Goddard's HHT Fuels Medical Research to Help Improve Diagnoses at Beth Israel Deaconess Medical Center

NASA Goddard Space Flight Center is conducting collaborative research with Harvard's Beth Israel Deaconess Medical Center (BIDMC), working toward the goal of refining the use of Goddard's Hilbert-Huang Transform (HHT) technology for a variety of medical advancements. The collaborative effort is expected to enhance monitoring of patients at risk for sudden cardiac failure and stroke, as well as diagnosis and treatment of depression and other neurological disorders. The research was also designed to use HHT to analyze physiological signals in order to measure the vitality of various systems within the body.

Benefits of Technology Transfer

BIDMC's use of Goddard's HHT technology is expected to offer highly significant benefits to the medical community and to the public sector, including:

- Improved diagnosis, monitoring, and treatment of cardiac disease, stroke, Parkinson's Disease, depression, and other disorders.
- New ways to predict the onset of health risks through the measurement of the relative vitality of various biological systems in the human body.
- Cost-savings for medical facilities that could use simple, inexpensive, outpatient-based methods of measuring blood-flow data to assess the risk for stroke.
- Improvements to the HHT technology that expand its applicability in several fields including medical research, as well as the space program. (Goddard researchers have already made improvements to the HHT technology based on the BIDMC research, which is helping with wing-flutter tests to improve Shuttle mission safety at NASA Dryden Flight Research Center.)

tech transfer *success*

On the Record

"The applications for HHT continue to grow as Goddard continues to work with other organizations to identify important new uses. The transfer of this important technology can clearly have an impact on many critical areas of research, including medicine, right here on Earth." – *Monica Montague, NASA Goddard Space Flight Center*

"By sharing the HHT technology with other organizations like BIDMC, NASA will also benefit by using the resulting knowledge to refine and further develop HHT and its use in other areas of research." – *Norden Huang, inventor of the HHT algorithm, NASA Goddard Space Flight Center (retired)*

"In collaboration with Dr. Huang, Beth Israel Deaconess Medical Center/Harvard Medical School researchers were able to explore several exciting new applications of the HHT algorithm with major public health implications, including sleep apnea detection and the quantification of cerebral blood flow and blood pressure dynamics in elderly people at risk of stroke." - *Dr. Ary Goldberger, Associate Professor of Medicine, Harvard University's Beth Israel Deaconess Medical Center*

About Beth Israel Deaconess Medical Center

Among independent teaching hospitals, BIDMC is the third-largest recipient of biomedical research funding from the National Institutes of Health. Research funding totals nearly $150 million annually. BIDMC researchers run more than 1,000 active sponsored projects and 200 clinical trials. BIDMC excels in surgery as well as treatment of cardiac conditions, cancer, and pulmonary and thoracic disorders and is known for expertise in neurosciences, gastroenterology and liver disease, obstetrics and women's health, podiatry, and emergency and trauma medicine.

Technology Origins

A revolutionary, adaptive set of signal-analysis algorithms, HHT's first application within NASA was analysis of wing-flutter tests and the next generation of aircraft design at NASA Dryden Flight Research Center. The technology has also contributed to Shuttle mission safety by testing the tiles that insulate the Shuttle in space for the Shuttle Return to Flight Project following the Columbia accident.

Finding a New Use

Dr. Norden Huang began developing HHT in 1995 and improved the technology for use in many industries. Unlike precursor technologies, HHT provides an effective method for analyzing nonlinear and nonstationary signals while improving the accuracy of linear- and stationary-signal analysis. Because analytical measurements within many areas of science benefit from a quantitative measurement of nonlinear data, HHT is widely applicable to a broad range of fields, including medicine.

The Transfer Process

Signed on July 19, 2004, the Space Act Agreement between BIDMC and Goddard was negotiated and administered by Goddard's Innovative Partnerships Program office. Interest in a technology transfer agreement was initiated by BIDMC, whose representatives contacted Dr. Huang directly to solicit his involvement in research utilizing HHT. During the course of their research, BIDMC scientists worked directly with Dr. Huang to understand the HHT algorithms and to apply them to analyses of physiological signals, enabling better monitoring of cardiac and neurological diseases.

Looking Ahead

BIDMC researchers are currently evaluating results of the collaborative research. It is expected that the results will enable both Goddard and BIDMC to gain valuable understanding of the role HHT can play in medical research.

For More Information

If you would like additional information about Goddard's technology transfer opportunities, please contact:

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