Infrared beam based security fence to protect the Boarder of cement factory

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***Abstract*- In this paper presented implemented approach for protecting border of large departments, large agencies, large universities, and large companies that have a large yard with a kilometers erecting walls, based on infrared beam. This system is based on infrared beam communication. For implementing of this system it is used invention protocol transmission data by authors. The presented method don't require to wiring for power supply. It is shown that cost of implementing this system is very low.**

***Keywords* -** Infrared Beam, Security fence, Transmission Data, Optic Communication

1. NTRODUCTION

Protection of very fast lands such as large university, large military and department agencies, and large company with several borders is difficult. The inspection by operator, using of barbed wire interval along its length, and so on, are the traditional methods for protecting of mentioned placed. But each of these has themselves special defaults and problems. Inspection by operators only can be performed in a limited. In the using of barbed wire method; the robbers or saboteurs can cut the barbed wire. In addition, this method is cost. Putting Closed-circuit television (CCTV) for supervision of borders is much cost and it is undesirable and irrational. In this paper is presented an approach for protection of border of very fast lands based on infrared beam. This method is much low cost and it is simple to implementation.
Infrared beam is used in data transmission with different channels such as optical fiber and atmosphere or free space communication (optical wireless communication). Many methods are used for data communication [1]

Optical communications, in various forms, have been used for thousands of years. The Ancient Greeks polished their shields to send signals during battle. In the modern era, semaphores and wireless solar telegraphs called heliographs were developed, using coded signals to communicate with their recipients [2].

Many simple and inexpensive consumer remote controls use low-speed communication using infrared (IR) light. This is known as consumer IR technologies.

In free-space optical communication links, atmospheric turbulence causes fluctuations in both the intensity and the phase of the received light signal, impairing link performance. They describe several communication techniques to mitigate turbulence-induced intensity fluctuations, i.e., signal fading. These techniques are applicable in the regime in which the receiver aperture is smaller than the correlation length of fading and the observation interval is shorter than the correlation time of fading. Thay assume that the receiver has no knowledge of the instantaneous fading state [3]. Free-space point-to-point optical links can be implemented using infrared infrared light, although low-data-rate communication over short distances is possible using LEDs. Infrared Data Association (IrDA) technology is a very simple form of free-space optical communications. Free Space Optics are additionally used for communications between spacecraft [4]. Maximum range for terrestrial links is of the order of 2 to 3 km (1.2 to 1.9 mi. But the stability and quality of the link is highly dependent on atmospheric factors such as rain, fog, dust and heat. Amateur radio operators have achieved significantly farther distances using incoherent sources of light from high-intensity LEDs. One reported 173 miles (278 km) in 2007. However, physical limitations of the equipment used limited bandwidths to about 4 kHz. The high sensitivities required of the detector to cover such distances made the internal capacitance of the photodiode used a dominant factor in the high-impedance amplifier which followed it, thus naturally forming a low-pass filter with a cut-off frequency in the 4 kHz range [5].

In outer space, the communication range of free-space optical communication is currently of the order of several thousand kilometers. But has the potential to bridge interplanetary distances of millions of kilometers, using optical telescopes as beam expanders in January 2013, NASA used infrareds to beam an image of the Mona Lisa to the Lunar

Reconnaissance Orbiter roughly 240,000 miles away. To compensate for atmospheric interference, error correction code algorithm similar to that used in CDs was implemented [6]

Secure free-space optical communications have been proposed using a infrared N-slit interferometer where the infrared signal takes the form of an interferometric pattern. Any attempt to intercept the signal causes the collapse of the interferometric pattern. This technique has been demonstrated to work over propagation distances of practical interest and, in principle, it could be applied over large distances in space [7]

In patent presented by Ildarabadi, this method implemented by laser beam [8]. Laser beam can't be used in day also setting transferring and receiving data and maintain it, between transfer and receiver by laser beam communication is difficult.

In this paper has been used of free-space optical communications for defense of fence of wide large organs based on InfraRed beam communcation. The next section describes how performance of proposed manner.

2 BORDER SECURITY BASED ON INFRARED BEAM

In this section a new approach is presented for protecting of border of the large lands against unwanted import and export human.

Base of this method is simple. A infrared bean is created in one point of border and a infrared beam receiver is placed other point of border as is showed figure 1.

