Chapter

Data Integrity Management for Laboratory of the Control of Lifecycle of Domestic Russian Tour Products

Vardan Mkrttchian, Yulia Vertakova and Arsen Symonyan

Abstract

A primary responsibility of domestic tour products is to provide safe and efficacious products of appropriate quality to consumers by assuring decisions are based on accurate, reliable, truthful, and complete data. This task in this chapter is solved on the basis of the authors' works on Avatar-Based Intellectual Managing for Innovation Technologies Transfer in the tourism industry of the Republic of Armenia, where citizens of the Russian Federation travel with their internal passports, that is, they use it as an internal tour product. The chapter describes the entire algorithm of the system, shows the results of the study, which guarantee Data Integrity Management for Laboratory of the Control of Lifecycle of domestic Russian tour products.

Keywords: Data integrity, management system, laboratory of control, lifecycle, domestic tour products, Industrial Internet of Things

1. Introduction

The COVID-19 lockdown has led to the closure of tour industry throughout the world an estimated 2.6 Billion people across the world are affected due to the same; nearly 186 countries around the world have stopped working due to this global pandemic. The rest argue that information technology will help tour industry and will eventually be a part of the regular living. However the calendar was disrupted and there was a need to stay on the touristic domestic service not only for people but also touristic industry. Now the best way to do so was to make use of online platforms, online to promote tour products during this pandemic. A primary responsibility of domestic tour products is to provide safe and efficacious products of appropriate quality to consumers by assuring decisions are based on accurate, reliable, truthful, and complete data. This task in this chapter is solved on the basis of the authors' works on Avatar-Based Intellectual Managing for Innovation Technologies Transfer in the tourism industry of the Republic of Armenia [1], where citizens of the Russian Federation travel with their internal passports, that is, they use it as an internal tour product.

2. The data integrity management for laboratory of the control of lifecycle of domestic Russian tour products

A world-class laboratory has been created at Sochi State University, which involves the use of the original Mkrttchian's technology - multi-agent models of intelligent digital twin-avatars [2, 3]. The subject of the laboratory is fully consistent with the section of the priorities of the scientific and technological development of the Russian Federation, specified in paragraph 1.1 of this document: "the transition to advanced digital, intelligent production technologies, robotic systems, new materials and design methods, intelligence ". The scientific profile of the laboratory is aimed at "the transition to advanced digital, intelligent production technologies" in such an important area for Russia as tourism. In the course of scientific and scientific-practical activities, "the creation of systems for processing large amounts of data, machine learning and artificial intelligence" will be carried out, as provided for by the Priorities of Scientific and Technological Development of the Russian Federation. This study is fits into a moment of operational uncertainty and theoretical redevelopment of the nature of tourism in a society marked by geopolitical turmoil and declining international security, as well as rapid changes at the global level, including the pandemic (COVID-19), which is currently posing new challenges for the sector. Today, it is more relevant and appropriate than ever to reflect on them, with the new, digital energy of blockchain technology, using a fundamental approach to digitalizing the decentralized lifecycle management of the domestic Russian tour product with problem-oriented digital twin avatars, supply chain, volumetric hybrid and federated-consistent blockchain. The goal of the project is theoretical study and practical implementation, in the form of basic models and software modules, artificial intelligence algorithms in managing the life cycle of an internal Russian tour product. Why at the State Sochi University, using the scientific potential of the head and responsible executors of the project, the Laboratory for digitalization and management of tour products, using multi-agent models of intelligent digital twins-avatars, is being created, the purpose of these studies is to solve a scientific problem in terms of creating an integrated scientific and methodological approach to modeling and design of monitoring systems, diagnostics and management of distributed cyber-physical objects and processes in the network segments of the Industrial Internet of Things based on the convergence of engineering technologies, data mining and in-depth analysis of processes, predictive modeling and machine learning. The objectives of the research are related to the development of new models, methods and a set of tools for digital transformation of monitoring, diagnostics and management of distributed cyber-physical objects during the transition to the digital economy within the framework of the fourth industrial revolution (Industry 4.0). The results of design research are needed to synthesize the architecture of a new generation of intelligent cyber-physical systems, which represents a multi-agent computing ecosystem. It is designed to provide decision support processes based on monitoring events and processes at distributed cyber-physical objects of the Russian tourism industry. In such systems, there are many cyber-physical objects that receive a huge amount of sensory data that cannot be processed by humans in real time. Currently, there are no ready-made integrated solutions for modeling and designing distributed monitoring and control systems for cyber-physical objects. Despite advances in engineering and knowledge management, the use of this approach for the synthesis of cyber-physical monitoring and control systems is still poorly developed. Such systems work with a variety of distributed cyber-physical objects, which are, in most cases, measuring devices with sensors that collect and accumulate sensor data for transmission to a processing center via a telecommunications network. The

