Optical Fiber Acoustic Sensor Systems

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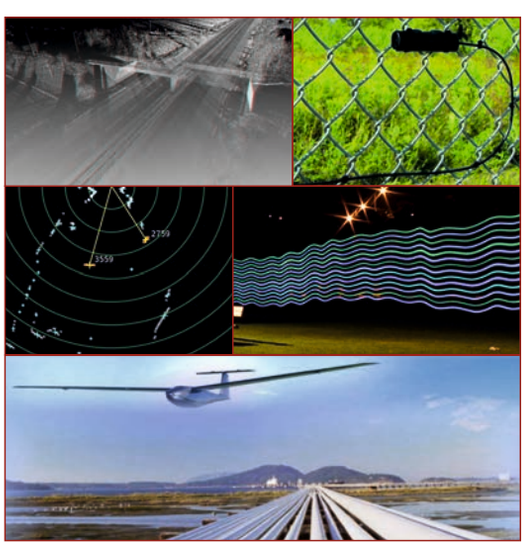
Conventional Security Methods

By today's conventional methods, security control of an area or region is provided by aircrafts, camera systems or armed forces. These methods are not economical and can be affected by environmental conditions.

New Sensor Technologies

Recently alternative technological methods are being developed to comply higher safety and security requirements. Infrared sensors, micro phonic cables, LIDAR & RADAR systems, light barriers, unmanned aircrafts are examples of new security methods. However, these methods are not suitable if long line of border is to be controlled. Different environmental conditions are still playing an important role on detection of intrusion or an alarm condition.



Alternative Needs in Security

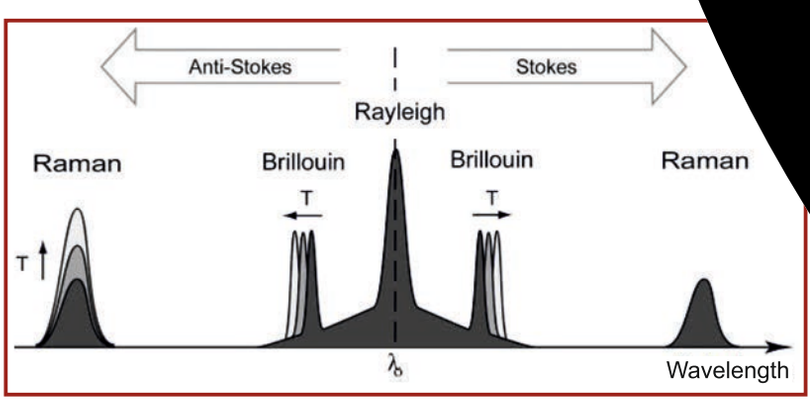
Necessity to transfer data to long distances at high speeds leads to development of new technologies. By using photons instead of electrons; higher bandwidth with lower costs is available for transferring data. Despite the idea of transmitting information with light is not new theoretically, components and devices for realizing this idea is emerging in the last few decades. Glass is a good isolator, that's why fiber cables are superior to its alternatives.

No disruptive energy fields are neither spread nor absorbed. Fiber cables are much lighter and smaller than copper alternatives when same or more bandwidth of transmission is required. In addition, installation and operational costs are also low. Therefore, fiber optic sensors have been developed because they are;

- Not affected by electromagnetic interference,
- Not require any power or additional hardware,
- Not affected by environmental conditions,
- Maintenance-free,
- Easy to establish,
- Very difficult to detect,
- Long lasting,
- Low cost.

Recognition Principle

Distributed sensing is based on the analysis of backscattered light emitted when a laser pulse is transmitted inside an optical fiber. The backscattering is due to interaction of laser light with density fluctuations and molecular vibrations of the medium.



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This scattering is divided into three types of information it carries;

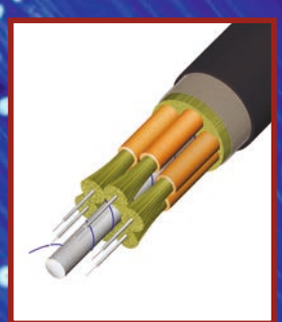
Raman: Produces backscatter of the lowest intensity with varying wavelength, due to thermally excited molecular vibrations.

Brillouin: Produces backscatter of lower intensity than Rayleigh, due to thermally excited acoustic waves. Drift in wavelength is similar to Raman backscatter.

