Smart Technology for Security in Tourism Complexes

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Abstract: - The technological development that is increasing daily in the world influences all sectors of the economy. One of the areas affected by this development is the tourism sector. Effective use of technological capabilities is an important issue in terms of providing the best service to customers and security in tourism. The aim of the paper is a conceptual study covering the application of smart technology for security in tourism complexes. In this work, a device has been created that transmits information secretly and safely through a red laser diode over a certain distance with minimal interference, which may be successfully used in complex tourism planning. The semiconductor laser diodes have been analyzed to optimize the investigated device's physical parameters. The advantages of semiconductor laser diodes, and their application areas, including secret transmission of information over long distances for the security purpose are presented, and also revealed their problems and limitations.

Key-Words: - Smart tourism, security, smart technology, information, urban planning, laser diodes,

Received: April 12, 2024. Revised: September 25, 2024. Accepted: October 29, 2024. Published: December 10, 2024.

1 Introduction

The growing technological development in modern times affects all areas, including tourism. Effective use of technological opportunities in tourism is one of the important issues. In the tourism sector, information and communication technologies first appeared with telephone and other communication technologies, and then with the use of computers [1-3].

Technological innovations have a significant impact on the tourism sector as well as on other sectors. [4].

Digital transformation in tourism - artificial intelligence, destination management systems, customer relationship management, central reservation systems, smart hotel management systems, smart card system that makes the life of both the customer and the tourism worker practical, smart travel agency system, smart tour guide system, virtual systems that allow tourists to plan their region, make last-minute room reservations, and schedule with mobile applications [5].

Artificial intelligence-based chatbots, service robots, self-service kiosks that work 7/24, and machines with digital infrastructure used in the tourism industry can be seen today in the wide range of services in the field of tourism.

Today, the destinations that carry out their tourism planning mainly considering the digital media, it is preferred to develop marketing strategies over the internet.

Based on the conclusion of digitalization today, it can be expected that in the future, the use of artificial intelligence, mainly personal services and robots, will be widespread in tourism enterprises.

As an example of these applications, in the world's first robot hotel opened in the city of Nagasaki, Japan, robots greet customers by greeting them in Japanese, talk with customers and carry suitcases and bags to all rooms of the hotel [6,7].

One of the important application areas of digitalization in tourism is providing tourist opportunities through digital tourism that will make life easier for people with disabilities who want to participate in tourism activities, but cannot participate in these activities. In the research conducted on this topic, it was determined that applications such as avatars, robots and holograms will ensure the participation of disabled tourists in travel activities and participate in these activities [8].

Tourism enterprises can provide a competitive advantage over their competitors by applying smart tourism applications. Because time saving and technology use by smart tourism applications can satisfy customers and create a sense of difference.
Destination managers can promote destinations by using the technological opportunities brought about by digitalization in tourism, for example by creating virtual reality and game software.

Smart security management of tourist facilities and between facilities in tourist complexes is one of the main concepts of planning modern smart tourism complexes. The article investigates the possibility of using smart technologies to ensure security during the planning of tourist complexes.

2 Application Possibilities of Smart Security Technologies

Tourist sites are places where certain tourist attractions are located, as well as the areas adjacent to them. There are tourist sites and tourist destinations. Tourist destinations cover a wider area, such as a city, island, country, in which specific sites are located. One tourist destination may include several tourist sites, as well as infrastructure serving one or more tourist sites (for example, hotels, restaurants, travel agencies, transport networks). Tourism sites vary in location, layout, size, management structure, and the political, social and economic contexts in which they are located. Some of these places have natural beauty (eg beaches, national parks) and some have cultural, historical or religious value (eg museums, monuments, places of worship). Some objects turn into tourist attractions only during certain periods of the year (for example, gastronomic fairs).

Where tourism sites are located in remote areas, lack of or poor internet connectivity can significantly limit the ability of first responders and law enforcement to respond effectively to crisis situations, especially given the extent to which security-related information is shared, for operational purposes, is increasingly carried out through Internet-based smartphone applications. In such situations, we recommend using smart technology that will transmit sound between objects in the tourist complex using a laser in its pure form. The article presents the creation of a device that sends information over a distance secretly and safely. The technology can also be used for national security in the military, including border areas to covertly transmit information over a certain distance without the risk of information leakage.

