# Editorial

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## 1 Introduction

The Internet of Things (IoT) is a fundamental part of next-generation advanced technological enhancements. The world is moving with incredible speed towards high-tech cutting-edge smart city concepts, which are the ultimate goal of next-generation technology. IoT is the backbone of smart cities at different security levels, education, corporate industries, and so on (Guedes and Alvarenga, 2018; Allam and Newman, 2018).

As a matter of fact, countries who have been investing in IoT and big data-based research over recent years will have an advantage in making themselves compatible with the next-generation smart city concept, and will be years ahead compared to other countries. It is high time for developed and developing countries to have reputed and experienced researchers come forward and conduct research on IoT-based smart technologies in various research areas such as transport, smart home energy management with distributed renewables, crowd energy, energy harvesting with real time control systems, renewable energy with hybrid interfaces, advanced robotics, advanced electrical machines, biomedical fields, smart grid and so on (Khan et al., 2013, 2014, 2016, 2017b, 2020; Howlader et al., 2017; Aravind et al., 2018). With a view to taking the world to the next high-tech level and making it compatible with the next-generation smart city concept, research into IoT integration in smart city planning is indeed the need of the hour.

IoT is a concept that not only has the power to impact how we live but also how we work. It refers to the billions of physical devices around the world that are connected to the internet, collecting and sharing data – in other words, talking to each other. Broadband internet is becoming widely available, the cost of connections is decreasing, more devices are being created with Wi-Fi capabilities and sensors built into them, technology costs are going down, and smartphone penetration is sky-rocketing. The prices of IoT hardware are dropping, putting sensors, processing power, network bandwidth and cloud storage within reach of more users and making a wider range of IoT applications practical (Esposte and Santana, 2019; Khan et al., 2017a; An and Kumar, 2020). All of these things are creating a perfect storm for IoT.

Smart city planning incorporates ultimate technological enhancements to raise the lives of people to the highest comfort level, to assist in accomplishing any technical work in the easiest way possible, and to go to distant places in the minimal amount of time. Major relevant areas include power control and energy management, transport systems, smart home energy management, distributed renewables, biomedical fields, B2G (building to grid), V2G (vehicle to grid), distributed renewable energy, etc. (Khan et al., 2019; Garau, 2017). IoT has a major impact on each area of the smart city mentioned above.

The aim of this special issue is to present quality research on IoT's impact, integration, influence and implementation in key areas of smart city planning. The issue hopes to make a significant contribution to the next generation of smart city planning.

## 2 Summary of the issue

The editorial board have collected research articles from several different contributions; after careful peer reviewed, five selected works have been published in this special issue.

In 'Internet of Things based architecture for additive manufacturing interface' by Phang et al. addressed the current challenges in managing multiple additive

manufacturing unit and provide an Internet of Things (IoT) solution to it. A webserver is used to create a webpage to upload the file, approval, and to check the printing status for multiple 3D printers, each installed with a camera for project monitoring. The authors have shown that this system provides higher efficiency in terms of processing time with a case study at Taylor's University, Malaysia.

In 'Enhanced authentication and access control in Internet of Things: a potential blockchain-based method', Muzammal and Murugesan presented an authentication and access control technique for IoT using the blockchain technology. Highlighting the review and analysis of recent trends to provide security in IoT, it is elaborated how blockchain has certain benefits that can be adopted in IoT. The authors presented a framework involving consensus mechanism to provide Device-to-Device (D2D) authentication and smart contracts logic to define and enforce access rules and policies. Their proposed framework involving efficient cryptographic approaches consisting of hash functions, digital signatures, and/or transaction logs within the blockchain is promising to enhance IoT security.

The uncertainty in solar energy is different from conventional, dispatchable generation fuels and it is difficult to incorporate into the standard system operating procedures. In the first part of the paper by Howlader et al., the machine learning algorithm (SVR – Support Vector Regression) is used to train models based on solar irradiance data and different meteorological weather information to predict the solar irradiance for different cities to validate the forecasting model. Again, the intermittent and inertialess nature of photovoltaic (PV) systems can produce significant power oscillations that can cause significant problems with dynamic stability of the power system and also limit the penetration capacity of PV into the grid. In the second part, it is shown that the residue-based power oscillation damping (POD) controller obviously improves the inter-area oscillation damping. The validity and effectiveness of the proposed controller are demonstrated on the three-machine two-area test system that combines the conventional synchronous generator and flexible alternating current transmission systems (FACTS) device using simulations. This report overall puts an in-depth analysis with regard to the challenges of solar resources with integrating, planning, operating, and particularly the stability of the rest of the power grid, including existing generation resources, customer requirements, and the transmission system itself that will lead to an improved decision making in resource allocations and grid stability.

In 'Control and monitoring of air-conditioning units through cloud storage and control operations', Aravind and Majrani presented a temperature control and monitoring of the air conditioning units is critically important towards energy savings. The work proposed to design and develop an air conditioner monitoring system for monitoring and control using internet of things. The developed system uses an integrated mobile app using a cloud service that enable user to monitor and control its operations. The system consists of three subsystems which are micro-controller, cloud storage and mobile app. With the data collected an algorithm to monitor and control the performance of such an air conditioning system through this embedded module is envisioned to be part of the energy efficient systems.

Khan et al. described the cloud based services on next generation smart living technology. Five major categories have been explored namely (I) Power and Energy Sector, (II) Transport Sector, (III) Healthcare Sector, (IV) Retail Sector, and (V) Education Sector with a view to analyzing the scope and existing works carried in IoT. Each sector has been analysed in detail with respect to possible real-time cloud services, which can be incorporated into the respective area. Consequently, existing cloud services, current trends, limitations, and future scopes have been discussed followed by recommendations in each section. For example, in case I (Power and Energy Sector), limitations of cloud service have been discovered such as unoptimised communication scheme, data complexity, interoperability, cyber security risk and data integrity issue. To address these limitations respectively, a policy to ensure horizontal compatibility, proposal to increase local processing, data compression, prediction, implementation of big data techniques, authentication, encryption, planning, redundancy have been included as recommendation. For other four categories, in a similar approach, a vast technical analysis has been carried out.

## 3 Conclusion

The five contributions in this special issue represent several different approaches related to IoT based Architecture for Additive Manufacturing Interface, blockchain methodology in authentication and access control in IoT, IoT based monitoring and control in electrical machines and operating systems and IoT based cloud storage and its services in different sectors in smart city. To recapitulate, the editors strongly believe that the contribution in multidisciplinary IoT framework will make a valuable contribution to building smart cites.

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