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Creating of the New Type of Database for Tourism Business Modernization Based on the Analogy of Volumetric Integrated Circuits

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ABSTRACT: This paper develops a methodology for creating a new type of unified database of mystical-historical landmarks, based on digital and advanced technologies. It involves the development of principles for constructing a topological scheme for the information component and an algorithm for the management program. The topological framework and the management algorithm are based on the analogy to the operation of multi-cascade volumetric integral circuits, utilizing graph theory. The paper identifies the potential for implementing a digital microfilm database in both virtual and physical tourism. It also outlines methods for reducing product costs and increasing profits through network-based and cyclical economics.

KEYWORDS: information database, information nodes, information channels, topological scheme, graph theory, virtual and physical tourism.

INTRODUCTION

The international tourism market is experiencing rapid growth and is now the third-largest sector in the global economy. As a result, the tourism industry plays a crucial role in the economic development of the modern world.

Tourism is a multifaceted industry, requiring extensive collaboration across various sectors to create a cohesive tourism product. To address the challenges facing the tourism sector, it is essential to further enhance the automation of its management processes.

One of the primary objectives of this work is to develop a methodology for transitioning the global physical tourism market to digital rails, using Georgia as a case study.

To achieve this goal, a new type of so called “unified mystical-historical and landmarks of Georgia” database (the main database) should be created. This will serve as a user-friendly electronic information management system. Additionally, a digital microfilm database should be developed to present the information stored in the main database in an attractive format for users and to integrate digital technologies into physical tourism.

To create the information part of these databases, develop the management program, deliver the product in a user-friendly and appealing format, and maximize economic impact, high-tech and digital technologies should be employed.

High technology represents the most advanced and accessible form of technology [1]. Digital technology, on the other hand, refers to the use of digital systems, tools, and devices that process, store, and transmit data in electronic form [2].

To automate business processes and facilitate effective decision-making, various information systems are employed. These systems create a unified functional environment, enabling the management of processes through the application of best business practices and standards.

Georgia's natural landscapes, strategic geopolitical location, rich history, cultural development, and intellectual potential undeniably present the opportunity to create a tourism destination of both regional and international significance.

To achieve this goal, it is essential to:

1. Introduce a new, competitive tourist product to the international market, employing an innovative approach to address the challenges.

2. Implement result-oriented advertising and marketing strategies.
3. Enhance the quality of service, ensuring alignment between the quality of service and the pricing of the tourist product.

The development of both basic and digital film databases will play a crucial role in overcoming these challenges. These databases will be instrumental in the creation and development of new digital (virtual) and physical tours.

1. Database Construction Methodology

The main database, like any comprehensive database, should be structured into two core components: the information part and the management program.

The information part will be further subdivided into two sub-databases: one focusing on mystical-historical data and the other on landmarks.

We believe it is appropriate to focus both digital and physical tourism products on specific (target) countries or regions. Therefore, the mystical-historical sub-database should be divided into several sections (cascades), with each cascade containing information about a particular country.

The cascades corresponding to a particular country should be further divided into blocks (based on eras), and each block should be divided into stories (based on content).

The Georgian cascade should be linked to the cascades of other countries through a central inter-cascade switch.

The main inter-cascade switches will be historical events (or mysterious representations) that have had a fundamental impact on the development of events not only in Georgia but across the world. For the first stage, we have selected the following historical events:

1. Greek mythology
2. Campaigns of Alexander the Great
3. Christianity
4. Crusades
5. Fall of Constantinople

It should be emphasized that the main inter-cascade switches have been selected in such a way that the countries described in these events belong to both the Eastern (Asia) and Western (Europe) worlds. This selection is based on two main reasons:

· The course of human history is largely defined by the interaction between cultures and civilizations (both Western and Eastern).

· This selection simplifies the transition from the Georgian cascade to the cascades of both Asian and European target countries.

However, the number of actor countries that directly participated in the events described by the main inter-cascade switches is limited. As a result, a target country may fall outside the coverage area, significantly restricting the potential of the database.

To address this issue, we believe it is advisable to introduce intermediate inter-cascade switches in addition to the main ones in the database.