results of data analysis are used for predictive modeling of the dynamics of the development of processes at cyber-physical objects and for making management decisions. Cyber-physical monitoring and control systems are needed to automate the decision-making process based on data mining. The relevance of the project is associated with the need to develop and develop new universal mechanisms for modeling and designing cyber-physical systems using new control technologies and in-depth analysis of processes at controlled objects of the Russian tour product. For in-depth analysis of processes, it is necessary to develop automated technologies for collecting, storing and intelligent analysis of data obtained from controlled cyber-physical objects of the Russian tour product. The scientific novelty of design research consists in the creation of a new scientific and methodological approach to the modeling and design of cyber-physical systems for monitoring and controlling distributed objects and processes in the network segments of the Industrial Internet of Things, as well as the methodology for distributed monitoring, diagnostics and recovery of these systems during their operation. Scientific and practical significance lies in the creation of new technologies and software and tools for the synthesis of cyber-physical systems for monitoring and controlling distributed objects and processes on the Internet of Things. For in-depth analysis of processes, it is necessary to develop automated technologies for collecting, storing and intelligent analysis of data obtained from controlled cyber-physical objects of the Russian tour product. The scientific novelty of design research consists in the creation of a new scientific and methodological approach to the modeling and design of cyber-physical systems for monitoring and controlling distributed objects and processes in the network segments of the Industrial Internet of Things, as well as the methodology for distributed monitoring, diagnostics and recovery of these systems during their operation. Scientific and practical significance lies in the creation of new technologies and software and tools for the synthesis of cyber-physical systems for monitoring and controlling distributed objects and processes on the Internet of Things. A new generation cyber-physical monitoring and control system is implemented in the form of a hyper-converged component-based architecture of a reconfigurable ecosystem, which performs the functions of multi-agent processing of large amounts of sensor data in a computing grid of sensor node controllers based on a fog (edge) computing model. The main scientific problem solved in the research process is associated with the synthesis of a new approach to modeling and designing cyber-physical systems for monitoring, diagnostics and control of distributed objects and processes in the network segments of the Industrial Internet of Things. Optimization of management is one of the central tasks facing the Russian economy. Currently, there is a gradual transition in control systems from simple automation to technologies of “smart” or “smart”, and the concept of “digital twin” is central to the development of the corresponding systems. The existing experimental systems have a number of obvious bottlenecks - cyber vulnerability, fragmentation, binding to a specific tour product, etc. The use of intelligent avatar technology for the development of twins can eliminate bottlenecks, which is detailed in three fundamental monographs of the project manager. As a result of the implementation of the proposed scientific research, new scientific, scientific, technical and technological digital solutions will be created that will provide an innovative and digital transformation of product tour management, as well as the development of a typical multi-agent system of intelligent avatars for effective management. The expected results correspond to the world level of scientific research in this area, as they relate to the development of new approaches to monitoring and control of complex geographically distributed cyber-physical systems, which are the basis for the implementation of intelligent cyber-physical systems of a new generation. The results of the project are