3 Secure and Secretive Methods of Transmitting Information Over a Distance

Nowadays, communication has become one of the most important components of our lives. In some areas there is a need for more secure and secretive methods of transmitting information over a distance. For example, in border areas, radio communications are unsafe, since radio waves can be intercepted and eavesdropped. In mountainous areas it is necessary to transmit information from different heights, and transmit secret information between objects and from space. Note that laser communication is in many ways superior to radio waves. Laser waves are packed more densely than radio waves. This allows the laser to transmit more information per unit time. It is relevant to use this method in the planning of residential buildings and structures, as well as in the urban planning of complexes for various purposes.
Laser has a very important application in the field of communication. İts advantage is wide bandwidth and narrow beam width over long distances. The laser beams can be created in a range of wavelengths ultraviolet - infrared region of the electromagnetic spectrum. Any color of the emitted light may be used, but the infrared laser is preferred, as it is more difficult to detect [9]

The advent of semiconductor lasers leads to the use of them for signal transmission. They are excited by electric current and yield a laser beam in the infrared region of the electromagnetic spectrum. The advantage of laser transmission on ordinary radio waves is the strict secrecy provided by the narrow beam width [9].

Since no reception outside the narrow bundles of rays is possible, a high degree of secrecy can be maintained between the two points. Thus, it can be realized an interception-proof communication network.

The optical laser has a great possibility for use in long distance communication. The laser

communication through the atmospheric medium is effective only in clear weather conditions.

The goal of the work was to develop a device for wireless transmission of audio signals using laser beams. In the work, a device was developed for transmitting secret information, transmitting sound signals over a distance using a red laser diode. The types, characteristics, parameters and operating principles of the main elements used in the device for transmitting an audio signal using laser beams were investigated in the paper.

From the diagram of sound transmission through a laser beam it can be seen that the transmission process is carried out as follows (Fig. 1).

Fig.1. Diagram of a laser signal transmission system

Firstly, to generate and transmit any audio signal, it is necessary to use a microphone or any signal generator, as well as an amplifier and modulator. We used the phone or computer to manage all these processes. The phone generates, modulates and transmits any sound signal. After these processes, the signal enters our device in amplified form. The device consists of the following parts (Fig.2):

1. Signal controller HW - 104 and amplifier board (chip).
2. 5 V power supply.
3. Amplifier transistor.
4. A laser diode that converts an electrical signal into a laser beam (light beam) and emits it into space.

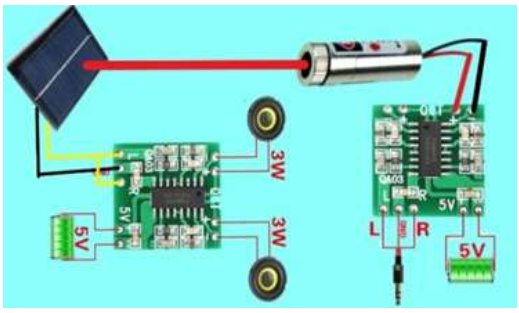

Fig.2. Block diagram of a device for transmitting sound by a laser beam

A transmitter and receiver were used to create the device.

1) The transmission circuit includes a PAM8403 IC amplifier (Fig.3), a laser diode, and a 9V battery. The PAM8403 amplifier amplifies the audio signal from the source to a level suitable for modulating the laser diode, the 9V battery supplies power to the laser diode, and the laser diode itself emits the laser beam at a voltage of 5 mV.

2) The receiver circuit includes solar panel, LM386 amplifier (Fig.4) and speaker. The solar panel detects the laser beam and converts it into an electrical signal to make the sound audible or amplify it to a level suitable for the speaker.

Using a transmitter and receiver, a prototype device was assembled for covert transmission of an audio signal via a laser beam.

The device transmits sounds using a red laser diode and achieves fairly clear sound with minimal interference.

