Proposal to add three new members to the existing UTB-LIGO MOU

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on behalf of the UTB LSC members

LIGO Tech Doc # G070519-00-0
LSC meeting, July 25, 2007, Boston, MA.

Existing group & proposed new members

- UTB has been an LSC member since 1998.

- Current membership consists of 6 faculty members (M. Diaz, J. Romano, S. Mohanty, S. Mukherjee, R. Grosso and M. Benacquista), several under-graduate and graduate students.

  -Contributing in the areas of burst, inspiral and stochastic searches and in detector characterization.

- Proposed new members : T. Creighton (Asst. Professor, Department of Physics & Astronomy) and L.R. Tang and H. Lei (Asst. Professors, Department of Computer Science).

T. Creighton

Teviet Creighton's proposed LSC activities:

- Pulsar Group:
  - » Resume duties as PULGroup reviewer
  - » Continue developing and updating code for Einstein@home validator
- Burst Group:
  - » Analyze effectiveness of current burst pipeline on acoustically-driven core-collapse supernovae
    Burrows et al., ApJ **640**:878 (2006); Ott et al., PRL **96**:201102 (2006)
    - ◦ Explosion driven by acoustic waves from accreting proto-neutron star
    - ◦ GWs carry away anywhere from $10^{-8}M\ c^2$ to $10^{-3}M\ c^2$(!!!) of energy, at ∼kHz frequencies.
    - ◦ But oscillations build up gradually over ∼hundreds of ms, much longer than other SN mechanisms.

    ⇒ Current ETGs might have poor efficiency for such long signals.
  - » If necessary, develop new ETG for this type of waveform.

L.R. Tang & H. Lei

Introduction

- L.R. Tang (Ph. D, UT-Austin) and H. Lei (Ph.D, SUNY-Buffalo) are computer scientists.

- Tang's expertise is in the area of Knowledge Discovery in Databases (KDD). Lei's expertise is in the area of pattern recognition.

- Both Tang and Lei have been collaborators of Mukherjee. Lei, Tang, Mukherjee and Mohanty have written scientific papers and proposals together. They have also initiated an inter-disciplinary program between the Physics and the CS departments.

L.R. Tang & H. Lei

Interests

- Tang and Lei have great interest in the gravitational wave data analysis, especially in the area of detector characterization and glitch analysis.

- Tang and Lei's expertise can enhance and bring new ideas in the area of glitch analysis and classification. They would like to make fruitful applications of their research to make a positive contribution to the gravitational wave data analysis area.

- Tang and Lei do not propose to be authors in the LSC scientific results papers. They would only be authors on methods papers that use their contributions.

L. R. Tang and H. Lei

Proposed LSC activities (1)

Lei and Tang propose to develop new algorithms that can extract features from noisy time series. Specifically, they will apply the recently developed S-means* algorithm to glitches detected by various ETGs and look for distinct patterns to aid detector characterization research.

*Similarity Driven Clustering and its Applications in Gravitational Wave Data Mining,H. Lei, L. R. Tang, J.R. Iglesias & S. Mukherjee, S. D. Mohanty, International Workshop on Knowledge Discovery from Ubiquitous Data Streams, 18th European conference on Machine Learning (ECML) and 11th European conference on Principles and Practice of Knowledge Discovery in Databases (PKDD), Warsaw, Poland, 2007.
ECML, PKDD proceedings, Springer-Verlag (LNAI series), September 2007, Accepted for publication.

L. R. Tang and H. Lei

Proposed LSC activities (2)

- Thus, in effect, Lei and Tang will be collaborating closely with Mukherjee in the existing automated glitch classification project by developing new ideas in addition to the ones that exist now in the pipeline. They will also be bringing in latest technical knowledge and expertise in glitch identification stage of the pipeline.

- The knowledge exchange will be two-fold : Lei and Tang will develop CS research in the area that in some sense will be focused towards gravitational wave data analysis. The LSC members engaged in detector characterization will use the new developments for customized data analysis targets.

Summary

UTB LSC group proposes to enhance its contribution to the collaboration by inclusion of three new members who are expected to bring new ideas to the MOU and also strengthen the existing projects.

While T. Creighton applies for a full membership, H. Lei and L.R. Tang proposes to be members with authorship only to the methods papers that they participate in.