Let us now move on to the terms from informatics and graph theory.

The cascades corresponding to individual countries represent storage systems for the mystical-historical information of those countries. The main and intermediate switches are informational nodes, while the transitions between cascades, central, and intermediate switches are informational channels.

It should be noted that the main and intermediate nodes also serve as information storage systems. Therefore, information discretization (and consequently, encoding) within these nodes can be carried out in a manner analogous to the discretization of information in the storage systems of the countries.

Thus, the historical-mystical sub-database will consist of historically and mystically organized information, within which connections are made through informational nodes and channels. The coordinates (time, event) of the starting and ending points of these nodes and channels (the local sources and sinks of information) on the corresponding coordinate system are determined by historical dates and/or the content of the events,.

The mystical-historical sub-database created according to this system allows for the approximation of processes occurring in Georgia to global events, and vice versa. This approximation can occur based on time (events that developed in the same period) and content (events with similar essence that developed in different periods).

It is clear that the database must account for the possibility of expansion, both through the addition of information about new countries (creating new storage systems) and by enriching existing storage systems, including the addition of intermediate nodes and informational channels.

Now, let's develop the algorithm for the management program, i.e., determine how the desired information is formed for output.

The management of the main database should follow the principles of a multi-cascade volumetric integral scheme. Information is processed within individual cascades, then this processed information is integrated through inter-cascade transitions (switches), which undergo further processing and are then delivered to the user.

To improve coordination between the cascades in multi-port volumetric integral schemes, conciliatory heterogeneities are used [5]. Similarly, to establish or enhance connections between the information stored in the respective storage systems and nodes of different countries, so-called conciliatory texts should be included in the informational channels. Thus, the informational channels themselves will also contain specific information.

Graph theory is widely used in modern science and technology, including natural sciences (physics and chemistry), social sciences (sociology and others), and, most notably, in informatics and network technologies [6].

For each specific tour, we will associate a graph. To do this, we will encode each cascade, switch, block, and story, and then map these elements to the graph within a coordinate system.

For each country's corresponding information storage in the database, we will assign an index (code) k (where k=1,2, ...kk; kk represents the total number of cascades in the database). By CS(k)-The k-th element of the storage collection will be denoted.

To the blocks within the CS(k) cascade, we will assign a code m (where m=1,2, … mm, mm represents the total number of blocks in the CS(k)cascade). The m-th element of the block set within CS(k) will be denoted by Bl(k,m).

To the stories within the Bl(k,m) block, we will assign a code I (where i=1,2,…,ii, ii represents the total number of stories in the Bl(k,m) block). The ii-th element of the story set within Bl(k,m) will be denoted by St(k,m,i).

To better understand this process, let's consider a specific example.

Suppose we want to transition from the Georgian storage to the to the Italian storage through the "Greek Mythology" node.

According to Greek mythology, Aeneas was one of the heroes of the Trojan War, from the royal Dardanian family. In ancient Roman mythology, he was the legendary ancestor of Romulus and Remus, the twin brothers who are said to have founded Rome. Aeneas led the surviving Trojans from the destroyed city of Troy to Italy.

The popular etymology of Aeneas' name appears in Homer's *Iliad*, and he is first mentioned in the Hymn to Aphrodite [7]. According to legend, when the Greeks took Troy, Aeneas managed to escape the city. He became the leader of the surviving Trojans and guided them in search of new lands to settle.

Aeneas' wanderings served as the basis for Virgil's epic poem *Aeneid* [8], which speaks of Rome's divine origin and glorifies Gaius Julius Caesar's ancestor, Augustus, the founder of the Roman Empire and its first emperor.

The cult of Aeneas is one of the oldest in modern Italy. In ancient Rome, it was especially popular among the patricians, who considered themselves descendants of Aeneas and his companions who had come from Troy.

On the other hand, Professor R. Gordeziani has made significant findings in his research on the ethnogenesis of the tribes mentioned in Homer's *Iliad*. His work explores the role of proto-Iberian, Georgian, and proto-Kartvelian tribes in the Trojan War. It reveals genetic connections between the Georgian tribes and the Etruscans, Lycians, Carians, and the entire world of Asia Minor and the Aegean, particularly Troy itself [9, 10].