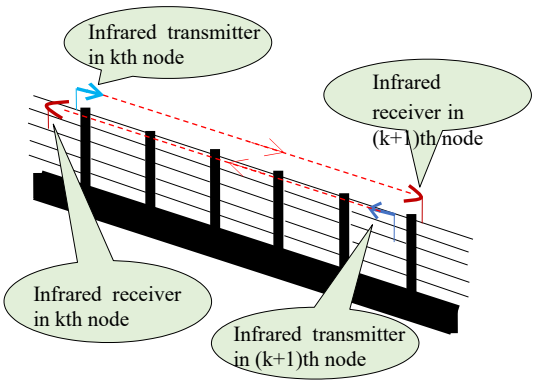

Fig. 1- Schematic of position Infrared transmitter and receiver

Distance between transmitter and receiver can be variable around 5 until 15 meters. If anyone passed on the border (fence) then it interrupts infrared beam and therefore transmitted data wouldn't receive to receiver. Thus it is distinguish a people has been entranced or exited.

For protection overall border of lands it is founded nodes on border. These nodes consist of two receivers and two transmitters as be shown figure 2.

This figure shows the protection system with n node that each node communicates with its adjacent nodes.

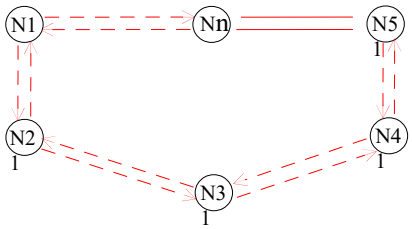

Fig. 2- Nodes relevance each other

Figure 3 shows the all of states that can be created for any node; these states are:

a) Normal station; in this state, any event haven't occurred. In this state every node transmits a beam with 1 mil-lisecond width to two neighbor nodes.
b) Day station; this state shows that it is day.
c) Interrupt station; this reflects the fact that someone is passing on the border. This state, is divided to two sub states, one; node has placed location that doesn't receive any beam from other side. Therefore node transfers its code to other side adjacent node that there is possibility date transmission it.
d) Receiving event code from other nodes.

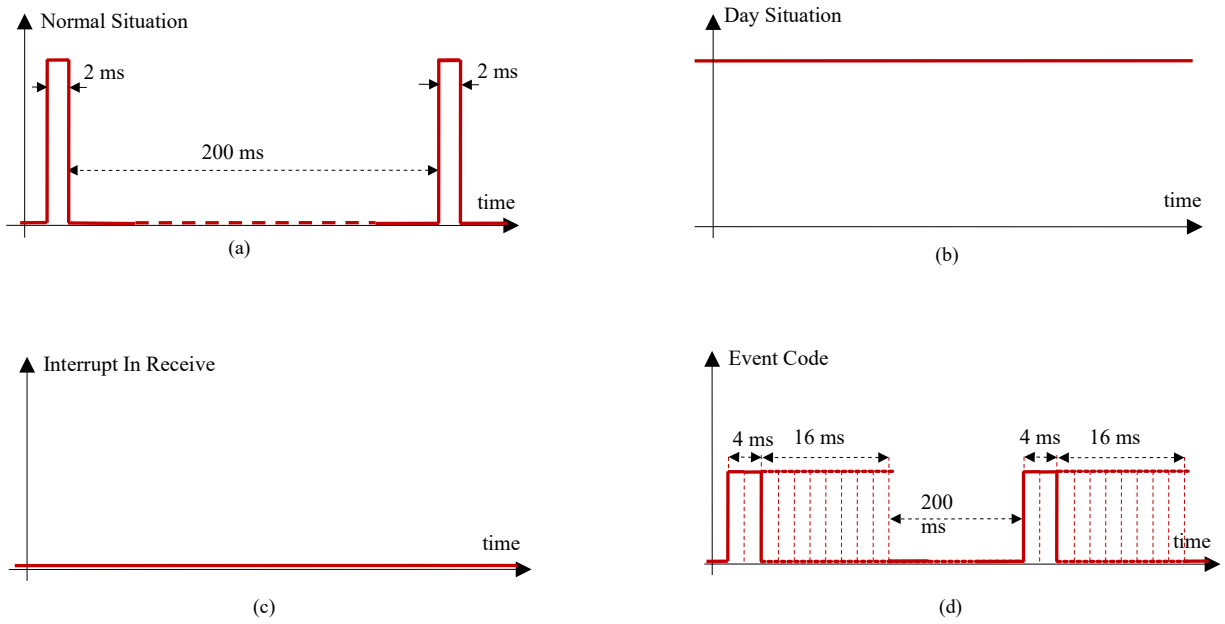

Fig. 3- all of states in each node

As has been seen in figure 3, in order to reduce energy consumption and also increase security data transmission, the following states are defined for system protection in each node.

1- Normal state; in this state, any event haven't occurred. In this state every node transmits a beam with 1 millisecond width to two neighbor nodes.

2- Prompt warning state; this reflects the fact that someone is passing on the border. This state, is divided to two sub states, one; node has placed location that doesn't receive any beam from other side. Therefore node transfers its code to other side adjacent node that there is possibility date transmission it.