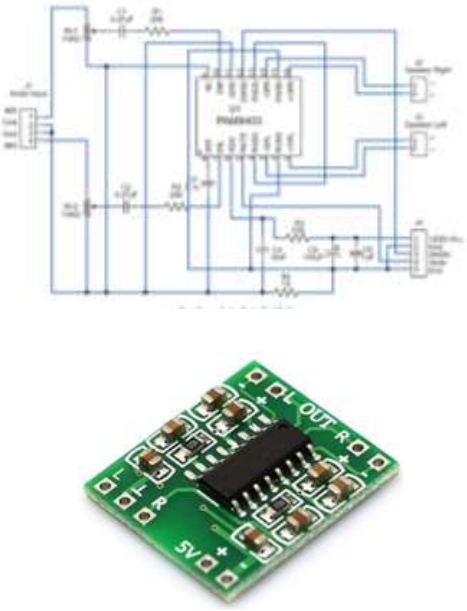

Fig.3. Block diagram and appearance of the PAM8403 (HW-104) audio amplifier chip

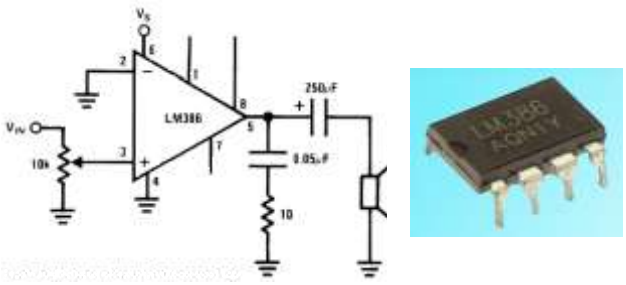

Fig.4. Block diagram of the LM386 microcircuit audio amplifier

Using the MultuSim program, an audio amplifier, diode, transmitter and receiver of a device for transmitting sound through laser beams were simulated, and the optimal parameters were determined (Fig.5). Based on these data, elements were selected and a circuit was assembled for a device for transmitting sound through laser beams. A laser communication system was created that was capable of transmitting an audio signal to the distance. Thanks to our system, it is possible to transmit a pure audio signal, without ambient light and noise.

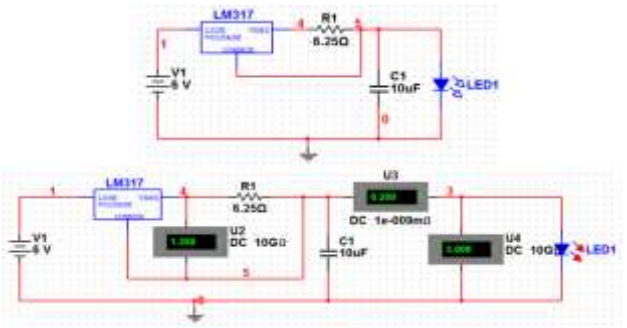

Fig.5. Model of a voice transmitter in the Multisim package

The computational model gives accurate predictions of the measured signal. Hence, it is possible to use the method for simulating the performance of an ideal optoacoustic transducer that is capable of reproducing continuous sound over the entire audible frequency range with high fidelity.

Using this new device we can transmit any data much faster safer and at very high transfer rates that are out of reach of the radio frequency (RF) spectrum. As compared to RF devices the circuitry is less and takes less space. It is the next-generation technique that has advantages over fiber optics, RF transmission. Its best use will be in space missions, defense systems, and tourist complexes

4 Semiconductor laser diods: applications and innovations

The development of electronics require of science the use of new semiconductor materials and optimization of the physical characteristics of equipments [10-12]

Laser diodes are one of the most important elements of optoelectronic devices. These are widely used in various fields like optical communication, medical treatment and industrial processing. Among the various types of laser diodes, gallium arsenide (GaAs) laser diodes are one of the most promising elements due to their excellent performance and reliability.

The GaAs laser diode was a revolution in the development of the telecommunications industry. The diode's ability to emit light at high frequencies allowed data to be transmitted at higher speeds over longer distances. This led to the development of high-speed internet, video conferencing and other communication technologies.

A GaAs laser diode is a semiconductor device that emits coherent light when electricity passes through it. The active region of a GaAs laser diode has a straight stripe and emits light efficiently. The laser stripe is formed by two split aspects that reflect light foward and back, resulting in stimulated emission of photons.

Compared to other types of laser diodes, GaAs laser diodes have advantages that make them ideal for many applications. Because they have high efficiency, consume less power and generate less heat than other laser diodes. These properties makes them suitable for portable devices and high-density applications.

GaAs laser diodes are highly reliable because they have a long service life and can operate in harsh environments. They are resistant to temperature, humidity and mechanical stress, making them ideal for industrial and medical applications.

GaAs laser diodes are high power output can produce high output power up to several watts, making them suitable for high power applications such as laser cutting, welding and drilling.

GaAs laser diodes have a low threshold current, which allows use them with a low amount of current. This makes them suitable for low power applications such as optical communications and sensing.

GaAs laser diodes have advantages on their analogies in telecommunications by their ability to transmit information over long distances. This is because the light they emit has a very narrow wavelength, meaning it can pass through optical fibers with minimal signal loss. This device emits light when current passes through them, and this light can be used to carry data using optical fibers.