Rayleigh: Produces the largest magnitude of backscatter at the same frequency as the incident light. Detects Low vibrations

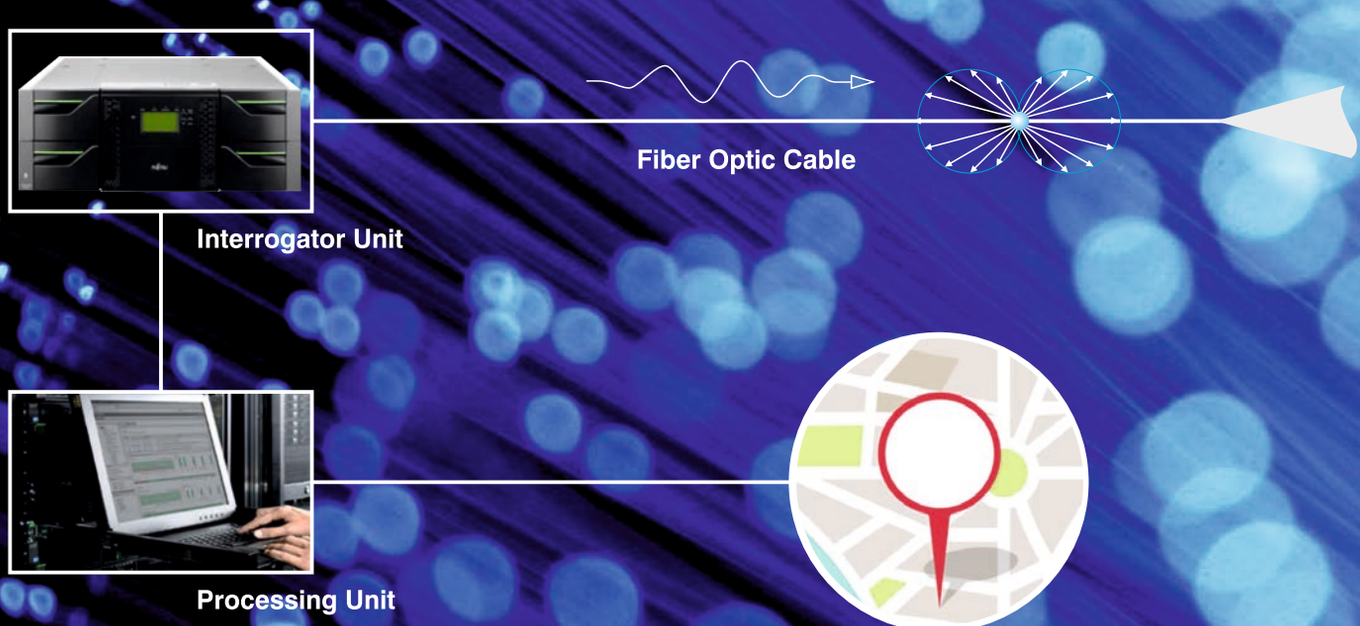
Technical Specification

- Sensing configuration: Distributed sensor with a max. fiber length of 50 Km. per controller
- Location accuracy: Within 1 to 10 m along to sensor cable
- Precision range: Depending on the depth, 40 meters on both sides of the sensor cable
- Event classification ability: pedestrians, vehicles, excavation activities, wire mesh cutting, climbing



Measurement Method

A short laser pulse is sent inside the fiber cable under test using a special optical interface unit. Laser light passing through the fiber, exposed to different interactions and backscatter signals pass through the same optical interface unit, which then reaches to receiving optic sensor. After digitizing the received signal, fingerprints of intrusion is determined and processed in the central processor unit. Necessary alarms and statistical data are automatically created depending on the system configuration. Outputs are optionally interfaced to necessary 3rd party and/or SCADA systems.



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Early Third Party Activity Detection

Application Areas

- Area Security (Airports, Military Zones, Government Buildings)
- Border Security
- Surveillance and Security Systems
- Monitoring of Pipelines and Tunnel Crossings
- Traffic Monitoring for Railways & Highways
- Fire Detection Systems
- Engineering Applications
- Structural Control (dam sets, waterways, highways)

Advantages

- Not affected by the climatic and environmental conditions
- Very easy operation and maintenance
- Minimizing the human factor in the detection technology
- Not affected by Electronic Warfare, EMI
- Not detectable by Electromagnetic Methods

Real-Time Positioning & Navigation Safety on the Railway & Highway Line Control



Border Security


Water Leakage Control


Pipeline Security


Water Height Control


Tunnel Security


Hull Safety of Dams


HEADQUARTERS
Tepe Prime
Dumlupınar Bulvarı
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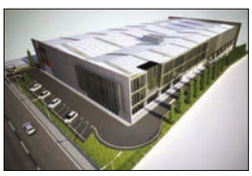

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