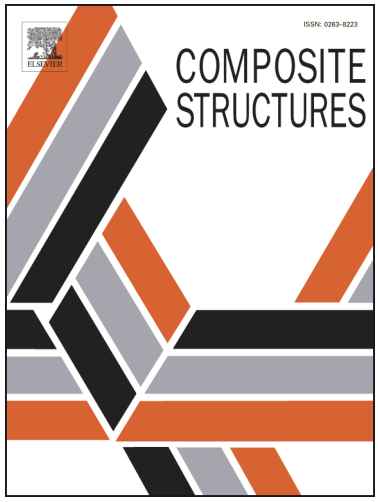

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Monotonic Loads Experiment Investigate of Composite Structure Based on Terrestrial Laser Scanner Measurement

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ABSTRACT

Nowadays, reinforced concrete is ubiquitous and indispensable building materials and is diffusely applied in various types of engineering structures due to which are regularly required to satisfy the high demands of comfort and security. So an accurate estimation of the ultimate load is essential in order to monitoring the deformation and assess safety of reinforced concrete structures.

Terrestrial laser scanner could be considered one of the most high precision monitoring devices for deformation of composite structures. This measurement is carried out for arch reinforced concrete structure. Due to the curvature and continuously variable slope of arch structure will bring in additional internal forces, it is necessary to adapt new displacement-strain relationship which is different from the linear structures. The goal of this paper is to investigate the accessional deformation of arch structure which is caused by curvature of arch and continuously variable slope.

1. Introduction

The goal of this paper is to investigate the accessional deformation of arch structure which is caused by curvature of arch and continuously variable slope.

The terrestrial laser scanner (TLS) may be considered one of the most high precision monitoring devices for RC composite structures. Nowadays, reinforced concrete (RC) is ubiquitous and indispensable building materials and is diffusely applied in various types of engineering structures due to RC structures are regularly required to satisfy the high demands of comfort and security. So an accurate estimation of the ultimate load is essential in order to monitoring the deformation and assess safety of RC structures.

1.1. Deformation Measurement

Due to reinforced concrete (RC) structures are regularly required to satisfy the high demands of comfort and security, RC has been ubiquitous and indispensable building materials since 19th century and nowadays is diffusely applied in various types of engineering structures [1-3]. So an accurate estimation of the ultimate load is essential in order to monitoring the deformation and assess safety of RC structures against failure and the prediction of the load-displacement behavior of the RC structure throughout the range of elastic and inelastic response is desirable [4-7].

1.2. Terrestrial Laser Scanner Technology

Compared with other techniques for deformation measurement, one significant advantage of the TLS is that it has fewer requirements in experimental environment, and can easily be implemented with a simple experimental setup [8-12]. Measurement data can be acquired continuously or at specific time intervals during the lifetime of a structure and combined with damage detection routines. These techniques have become popular in recent years thanks to the availability of new test post processing methods like operational modal analysis.

Combining structural health monitoring with fatigue analysis allows to estimate the residual lifetime of structure under dynamic loading. Compared with other techniques for deformation measurement, one significant advantage of the TLS is that it has fewer requirements in experimental environment, and can easily be implemented with a simple experimental setup [13-17].

2. Experiment

2.1. Measure program arc test

The experiment is conducted to probe the deformation behavior of an arch structure. Loads are added on top surface of the arch and thirteen epochs data are collected, where each epoch refers to continues load (2 kN/min) for