Coupler for fiber optic quasi distributed sensing (Ramot)

code: 7-2016-1000

Avishay EYAL, T.A.U Tel Aviv University, Engineering, School of Electrical Engineering
Shaul OZERI, T.A.U Tel Aviv University, Engineering, Electrical Eng-Systems

TAU researchers have developed a first of its kind sensing platform termed Optical - Universal Sensor Bus (O-USB). It facilitates simple, flexible and cost-effective deployment of sensor arrays over very long distances (tens of kilometers per control box) for a wide variety of applications. It supports almost any type of sensor and allows mixing of different types on the same bus.

THE NEED

There is a myriad of current and future applications which require large scale sensors arrays. However, employing the most sophisticated sensors alone is not helpful if there is no simple and cost-effective way to deploy them and transmit their readings to a central control and processing unit. This was the rationale behind the development of O-USB. The variety of potential applications is huge. Large scale sensor arrays are needed to protect strategic assets, borders and installations against intrusion. They can be installed along oil and gas pipelines (to detect theft or sabotage attempts) or along roads and railroads to monitor transportation and to detect hazards (fire, ice on road, landslides, human and animal crossing and more).
They can monitor soil moisture and nutrients in agricultural farms or be deployed in industrial facilities to detect critical parameters (concentrations of gas and pollutants, radiation levels, smoke, temperature etc.).
They can be installed in city streets to monitor parking spots (for city-parking management), and be used for enforcement of a no-drone zone around airports and other installations and the list goes on and on. In all these applications there is a large number of sensors which need to communicate their signals over significant distances and all prevailing technologies for implementing the link have many drawbacks. With O-USB deployment of sensor arrays will be simple, affordable and more practical than ever before.

OUR PROPOSED TECHNOLOGY

O-USB technology is based on coherent optical communication. Analog or digital signals from the sensors are encoded on the phase of the light carrier which is transmitted in a telecom-type optical cable. The optical carrier is transmitted from the main unit and received by it. The transmitted information is translated back to electrical signals via a phase-demodulation technique.
A key aspect of the technology is that the encoding of the sensor data on the phase of the optical carrier is performed, 'non-invasively', at any desired point along the optical cable. Namely, a sensor signal is transmitted into the optical cable and modulates the phase of the optical carrier. This is performed with no need to cut the optical cables or harm it in any way. A sensor can be added to the bus or removed from it, anywhere, with a 'one-click' operation. Hence, in contrast with other wired technologies, there is no need to know in advance the position of the sensors and to prepare for them input ports in the cable.

ADVANTAGES

• O-USB can support a large variety of sensors: microphones, geophones, hydrophones, temperature sensors, gas sensors, smoke-detectors, radiation monitors, light level, proximity sensors, pressure sensors, moisture sensors and much more.
• A single main unit (control box) can support ~1000 different sensors
• Simple and cost-effective deployment. The sensors are connected to the bus (or removed from it) by non-expert users, at any desired location in a 'one-click' operation.
• The bus is inherently secure and is less vulnerable to cyber-attacks than wireless sensor networks
• O-USB are insensitive to electromagnetic interference
• O-USB can be deployed indoors, outdoors, underwater and underground
• No need for additional line for power distribution to the sensors or field battery replacement (Sensors harvest their required power from the O-USB cable)

Contact for more information:

Ofer Shneyour ✉, VP Business Development, ICT, +972.3.640.6496

Ramot at Tel Aviv University Ltd. P.O. Box 39296, Tel Aviv 61392 ISRAEL
Phone: +972-3-6406608
Fax: +972-3-6406675