LIGO-SURF Summer 2006 Project Abstract for the Project

"Searching for Gravitational-Wave Bursts of Arbitrary Waveform"

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Abstract:

One class of signal LIGO is searching for consists of short duration gravitational wave bursts of a priori unknown waveform. Potential sources include core collapse supernovae and the coalescence of binary black holes. To detect such events, existing search algorithms project the LIGO data stream onto various time-frequency bases and then search for regions of excess signal energy. One of these search algorithms, the Q Pipeline, determines the statistical significance of events based solely on the peak signal observed in the time-frequency plane. This project investigated extensions to this approach that also consider the statistical significance of arbitrarily shaped regions in the time-frequency plane by exploiting the advantages of data clustering. After considering various aspects of different data clustering methods, density based clustering algorithms were chosen to be the best fit for our purpose due to its ability to find arbitrarily shaped clusters and reject noise. A density based clustering function has been implemented, extensively tested, and integrated with the standard Q pipeline burst search algorithm.

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                                          (Mentor)

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