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AI Based Drones for Security Concerns in Smart Cities

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ABSTRACT

The concept of a smart city has attracted the attention of all corners of the world. It updated with new technologies like AI, Blockchain, IoT, Drones, and many other things. Security in big cities is one of the main concerns, and everyone wants to feel safe 24/7 in every activity they do. In this paper, our research aims to highlight the use and importance of drones for intelligent city management, especially in the context of security. The drone security management flow is explained using the methods and technical details. This is followed by discussion on security concern in cities and how it is dealt with AI based drones. In the conclusion section, it is discussed how emerging technology such as blockchain can help improve the management of smart cities. The use of drones supports the intelligent city concept with all its advantages in regional monitoring. Concept of smart cities is catching attention across the globe and it's important as per context of emerging economies. In this paper, we discussed about the use of emerging technologies to make it possible. AI, Blockchain and Drone technologies are playing important role. Their significance and attention by researchers in exploring possibilities is shown in this paper. This paper will be very useful for researchers and engineers working in the same domain.

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1. INTRODUCTION

Artificial intelligence is one of the fast emerging and widely accepted technologies in modern time. AI mimics human brain functioning to solve real life problems. Application areas of AI include robot, smart car, prediction, in e-commerce, navigation, human resource, healthcare, agriculture, gaming, automobile, social media and marketing. Security is one of the major concerns for any individual, organization and society which is being addressed with the help of artificial intelligence. AI security refers to tools and techniques that leverage artificial intelligence (AI) to autonomously identify and/or respond to potential cyber threats based on similar or previous activity[1].If we look at AI security, then it is a comprehensive area. For example, sophisticated AI algorithms are extensively used to detect malware, run pattern recognition and

detect even the minutest behavior of malware even before it enters the system. With fast-evolving cyber attacks and rapid multiplication of devices happening today, AI and machine learning can help to keep abreast with cybercriminals, automate threat detection, and respond more effectively than conventional software-driven or manual techniques[2]. AI is being used for detecting cyberthreats and malicious activities in cyberworld so in this area artificial intelligence techniques can immensely help to prevent the threats. In combination with natural language processing AI can help to extract patterns from textual data to find any threat that can occur. Another interesting area where AI can battle with bot(a malicious program that can create

bogus accounts with stolen credentials can be a real menace. In addition to previously discussed application areas of AI, it is being widely used.

This paper is organized as follows: Firstly, we discuss the concept of smart city in the light of artificial intelligence technology and how AI based system are being used for the management of smart cities. In the next section, our focus would be on the detailed discussion on how the blockchain technology can empower smart cities. As drones are extensively used by security agencies and other organization in general for monitoring any malicious activities so our subsequent section explains how AI based drones can further enhance the surveillance of any event. This is followed by discussion on security concern in cities and how it is dealt with AI based drones. In the conclusion section, it is discussed how emerging technology such as blockchain can help improve the management of smart cities.

2. AI FOR SMART CITIES

This paper is organized as follows: Firstly, we discuss the concept of smart city in the light of artificial intelligence technology and how AI based system are being used for the management of smart cities. In the next section, our focus would be on the detailed discussion on how the blockchain technology can empower smart cities. As drones are extensively used by security agencies and other organization in general for monitoring any malicious activities so our subsequent section explains how AI based drones can further enhance the surveillance of any event. This is followed by discussion on security concern in cities and how it is dealt with AI based drones. In the conclusion section, it is discussed how emerging technology such as blockchain can help improve the management of smart cities.

Figure1: AI applications in smart cities

3. BLOCKCHAIN FOR SMART CITIES

Blockchain is one of the emerging technologies for smart city. Lots of papers have been written [6][7][8] that reflects the significance of Blockchain for smart cities. Universal ID cards, Universal data storage and management, smart contract for properties etc. are application of Blockchain for smart cities.

Figure 2. Blockchain applications in smart cities

Figure 2 above is an example of 12 Use Cases that can be used in smart cities. Among them can be used regarding Universal Data Storage Platforms, Keyless Signature Interfaces, Security for IoT Devices, and

others. With these 12 Use Cases, we can provide a future picture of how smart cities are very beneficial to society.

4. DRONES FOR SMART CITIES

Drone is one of the emerging technologies used in smart cities. Lots of papers have been written [9][10][11] that reflect the significance of drones for smart cities. Surveillance, traffic management, goods delivery etc. are applications of drones for smart cities.

Figure 3. Drone applications in smart cities

5. Security Concern in Cities

Recent advancement in drone technologies present both opportunity and challenges in different areas of life as shown in figure.1.