components for the creation and implementation of new technologies and systems within the framework of the fourth industrial revolution, the transition to a digital economy, digital transformation of management processes and decision support. The public and social significance of the project is determined by the fact that the results of the project are intended for the implementation and development of new intelligent cyber-physical systems for managing the tour product of the Russian Federation. The main scientific problem solved in the research process is related to the synthesis of a new approach to modeling and designing cyber-physical systems for monitoring, diagnostics and management of distributed objects and processes of creating and implementing an internal tour product in the network segments of the industrial Internet of Things. The expected results correspond to the world level of scientific research in this area, as they relate to the development of new approaches to monitoring and managing complex geographically distributed cyber-physical systems, which are the basis for the implementation of intelligent cyber-physical systems of a new generation. During the implementation of the project, a new multi-agent approach will be developed. Modeling and design of modern cyber-physical systems in the industrial Internet of Things. The results of the project are components for the creation and implementation of new technologies and systems within the framework of the fourth industrial revolution, the transition to a digital economy, digital transformation of management processes and decision support. The results can be used to synthesize new intelligent monitoring systems, which prove the practical significance of design research, as well as the versatility of the developed models, methods and technologies, which in turn will allow the use of tools for creating various geographically distributed cyber-physical systems for creating and implementing an internal tour product. In the process of preparing this article, a new technology for "Data Integrity and Quality" was developed. The main area of research is the synthesis and development of proactive monitoring technologies for managing the risks of events in geographically distributed systems of internal tourism products, the following specific results:

1. The concept is a methodology of proactive monitoring of events in geographically distributed systems of the environment based on the collection, consolidation and predictive analysis of big data on normal and emergency situations in order to identify possible causes and factors of influence for predictive modeling and risk assessment of the occurrence and development of negative events, which includes: - methodology for collecting and processing big data from distributed sensors, measuring devices.

2. The method of consolidation of large heterogeneous data on critical events, accidents and emergency situations with different time and geospatial labels, including elimination of duplicates, validation, information noise cleaning, formalization in the form of vector and graph models, classification and clustering in the space of signs and influence factors, collection of statistics, retrospective analysis to establish correlations with similar incidents in the past (event patterns).

3. Model and method of ensuring information security for the protection of large sensor data in distributed information storage on sensor and mobile data collection nodes and in communication channels of the telecommunications environment in the process of collection, transmission and storage based on distributed ledger technologies (blockchain).

DOI: http://dx.doi.org/10.5772/intechopen.96071

4. Methods of presenting information about events in the form of time series of event characteristics and time series of dynamics of possible factors for assessing the risks of occurrence and development of negative events, determining correlations with a number of factors and patterns of their influence.

5. The method of comparative analysis (benchmarking) of time series of event characteristics with time series of influencing factors to determine possible correlations between them, selection and assessment of the sensitivity and the degree of influence of factors on the occurrence of accidents and emergency situations.

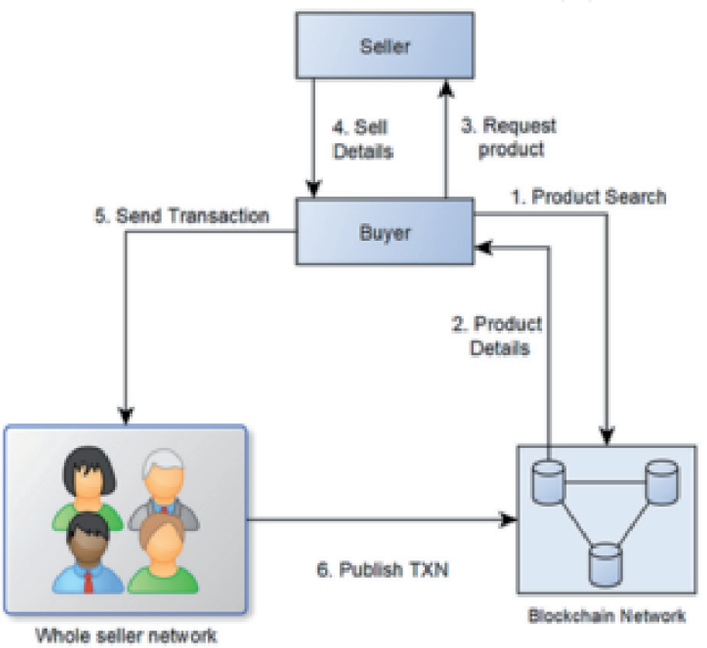

Figure 1.
Diagram on problem-oriented digital twins-avatars, supply chain, 3D-hybrid, federated & coordinated blockchain and domestic tour product whole seller monitoring for data integrity management.