Based on the above, one vertex of the graph should be placed in the block of the Georgian storage, which contains information about ancient Georgia, specifically in the story where the genetic connection between the Georgian tribes and the Trojans is discussed.

The next vertex of the graph should be placed in the block of the "Greek Mythology" node, which contains Homer's *Iliad*, specifically in the story that provides information about Aeneas' participation in the Trojan War.

It should be noted that the block containing Homer's *Iliad* can also be considered as a node. This is because the legendary descendants of Troy's last king, Priam, were also considered the ancestors of the first royal dynasty of the Franks, the Merovingians [11,12]. Additionally, the Germanic tribes regarded Troana, the daughter of Priam, as their ancestor.

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a)

CS(k1)				
Bl(k1,1)		Bl(k1,m1)		Bl(k1,mm)
St(k1,1,1) … St(k1,1, ii)	…	St(k1, m1,1) … St(k1, m1, i1) … St(k1, m1, ii)	…	St(k1, mm, 1) … St(k1, mm, ii)

SW(k2)				
Bl1(k2,1))		Bl1(k2,m2)		Bl1(k2,mm)
St1(k2,1,1) … St1(k2,1, ii)	…	St1(k2, m2,1) … St1(k2, m2, i1) … St1(k2, m2, ii)	…	St1(k2, mm, 1) … St1(**k2**, mm, ii)

CS(k3)				
Bl(k3,1)		Bl(k3,m3)		Bl(k3,mm)
St(k3,1,1) … St(k3,1, ii)	…	St(k3, m3,1) … St(k3, m3, i1) … St(k3, m3, ii)	…	St(k3, mm, 1) … St(k3, mm, ii)

b)

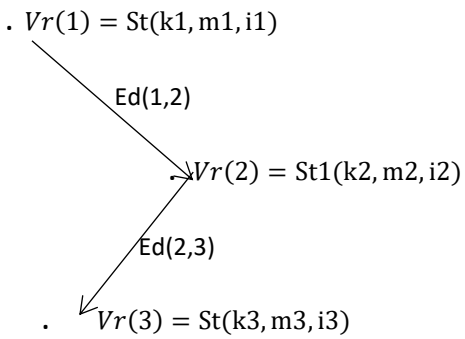

Diagram 1: Construction of the Cascades of Georgia and Italy, "Greek Mythology" Switch (a), and Building the Graph of One of the Transitions Between Them (b)

The third vertex of the graph should be placed in the block of the Italian cascade that contains Virgil's *Aeneid*, specifically in the story that preserves information related to Aeneas.

Based on this information, let's consider a possible scenario of how the information will be structured when transitioning from the Georgian storage to the Italian storage, and how the desired output can be formed.

Diagram 1 presents construction scheme of the Georgia and Italy cascades, the "Greek Mythology" switch, and building of the graph one of the transitions between them.

In this diagram, k1represents the code for the Georgian cascade, CS(k1) is the storage of information about Georgia, m1 is the code of the Bl(k1,m) block that contains information about ancient Georgia, and i1 is the code of the St(k1,m1,i) story that contains information about the genetic relationship between the Georgian tribes and the Trojans. This story, St(k1,m1,i1) will be the first vertex in the graph, denoted as Vr(1).

The second vertex (Vr(2)) should be placed in the SW(k2) switch (where k2 is the code for the "Greek Mythology" switch) in the Bl1(k2,m) block ("Iliad"), specifically in the St1(k2,m2,i2) story that contains information about Aeneas' participation in the Trojan War.

The third vertex (Vr(3)) should be placed in the CS(k3) cascade (where k3 is the code for the Italian cascade) in the Bl(k3,m3) block ("Aeneid"), specifically in the St(k3,m3,i3) story that contains information about Aeneas.

the vertices Vr(1) and Vr(2)should be connected to each other by the edge Ed(1,2), while Vr(2) and Vr(3) should be connected via the edge Ed(2,3) (representing informational channels).