Second; node hasn't located sides of accurate event location, therefore it sends received data (code) to adjacent nodes.

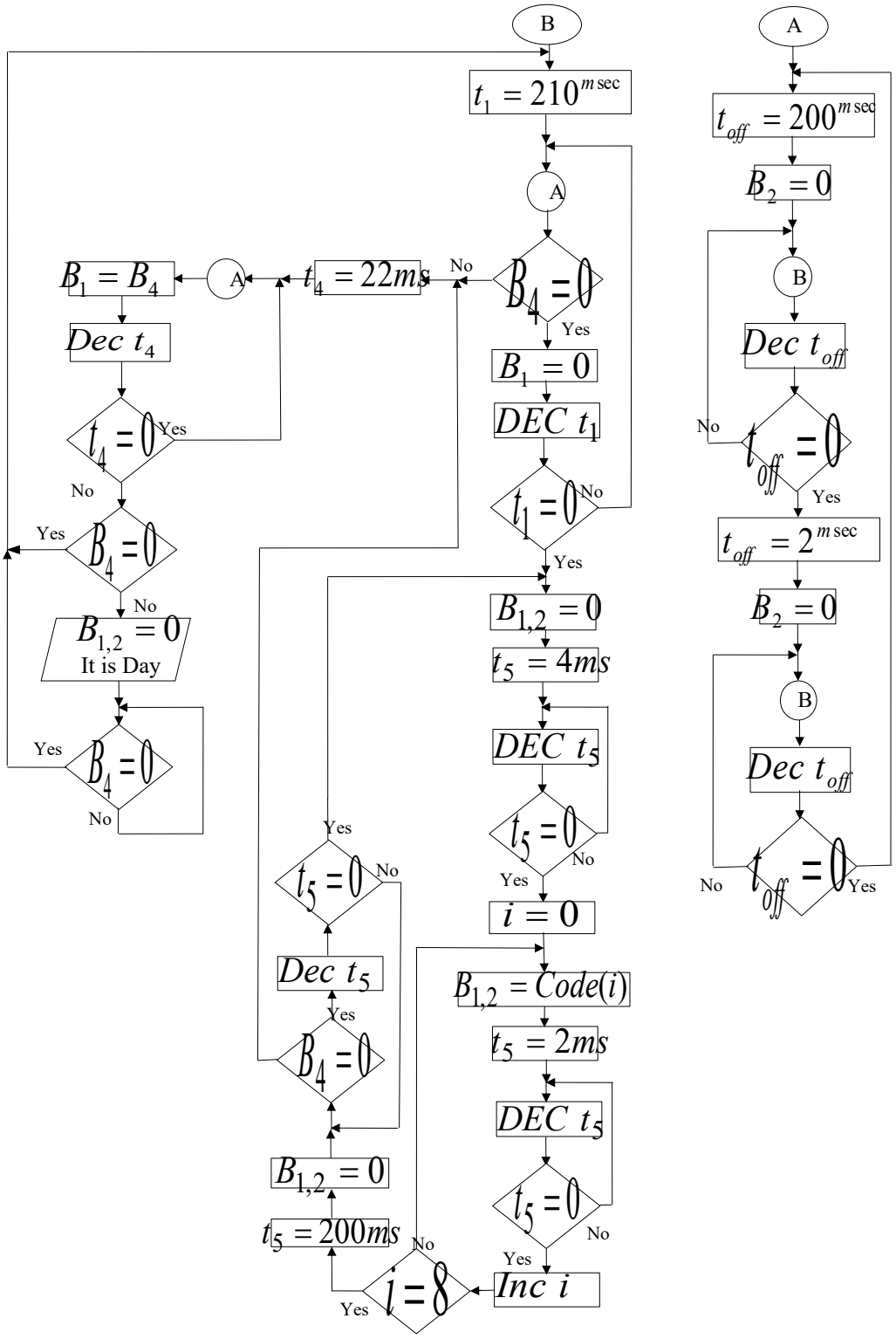

Figure3.a- flowchart of implementation of presented approach

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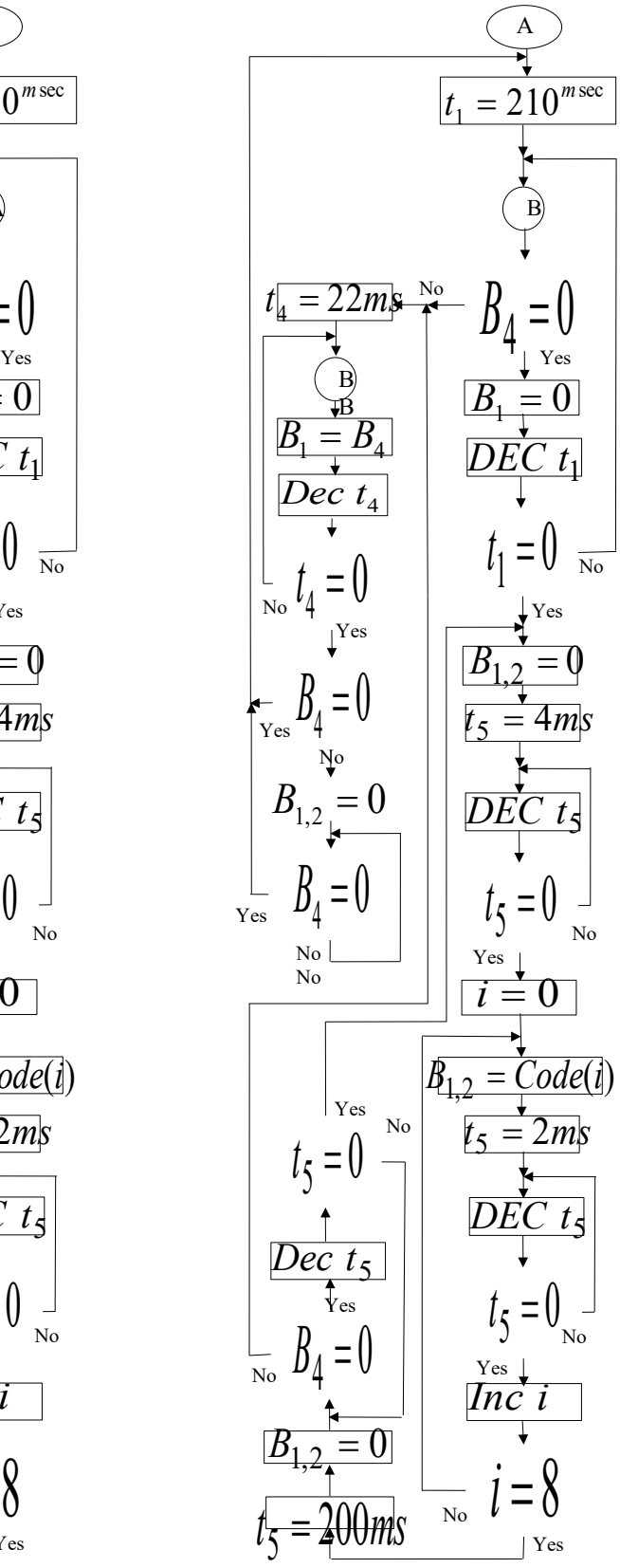

plementation of presented approach (be continued fig3.a)

3 CONCLUSION

In this paper for protection of very fast lands such as large university, large military and department agencies, and large company with several borders is presented new approach. The inspection by operator, using of barbed wire interval along its length, and so on, are the traditional methods for protecting of mentioned placed. But each of these has themselves special defaults and problems. The presented method is used of optic communication based on InfraRed beam. Implementing of this system can decrease the cost of protection in founding and operation. This for is new version of improved protection system that already presented in is patented by first author.

REFERENCES

[1] C. Lim, A. Nirmalaths, D. Novak, “Techniques for multichannel data transmission using a multisection infrared in millimeter-wave fiber-radio systems”, IEEE transactions on microwave theory and techniques, vol.47, no.7, pp.1351-1357, 1997

[2] H.D. Wacker, J. Borcsok, H. Hillmer, “Redundant optical data transmission using semiconductor infrareds”, IEEE/ACS international conference on computer systems and applications, 2008.

[4] Xiaoming Zhu, J. M. Kahn, " Free-space optical communication through atmospheric turbulence channels", IEEE Transactions on Communications Vol. 50, No. 8, p.p 1293 – 1300, Aug 2002

[5] Clint Turner "A 173-mile 2-way all-electronic optical contact" Modulated light web site. Retrieved June 28, 2011

[6] Lee, I.E., Sim, M.L., Kung F.W.L., "Performance enhancement of outdoor visible-light communication system using selective combining receiver," Optoelectronics, IET, vol.3, no.1, pp.30-39, February 2009

[7] F. Javier Lopez-Martinez, Gerardo Gomez; José María Garrido-Balsells "Physical-Layer Security in Free-Space Optical Communications" IEEE Photonics Journal, Vol.7, No. 2, pp. Feb. 2015

[8] R. Ildarabadi, Patent “Environmental protection system based on optical data communication for universities, military barracks and boundaries", 1396/7/3-93679, International Classification: “G06F/00; G08B 13/00; G06f 19/00”