Chapter 9
A Secure Quantum Technology for Smart Cities Using Travelling Salesman Problem (TSP): Application Perspectives

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ABSTRACT

Modern computing techniques like quantum computing are based on the remarkable phenomena of quantum mechanics. With an increasing number of instances of quantum supremacy displaying that a programmable quantum device can overcome the challenge that no computer algorithm can solve in any reasonable amount of time being shown by Google, IBM, Honeywell, and other distinct positions where quantum computing research is being conducted, quantum computing has grown in significance in recent days. Ultimately, travelling salesman problem (TSP) method is used and gives additional constraints on the beginning and ending points of the routing path. Hence, the outcome collections demonstrate that it is possible to obtain a strong quality result that has significant real-world applications even though the samples show an increase in problem complexity.

DOI: 10.4018/978-1-6684-6697-1.ch009

INTRODUCTION

Evolution of Computing

An advancement in the field of information and technology results in the discovery of a brand-new one. The study and creation of functional computer technologies have significantly advanced in science, technology and the country in less than a century (Hamidreza Bolhasani and Amir Masoud Rahmani, 2019). The first practical computer was developed in the early 20th century that was unable to do mathematical operations on its own. Therefore, standard physical execution of theoretical principles is necessary for practical devices (M. Veldhorst et al, 2017). As long as the input is pertinent and the instructions are favourable thereby computers can now solve issues quickly and accurately. A real general-purpose computer with a storable programme model is named as the Universal Turing Machine (UTM) which was developed by Alan Turing during World War II and there is where it all began. Subsequently, Von Neumann redesigned it and it is today the most significant piece of system architecture. The performance and strength of computers and their physical components kept getting better throughout time. Furthermore, computer business grew to be larger than the military department. The most recent electrical technologies people use today are a result of society growing ability to control and understand nature and physical processes (A Rehash Rushmi Pavitra et al, 2022).

In the past two decades, there has been an increase in the number of machines and gadgets, including televisions, cars and even refrigerators that have computation components built into them. Additionally, all of these devices are becoming even more integrated with one another giving their consumers to accomplish the specific task.

In general, a novel form of computation called quantum computing which is based on quantum mechanics deals with the physical world stochastic and erratic nature. Despite quantum mechanics is a more comprehensive model of physics than typical mechanics (David J. Griffiths and Darrel F. Schroeter, 2017). Quantum computing is a more comprehensive model of computing and has a greater potential to address issues that traditional computing cannot address them (Michael A. Nielsen and Isaac L. Chuang, 2010). In contrast to several classical computers, which are based on usual computing and use binary bits 0 and 1 independently, they use their own quantum bits also termed as qubits to store and process the information hence such type of computing operations are said to be quantum computer (Charles H. Benett, and David P. DiVincenzo, 2000). In other words, bits, registers, logic gates, algorithms and other essential components of a traditional computer have equivalent characteristics in a quantum computer. A quantum computer uses quantum bits or qubits which operate in an extremely intriguing fashion, instead of conventional bits. Whereas a bit can only hold a value of 0 or 1 a qubit can simultaneously be in various states and store an endless number of values in between, comprising 0 and 1. If that appears unclear, consider how schrodinger's cat could be both living and dead, or how a car could be both a motorcycle and a vehicle. Through physics concept of superposition, one can think about the numbers qubits store in a more delicate manner such as when two waves combine to create a third wave that includes both of the first two. Similar to how qubits employ superposition to concurrently represent several states (multiple numerical values).

The primary idea of a smart city was born as a result of advancement of quantum computing. In cities all devices are connected to one another and exchange information periodically through distinct medium. Then, accessing data from other vehicles that information is used to optimize day to life by other things and gave optimized routes and shutting off specific lights when they are not in use. On the other hand