The resulting information, INF(SUM), is formed as follows:

INF(SUM)= INF(Vr(1)) +INF(Ed(1,2))+INF(Vr(2)) +INF(Ed(2,3))+ INF(Vr(3))

Where INF(Vr(1)), INF(Vr(2))), INF(Vr(3)), INF(Ed(1,2)), INF(Ed(2,3)) represents the information contained in the elements of the graph (vertices and edges).

It should be emphasized that the transition from the block in the Georgian storage, which contains information about ancient Georgia, to the "Greek Mythology" node is not the only possible path. In this context, it is important to note that the Georgian state (specifically Colchis) is directly connected to the myths of Phrixus and Helle, Prometheus, and the Argonauts. Furthermore, the mountain where Prometheus was chained is also the one where the path of Zeus' lover, Io, led. It was here that the imprisoned deity prophesied that her torment would end in Egypt and that her son would become the ancestor of great heroes. This is also where the true hero of Greek mythology, Heracles, was said to have passed when he went to retrieve the apples of the Hesperides.

The story related to the flood is particularly interesting. There is a hypothesis by Professors Ryan and Pitman of Columbia University, according to which the history of the flood represents a peculiar reflection of the global process of rising sea levels. Specifically, Ryan and Pitman link the flood to the rise of the Black Sea's water level by 140 meters in 1500 BCE.

Independent of Ryan and Pitman's research, Bulgarian geology professor Dimitrov proposed the idea of a flood that occurred in the Black Sea. Ancient Greeks, Babylonians, Hebrews, Indians, Chinese, and many other peoples have flood legends (over 250 flood legends from various regions of the world are known). These legends differ from each other only in details.

From all the above, it is clear how much potential the "Greek Mythology" node holds in terms of information switch.

Finally, it should be noted that if we are interested in the impact of ongoing processes in Georgia on events in a foreign (target) country (or in drawing parallels between them), the initial source of information should be placed in the corresponding block and story of Georgia's cascade, and the final source should be placed in the block and story of the target country. Conversely, if we are interested in the impact of ongoing processes in a foreign country on events in Georgia, the initial source of information should be placed in the corresponding block and story of that foreign country, while the final source should be placed in the corresponding block and story of Georgia's cascade.

2. Perspectives of the Main Database's Adaptation in the Tourism Business

The database constructed according to the above method will be of interest to a relatively narrow circle of users, primarily to the personnel engaged in the tourism business.

The ability to work with this database will enable specialists in the tourism industry to:

- Adequately prepare for a specific tour;
- Develop and prepare targeted advertising campaigns for a particular foreign country and/or region;
- Effectively organize tours focused on visitors to these regions;
- Create new types of tourism activities (including combined tours with foreign countries) – a new product for the tourism market.

To improve service quality, training and retraining centers should be established, where personnel employed in the tourism sector can acquire the necessary skills, one of which will be the ability to work with the developed database.

To increase the interest of a wider audience, digital microfilms should be created and integrated into virtual tours. Additionally, the adaptation of virtual tours into physical tourism should take place, and based on this, so-called "show-tours" should be developed.

2.1 Virtual Tours

Digital microfilm is created based on the use of digital technologies and live video recording editing. A virtual tour, on the other hand, represents the integration of several thematically connected microfilms, created using Blender technology, that describe an era or a specific event or episode from the life of Georgia or a foreign country.

In the 3D virtual microfilms created within the framework of virtual tours, the latest technologies should be utilized to enhance the perception of reality. Specifically, the following technologies should be employed:

- **3D Modeling**: The use of software for creating virtual models of objects, environments, and characters.
- **Animation**: The use of animation software for animating movements and actions to bring models to life.
- **Lighting Variation**: The use of advanced lighting techniques in virtual environments to improve the realism of perception.
- **Rendering** – The generation of original video content through the use of powerful rendering software.

A database should also be created for digital microfilms, which will be constructed in exactly the same way as the main database. Only the information stored in the mystical-historical sub-database will be replaced with the corresponding microfilms.

