upper set of curves show the variation in pressure. Everytime the green pressure curve is below the red constant pressure curve, energy consumption and leakage losses are reduced accordingly"

Smart grid

A **smart grid** is a modernized electrical grid that uses digital sensors to collect digital information and to act on such information about the behaviours of suppliers and consumers, in an automated fashion to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity.

Smart Parking

Coordinated Parking management at city level can result in reducing the time spend in looking for parking by combining sensors on parking lots and smartphone apps.

In other words simple use of sensors, some data crunching and analytics, paired with a smartphone app, can actually help ease parking woes in urban areas.

Parkhelp, a company has installed Intelligent guidance systems in more than155,000 parking spaces in 42 countries.
Intelligent guidance solution for urban traffic which helps localization of empty parking
spaces reducing the searching time and optimizing the parking places management.
The increase of parking spaces turnover and its higher occupancy help reducing the traffic.
The reduction of traffic implies a reduction of fuel consumption which results in less pollution by CO and NO2 emissions.
An easy to use information system which helps reducing fuel consumption and time.

Urban Transport and Planning

Traffic and transportation planning needs lot of data, analysis and stimulation models. The growth in ICT is a boon for the Planners. The cost and time involved in collection of data is reduced tremendously through sensors, mobile phones and other gadgets. GPS and GIS technologies have developed enormously to facilitate planners with precise data for future planning.

Reducing the time spend in commutation by combining traffic data and smart phone apps for regular commuters. Google Map has a facility to find out the shortest distance from one place to another destination. The modes of travel can be selected by the user is very effective when coordinated with Transport authorities.

The Road and Transport Authority (RTA) of dubai has the data of timings of buses in a specific bus route along with numbers. This allows the user to select the best mode of travel that suites him as the travel distance and travel time for the selected modes are revealed. (Fig.No.1)

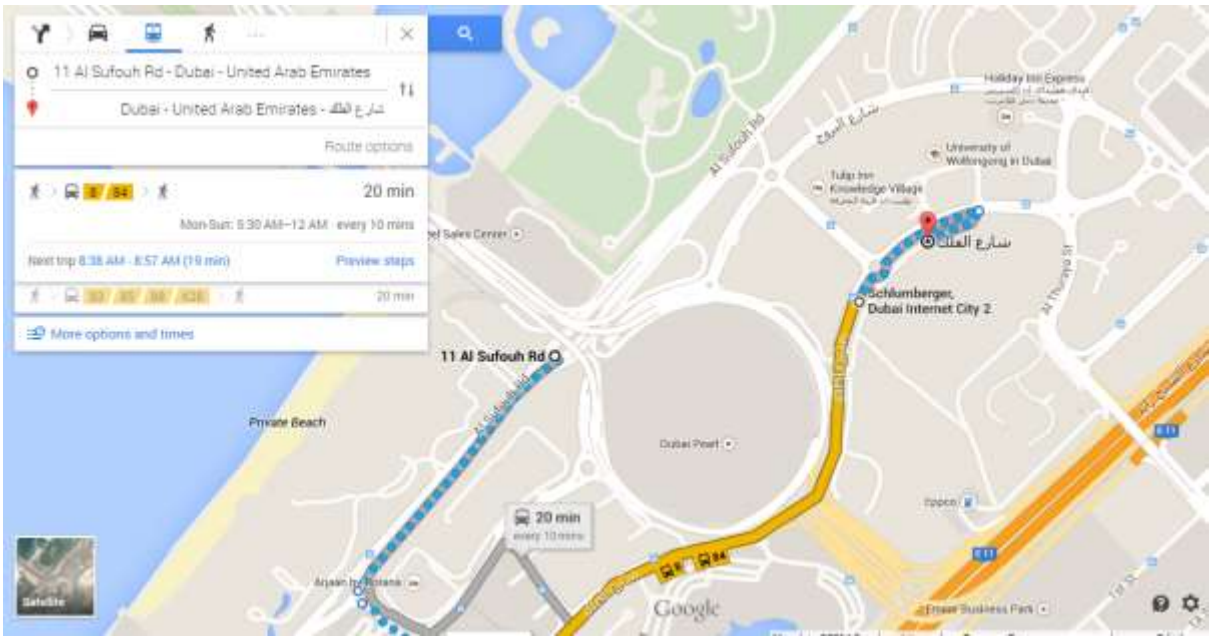


Fig.no.1 (source: Google maps)

RFID enabled Smart card/ Single card to carry out all transactions. Smart card as a ticket for buses, trains, ferries and at shops, government transactions and as an ID. All these measures have reduced the considerable time taken for ticket transactions, smoother and faster commutation.