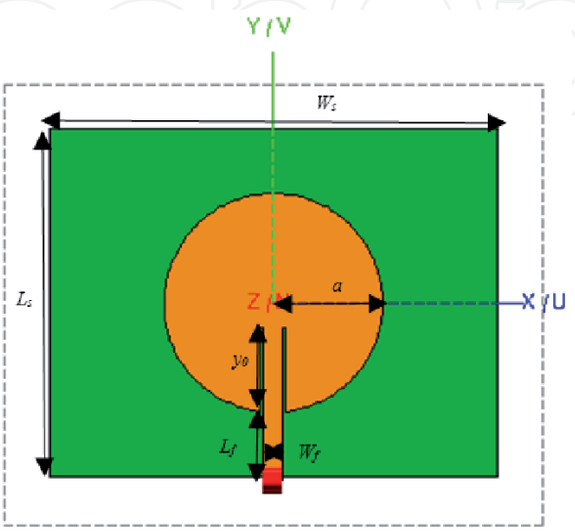

Figure 2.
One geometry of the designed basic antenna for monitoring data integrity management.

6. Predictive model for predictive assessment of the risks of occurrence and development of similar critical events, accidents and emergency situations.

7. A method of visualizing the results of proactive monitoring with geospatial and temporal reference on mobile communications.

The main result of design research is the creation and development of an approach to proactive volume monitoring of the domestic tour products using

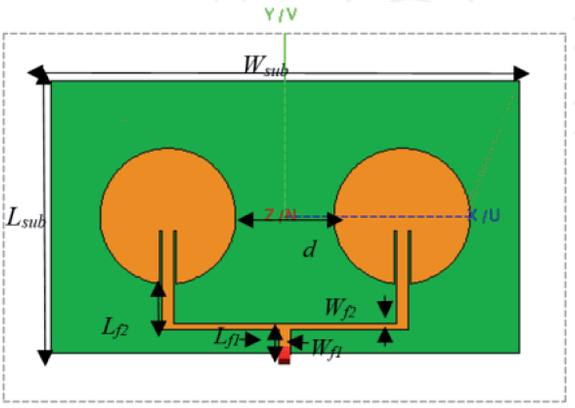

Figure 3.
Two geometry of the designed basic antenna for monitoring data integrity management.

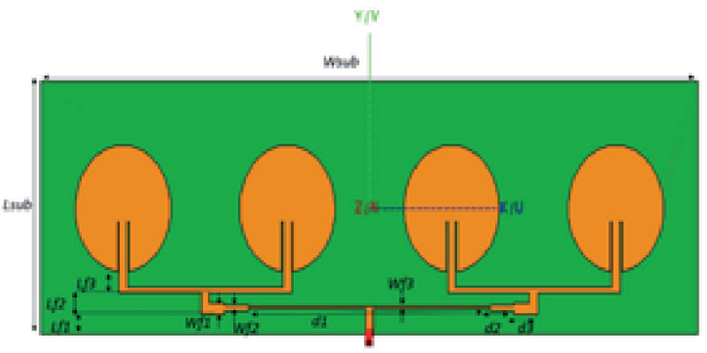

Figure 4.
Four geometry of the designed basic antenna for monitoring data integrity management.

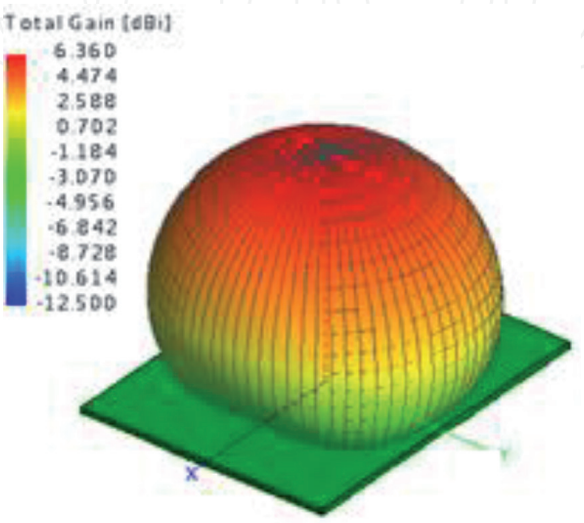

Figure 5.
3D normal blockchain for monitoring data integrity management.