For the seller, the digital product will, on one hand, be a source of income, and on the other hand, a powerful tool for advertising physical tours; for the buyer, it will provide the opportunity to satisfy intellectual and spiritual needs and plan travel or leisure and entertainment properly. This product will also serve as a connector between different countries and regions.

Moreover, the creation of such a product will be important for people with disabilities who cannot participate in physical tours.

We also consider the establishment of a specific camp for young people to be a promising direction. This will not be a typical stationary camp, but a dynamic "camp on rails (or wheels)." During their stay at this camp, the youth will visit the first settlement of Europeans in Dmanisi, the traces of the Sumerians in Georgia on Mount Grakliani, the mysterious Mount Khvamli, where Prometheus was chained by Zeus' command, a mountain that, according to ancient sources, is believed to be the place of the travels of Ios, the Argonauts, and Heracles. In Georgia, they will visit the cradle of Christianity in Mtskheta, the traces of dinosaurs in Sataplia, and many other mystically or historically significant places. They will also watch video-computer films created on relevant topics and will walk the path taken by the Argonauts through the Georgian state of Colchis. The remaining days will be spent by the sea.

1. **Economic Aspects.**

The most important factor in increasing the competitiveness of any product is the implementation of advanced information (and not only information) technologies.

In this regard, network and circular economy principles should be applied in the creation and realization processes of the product (both virtual and physical tours).

The main reason for our decision to shift to a network economy lies in the rapid growth of the number of providers and customers within it (when using a network economy, the amount of sold products grows exponentially, unlike the linear growth in traditional models). Additionally, the network economy is characterized by reverse price formation - a trend of price decrease over time (which, in turn, further increases the number of customers).

Shifting to a network economy primarily means creating an environment in which we can establish mutually beneficial connections with other companies or individuals for product promotion and sales.

In this regard, a large-scale advertising-marketing network should be created to intensify product promotion and sales, which can be seen as the globalization of our product's promotion and realization process - integrating regional markets into a single network.

Unlike traditional marketing, where measuring effectiveness is quite difficult, network marketing provides a precise means of controlling results using web analytical platforms such as Google Analytics.

Based on the analysis of the impact of internal and external factors on the performance of the advertising-marketing network, we can identify new ways to achieve significant growth in competitiveness. Therefore, significant attention should be given to the statistical analysis of product realization outcomes in relation to various factors. This will, in turn, allow us to make adjustments in the working process if necessary.

The creation of an advertising-marketing network will assist both in the promotion and sale of digital products and physical tours, as well as in the organized conduct of physical tours.

Circular economy is an economic system whose goal is to eliminate waste and continually use already consumed resources.

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The development of the circular economy can be seen in the construction of innovative circular business models, digitization, and the use of digital technologies [15].

According to the principles of the circular economy, new products can be created by utilizing products made in previous stages through the following activities:

1. The combination of existing microfilms allows for the creation of new digital tours with different content, thus eliminating the problem of creating new microfilms.
2. Many significant events are related to the same landmark or location, so the issue of making new footage is no longer relevant.
3. Some new microfilms can be created by synthesizing and editing previously created microfilms.
4. The digital product is reusable, meaning that after its sale, there is no need to create a new product.

All of this provides the opportunity to significantly reduce the product's cost.

To reduce the costs associated with advertising-marketing and organizing physical tours, we will use a comprehensive approach, which involves the creation of local sectoral-corporate (resulting in the sharing of costs for advertising-marketing activities and expensive elements of physical tours) and territorial-logistical (leading to the reduction of costs for expensive elements of physical tours) cluster networks.

A multi-profile-logistical cluster is a geographically connected network of firms, entrepreneurs' groups, and ensembles working voluntarily together in agriculture, transportation, logistics, commerce, culture, and other sectors.

The sectoral-corporate cluster represents a voluntary association of firms and companies operating in the tourism sector to reduce costs on expensive components such as hotel rates, concerts, fireworks, meals, Georgian feasts, video-computer film screenings, advertising, etc. It is important to emphasize that the sectoral-corporate cluster is a voluntary association for the coordinated (and not centralized) management of tourist activities.

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