FBGs Real-Time Impact Damage Monitoring System of GFRP Beam Based on CC-LSL Algorithm

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Glass-fiber reinforced polymer (GFRP) composite materials have an undisputed dominance over conventional metallic materials. However, susceptibility to barely visible or invisible internal damage due to impact has increased the demand for these composite materials in robust real-time structural health monitoring (SHM) system since they are capable of localizing the source of impact. Thus, in this paper, an *in situ* FBG sensor was embedded in a GFRP beam, providing an online real-time monitoring system and with the knowledge of cross-correlation linear source location (CC-LSL) algorithm, the impact location was capable of being determined in a split second. The consistency of cross-correlation function in providing repeatable results for all trials estimated a consistent time difference for all the impact points. The CC-LSL algorithm also revealed that the highest percentage of error was only 4.21% away from the actual hit. In the meantime, FBGs also showed good results as a dynamic strain measuring device in capturing frequency response at certain orientations compared to the AE sensor.

Keywords: FBG sensor; smart structure; structural health monitoring; composites; real-time monitoring system.

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