

Title

A Laboratory for Signal Processing

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Aims

In the following *signal processing* or *signal processing* will stand for all form of storing and processing digital information and the theoretical/mathematical work related to those applications. In this broad sense signal processing is becoming an important part of several different branches of mathematics and applied sciences today.

There are already several groups on campus, including groups in computer science, engineering (at least two different groups), and mathematics, using wavelets/image processing in their work. Most of those groups are not specialized in this topic, and do not do their main work in this field. The aim of this proposal would be to enhance those efforts and open up new applications by building up an interdisciplinary research center or Lab in image processing, in particular the theory of wavelets and its applications in image processing and information technology. Several universities and private companies already have such centers. Those include:

- (1) Bell Labs Computing Research Center;
- (2) AT&T;
- (3) *Center for Image Processing and Integrated Computing* (CIPC), which is an interdisciplinary research center of the University of California, Davis;
- (4) *The Center for Signals and Image Processing* (CSIP) at Georgia Tech;
- (5) *The Institute for Systems Research* (ISR) at the University of Maryland.

The possible applications include

- (1) Compression of digital information (eg. weather data collected in Louisiana)
- (2) Medical imaging (eg. application to Single Photon Emission Tomography, Magnetic Resonance, and Ultrasound)
- (3) Materials Sciences (there are already people in engineering using wavelets in material sciences)
- (4) Biomedical image processing

(5) Telecommunication

The group would have to contain members that are specialized in the following topics. It should also build up contacts with people on campus working on topics related to image processing.

- (1) Two or more mathematicians specialized in the theory of wavelets and its applications;
- (2) Computer specialists to develop and evaluate algorithms;
- (3) Specialists in special applications of image processing.
- (4) It would also be necessary support Ph.D. students to work with with the group (write the code etc.)

In the beginning the group would be concentrated on a few special applications based on the special situation in Louisiana and central initiatives at the Baton Rouge campus. In particular the following topics are natural:

- (1) Applications in analysis of weather information;
- (2) Materials Science.

Because of the economical importance the groups should later build up connections to groups in biomedicine.

Students

There is a huge demand in industry and science for people specialized in image processing. The group would therefore function as an important part in preparing our students for modern technology and research. The group would attract students from several different departments like Computer Science, Engineering, and Mathematics. It could therefore play an important role in building up interdisciplinary connection on campus.

Economical Impact

Digital information is everywhere in sciences and in the economy. A group like this would therefore fill an important gap in research at LSU. The long term effect would be attract companies working in information technology to Baton Rouge.

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