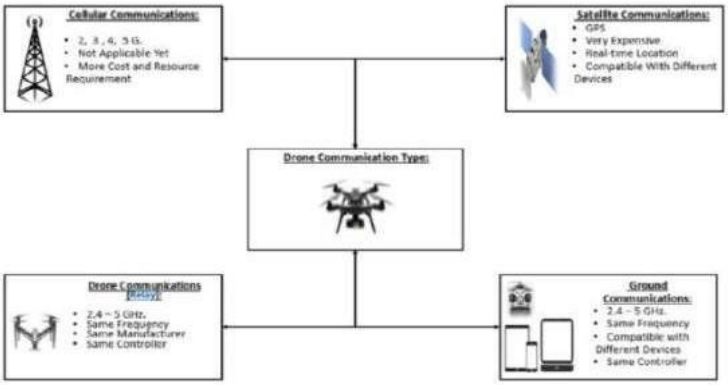

Figure 4. Drone usage in different areas of life

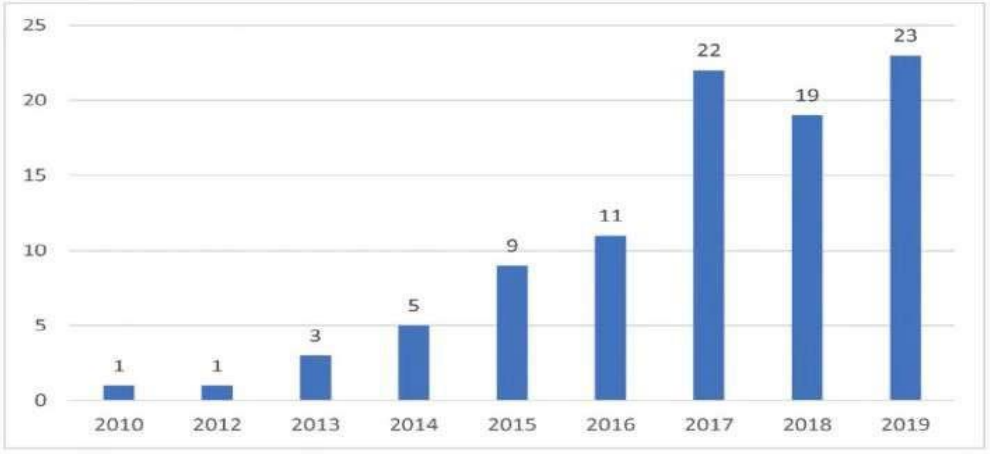

Figure 5. Publications on privacy, security and risks in smart cities: 2010-2019

From figure.5 it is evidently clear that research community interest has immensely increased in the study of privacy, security and risk of drones in smart cities. As we know that drone technology provides a lot of advantages and benefits in our day today life but on the other hand its security issues must also be studied thoroughly to avoid any risk that may fall out from its usage. Moreover, security and privacy breaches must be addressed properly. Recording and image capturing must be done keeping in mind the privacy and confidentiality of peoples' concerns[12].

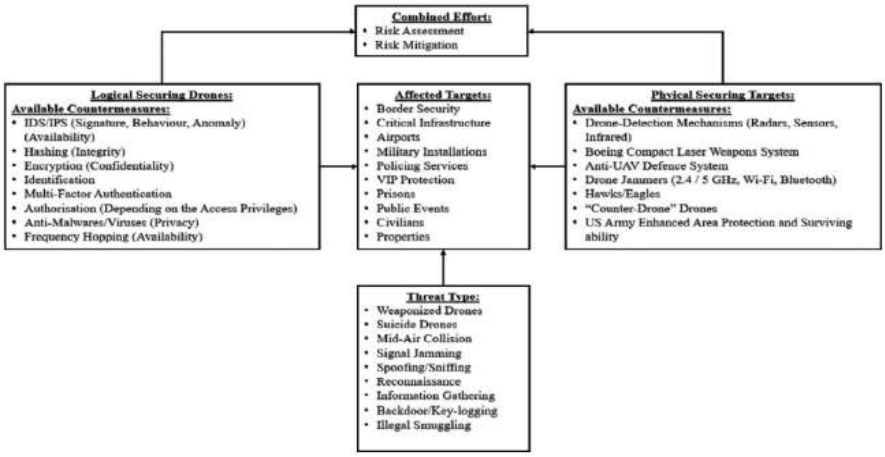

Figure 6. Drone's threat taxonomy

Several types of risks are associated with the usage of drone especially cyber and physical attack. It is also important to note that the usage of drone must be restricted to only those areas where it is needed and should be avoided in civilian areas and properties. It is also seen widely that the owners of drone use Bluetooth technology to control their devices and use it in restricted area which creates problem for citizens and civilians. It is also reported in many literatures that drone usage also interfere in Wi-Fi connections and Bluetooth signal which raise the issue of privacy and security concerns.

However, with the advancement of technology particularly in the field of machine learning it has become possible to prevent these attacks by predicting them in advance. For example, jamming attack can be dealt with the security technique namely secure offloading which can be implemented in machine learning algorithm such as Q-learning[13][14] and DQN[15]. Other attacks such as intrusion, malware, denial of service, spoofing and traffic blockage can be realized with the help of popular machine learning algorithms namely naives bayes algorithm[16], support vector machine[17], k-NN [18] and neural networks.

Small drones are catching attention of research community due to their small size and light weight and less number of wings. Moreover, the security and privacy of individual and governments under threat due to these drones. There are several other studies which highlight common challenges and threat to individual and government agencies[19][20].

6. CONCLUSION

Concept of smart cities is catching attention across the globe and it's important as per context of emerging economies. In this paper, we discussed about the use of emerging technologies to make it possible. AI, Blockchain and Drone technologies are playing important role. Their significance and attention by researchers in exploring possibilities is shown in this paper. This paper will be very useful for researchers and engineers working in the same domain.

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