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Fibre Bragg grating Sensor For Real Time Fence Monitoring

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Abstract content
 (Max 300 words)

The development of a fibre Bragg grating (FBG) sensor for real time fence monitoring is reported. Fibre Bragg grating consists in a periodic modulation of the effective refractive index in the core of an optical fibre. The modulation in the refractive index is achieved by exposing the core of the fibre to intense ultraviolet interference pattern. The periodic modulation produced in the fibre, allows the fibre to reflect a specific wavelength, known as the Bragg wavelength, and transmit the others. The Bragg wavelength shifts when external mechanical or thermal perturbations are applied to the FBG, making FBG useful for optical sensing applications such as intruder's detection via strain, vibration or breakage in fence and perimeter monitoring. Multiple FBGs can be inscribed in one optical fibre; thus allowing multipoint sensing. We report a system that consists of a broadband source sending light in the FBGs cable where each FBG reflects a specific wavelength. Through the scanning process of a tuneable fibre Fabry-Perot filter, and a photo-detector, the optical spectrum in wavelength domain is converted to time domain for real time signal processing. By increasing the scanning frequency of the filter, perturbations of several kHz are detected. The FBGs cable is embedded in the fence where perturbations are applied. These perturbations cause quasi-static or dynamic shift in the Bragg wavelength of the affected FBG, while the Bragg wavelengths of other FBGs will not shift; therefore these FBGs can be used for other intruder attempts at the same time. By monitoring the shift in the Bragg wavelengths, we can detect an intruder to the perimeter. We conduct real time signal processing in LabVIEW and introduce the gravity centre algorithm for an increase in the system resolution. The data are sent to internet for remote monitoring. An indoor fence with four FBGs was monitored and perturbations were successfully detected. This fully automated real time running system can be used to detect breaking in or out of military bases, government's facilities and prisons by activating an alarm; consequently no human power is needed. The proposed configuration makes use of standard components for telecommunication; therefore the system is relatively inexpensive and easy to implement.

Apply to be
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 award (Yes / No)?

Yes

Level for award
 (Hons, MSc,
 PhD)?

MSc

Main supervisor (name and email)
and his / her institution

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**Would you like to
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Yes

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