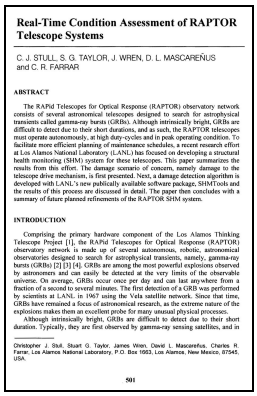

Real-Time Condition Assessment of RAPTOR Telescope Systems

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ABSTRACT

The RAPid Telescopes for Optical Response (RAPTOR) observatory network consists of several astronomical telescopes designed to search for astrophysical transients called gamma-ray bursts (GRBs). Although intrinsically bright, GRBs are difficult to detect due to their short durations, and as such, the RAPTOR telescopes must operate autonomously, at high duty-cycles and in peak operating condition. To facilitate more efficient planning of maintenance schedules, a recent research effort at Los Alamos National Laboratory (LANL) has focused on developing a structural health monitoring (SHM) system for these telescopes. This paper summarizes the results from this effort. The damage scenario of concern, namely damage to the telescope drive mechanism, is first presented. Next, a damage detection algorithm is developed with LANL's new publically available software package, SHMTools and the results of this process are discussed in detail. The paper then concludes with a summary of future planned refinements of the RAPTOR SHM system.

INTRODUCTION

Comprising the primary hardware component of the Los Alamos Thinking Telescope Project [1], the RAPid Telescopes for Optical Response (RAPTOR) observatory network is made up of several autonomous, robotic, astronomical observatories designed to search for astrophysical transients, namely, gamma-ray bursts (GRBs) [2] [3] [4]. GRBs are among the most powerful explosions observed by astronomers and can easily be detected at the very limits of the observable universe. On average, GRBs occur once per day and can last anywhere from a fraction of a second to several minutes. The first detection of a GRB was performed by scientists at LANL in 1967 using the Vela satellite network. Since that time, GRBs have remained a focus of astronomical research, as the extreme nature of the explosions makes them an excellent probe for many unusual physical processes.

Although intrinsically bright, GRBs are difficult to detect due to their short duration. Typically, they are first observed by gamma-ray sensing satellites, and in

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Ключевые слова:

Содержание.