Blockchain Network- with problem-oriented digital twins-avatars, supply chain, 3D-Hybrid, federated & coordinated blockchain [1–3] (**Figure 1**) and the developed antenna array [2, 4–16] (**Figures 2–4**) and Blockchain was development from 3D normal, 3D hybrid, and 3D hybrid, federated & coordinated (**Figures 5–7**) [2].

This chapter presents the design reader array antenna operates, for correspond to IoT applications for monitoring domestic tour product. The antenna was performed using federative blockchain. The configuration presents a good performance in terms of gain and bandwidth compared with the designed single and array antenna. The increase in the number of radiating elements improves the antenna performances especially the gain. This structure will be a good solution for IoT

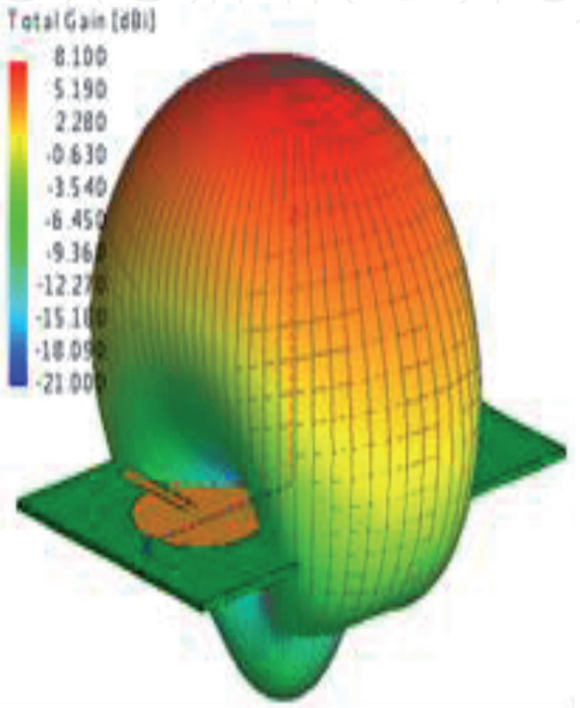

Figure 6.
3D hybrids blockchain for monitoring data integrity management.

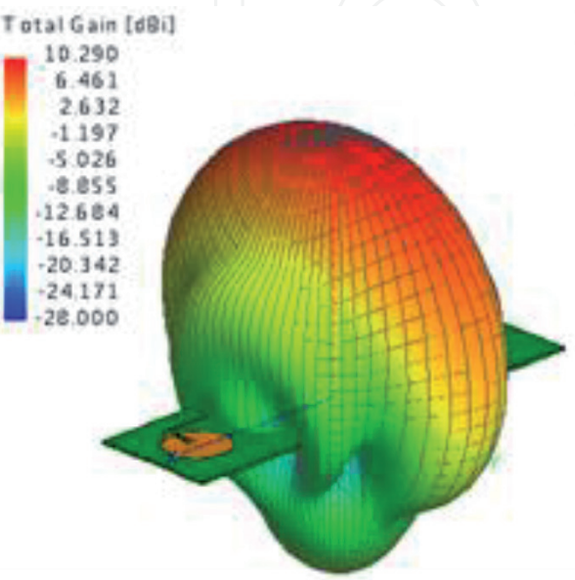

Figure 7.
3D hybrids, federated and coordinated blockchain for monitoring data integrity management.

applications. As perspective of this work, fabrication and measurement should be done to confirm the simulated results.

3. Conclusion

The chapter describes the entire algorithm of the system, shows the results of the study, which guarantee Data Integrity Management for Laboratory of the Control of Lifecycle of domestic Russian tour products. As a result of the research, key technologies of the of "Industry 4.0" era were identified, their characteristics and role in use were given. Conclusions are made that the introduction of these technologies will favorably affect productivity, revenue growth, employment and investment. In the conclusion the detailed description of various areas of using the Internet of things in activity of the domestic tourist organizations is resulted. The study allows us to conclude that the digitalization of the touristic sector will entail the release of better products. In addition, Industry 4.0 will lead to the creation of more flexible systems, the participants of which will exchange information via the Internet, which in turn will significantly increase labor efficiency and reduce costs in domestic tour production processes and data Integrity management.

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