The Road and Transport Authority (RTA) of dubai has initated NOL cards and e-wallet for commutation. Smart applications launched by RTA can be downloaded

Street lighting

Intelligent smart street lighting systems uses automation technologies for optimized management and efficiency. Light Sensors are used control the switch on and off during day and night. Working sensors identify faulty lights for replacement. Remote management is possible as the lights communicate with the control unit through wireless network like zigbee.
(Fig.No.2)

Making a short comparison with the normal street lighting systems: Supposing that one lamp is switched on for 4,000 hours per year. One streetlight has a median consumption of 200 W and the price of energy is of 200€ yearly. If suppose a 5 km long street, it is necessary to install 125 street lights (one each forty meters), with yearly energy consumption of 25.000€. With the system presented in this paper, every lamp uses about 20-25 W (95% of energy consumed by the LEDs). With an equivalent example as before, energy cost decrease to
5.000€ (savings of 80%).

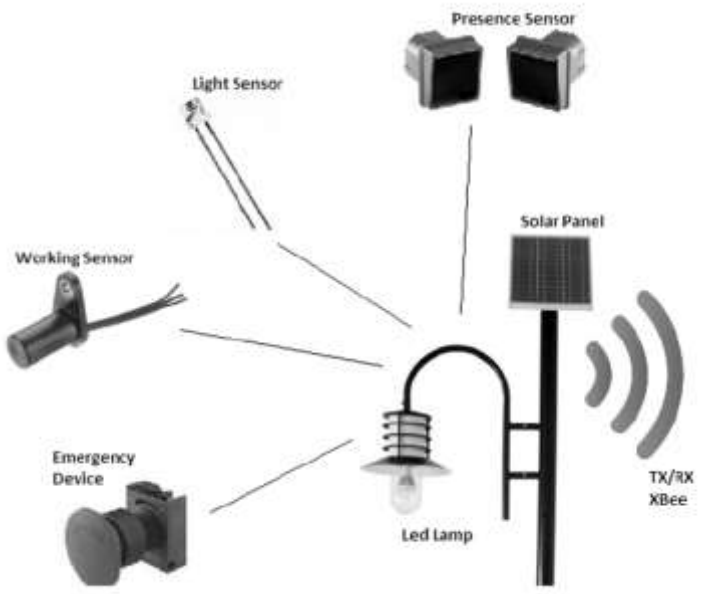


Fig.no.2
(source: "Intelligent wireless street lighting system," by Leccese, F.; Leonowicz, Z)

Safer Cities

Smart phone apps that collects data of crime, analyses and outlines the unsafe spots of city. This helps mapping of crime by authorities and taking preventive and remedial actions.

Tracking of children by parents using technological gadgets can build a secured community. Apps like "GPS Tracker Pro" lets you quickly locate family members and friends. Once installed on children's phones, it gives peace of mind to parents and allows children to maintain an active lifestyle with an extra degree of safety. (Fig.No.3)

The smart phone app "Smart 24X7" launched in Chandigarh on 05/01/2015 in the name of "Raksha:" and "Himmat" launch in Delhi on 01/01/2015 have contributed towards safer cities.

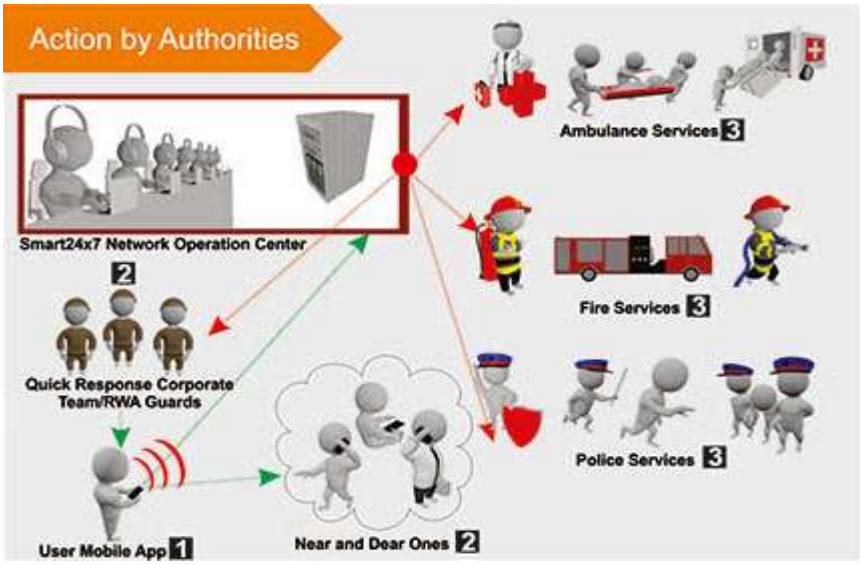


Fig.no.3 (Source: Smart 24X7)

Development of CCTV's non-motion detection and detection of suspicious behaviour can help in preventing planting of bombs and other antisocial activities. Sensors that can alert illegal intrusion to the authorities giving less chance for crime.

CONCLUSION

Technology has a revolutionary role for a smarter world. Smart cities are nothing but better and efficient ways of managing cities using Information, Communication and automation technologies. Well coordinated sharing of resources by various agencies using technology can facilitate management of Infrastructure of cities effectively as Infrastructure is the core of a city's growth. Research and development in automation has a promising role in shaping the cities for a better Infrastructure in turn leads to better quality of life in spite of its increasing challenges faced by rapid urbanization.

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