In addition, GaAs laser diodes can operate at very high frequencies, allowing data to be transferred at very high speeds. Therefore this laser

diod considered as ideal element for use in high-speed data transmission applications such as fiber optic networks.

The telecommunications industry is constantly evolving, and GaAs laser diodes are likely to play an increasingly important role in the future. GaAs laser diodes are successfully used in quantum communication systems, which is one of the directions in electronics development. These systems use the principles of quantum mechanics to reliably transmit information over long distances, and GaAs laser diodes are an important component of these systems. Another area of development is the use of GaAs laser diodes in 5G wireless networks, where they will be used to transmit data at very high speeds over short distances.

The use of GaAs laser diodes for the purposes of security and protection of state borders, residential and public buildings, including tourist sites has become an increasingly important factor in recent years. To this end, these diodes have proven to be an effective tool for enhancing national security as well as building and facility safety as they offer a number of benefits that cannot be found with other technologies.

These diodes can be used to transmit information over long distances, even in bad conditions when traditional communication methods may be unreliable. GaAs laser diodes provide high-speed data transmission capabilities.

One of the key areas of GaAs laser diode research has been to improve the efficiency and power of these devices. Recent advances in materials science and device design have led to the development of new laser structures that can achieve much higher efficiencies and power outputs than previous ones. For example, researchers have developed GaAs Quantum Well laser diodes that can achieve efficiency levels of more than 70%, which is significantly higher than the 30-40% efficiency levels of traditional laser diodes.

Another area of research focusing on GaAs laser diodes has expanded the range of wavelengths these devices can emit. Traditionally, GaAs laser diodes emit light in the near-infrared region of the electromagnetic spectrum, so this is useful for applications such as telecommunications but not for other applications such as medical devices or spectroscopy. However, recent research has led to the development of GaAs laser diodes that can emit light in the visible and mid-infrared regions of the spectrum, opening up new possibilities for these devices.

As GaAs laser diode technology advances, ways to integrate these devices with other technologies are being explored to create more powerful and versatile systems. For example, GaAs laser diodes have been developed that can be integrated with silicon photonics to create highly efficient and cost-effective optical interconnects for data centers.

Researchers are working to improve the reliability and durability of GaAs laser diodes, these properties are critical for many applications. One approach has been to develop new materials and device structures that are more resistant to degradation over time. For example, researchers have developed GaAs laser diodes, which are more resistant to damage from high temperatures and other environmental factors.

Thus, the future of GaAs laser diodes looks bright, with ongoing research and development leading to new and exciting advances in efficiency, power output, wavelength range, integration with other technologies, and reliability.

Although GaAs laser diodes have proven to be a promising technology, they have a number of problems and limitations. One of the main problems with GaAs laser diodes is their high cost. The manufacturing process of these diodes involves complex and expensive procedures, making them more expensive than other types of laser diodes. However, this cost can be mitigated by increasing production volume and improving the manufacturing process, which can lead to savings.

One of the limitations of GaAs laser diodes is their limited wavelength range. These diodes can only emit light in a certain range of wavelengths, which may not be suitable for all devices. However, this limitation can be overcome by using multiple diodes of different wavelengths or by using external wavelength conversion techniques.

GaAs laser diodes also have relatively low power output compared to other types of lasers. This may be a limitation for applications that require high power output, such as laser cutting and welding.

The another limitation of GaAs laser diodes is the sensitivity to temperature changes, which can affect their performance and reliability. This can be a problem for applications that require stable and consistent performance.

The next limitation of GaAs laser diodes that they have a limited lifetime, which can be a limitation for applications that require long-term reliability.

While GaAs laser diodes have some problems and limitations, they are still a promising technology that can be used in a variety of applications. By addressing these issues and limitations through improved manufacturing processes and the use of

external techniques, the full potential of GaAs laser diodes can be realized.

4 Conclusion

Global digitalization has a direct impact on the tourism industry. Therefore, the use of new technologies in terms of customer service, security in tourism and for the effective organization of activities at enterprises in accordance with modern times is an important issue.

The aim of the paper is a conceptual study covering the application of smart technology for security in tourism complexes. In this work a device has been created that transmits information using a red laser diode over a certain distance secretly and safely with minimal interference.

The advantages of semiconductor laser diodes, their application areas, including secret transmission of information over long distances for the security purpose are presented, and also revealed their disadvantages.

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Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

The authors equally contributed in the present research, at all stages from the formulation of the problem to the final findings and solution.

Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself

No funding was received for conducting this study.

Conflict of Interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.