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BORANG PENGESAHAN STATUS TESIS ♦

JUDUL: APPLICATION OF FIBER BRAGG GRATING SENSORS IN
MONITORING CIVIL ENGINEERING STRUCTURES

SESI PENGAJIAN: 2005 / 2006

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Date : 27 JUNE 2006

APPLICATION OF FIBER BRAGG GRATING SENSORS IN MONITORING
CIVIL ENGINEERING STRUCTURES

CHIN KAI SAN

A project report submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Engineering (Civil-Structure)

Faculty of Civil Engineering
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JUNE 2006

I declared that this project report entitled “APPLICATION OF FIBER BRAGG GRATING SENSORS IN MONITORING OF CIVIL ENGINEERING STRUCTURES” is the result of my own research except as cited in references. This project has not been accepted for any degree and is not concurrently submitted in candidature of any degree.

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Date : 27 JUNE 2006

In loving appreciation of my dear family and friends

May God shower his blessing on you.

Love you forever...

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ABSTRACT

Fiber Bragg grating (FBG) is finding increasing usage in aerospace guidance, marine structures and civil engineering applications. This is due to their lightweight, non-obtrusive, immunity to electromagnetic interference, high bandwidth and sensitivity, and solid-state properties. Analysis of case studies is carried out to study the applications of Fiber Bragg grating sensors in civil engineering structures. In this research, a fiber Bragg grating sensing system for strain measurement is being described. Low cost and simple grating-based FBG has been used to produce the strain and induce Bragg wavelength shifts. A brief experimental testing on an instrumented metal plate showed that the proposed system is able to perform strain measurements with linear response. A general guideline is proposed on the fabrication and installation of fiber Bragg gratings for structural monitoring in local conditions.

ABSTRAK

Gentian optik parutan *Bragg* semakin banyak digunakan dalam bidang aerospace, struktur marine dan juga bidang kejuruteraan awam. Ini adalah disebabkan oleh ciri gentian optik yang ringan, kurang kelihatan, terjamin selamat daripada gangguan elektromagnet dan mempunyai sensitiviti yang tinggi. Analisa ke atas beberapa kes telah dijalankan untuk menyelidik aplikasi gentian optik parutan *Bragg* dalam struktur kejuruteraan awam. Dalam penyelidikan ini, sistem pengesan gentian optik parutan *Bragg* untuk mengukur terikan telah digambarkan. Gentian optik *Bragg* harga rendah telah digunakan untuk menghasilkan terikan dan menyebabkan perubahan panjang gelombang *Bragg*. Kajian yang ringkas telah dijalankan ke atas plat aluminium dan menunjukkan sistem pengesan terikan yang dicadangkan berupaya mengukur terikan. Panduan umum mengenai pemrosesan dan pemasangan gentian optik parutan *Bragg* telah dicadangkan untuk penggunaan dalam keadaan tempatan.