Graphical System Design for Biomedical Applications

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itim Knowledge Solutions, Bangalore
▪ **itie** is a Software product development, Consultancy, and Technology Education Company started in 2006

▪ The **itie** team is grouped with number of experts from industry and academia, enabling us to deliver technology solutions in the areas of Embedded Technology, DSP, Bio-medical, Control engineering & automation to Automotive, Aerospace industries.
Working with....

- National Instruments
- KPIT Cummins
- General Motors India
- GE Global R&D, India
- Saffron Aerospace India
- Goodrich Aerospace India
- Vectormax (USA)
- ProSIM R&D
- Squarehoop (UK)
- IIT Delhi
- VIT Vellore
- PSG Tech, Coimbatore

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GET READY For THE SCINTILLATING EXPERIENCE!!!
Role of Virtual Instrumentation

- User-friendly GUI for experiments and analysis
- Modular development scheme
- Flexibility/adaptability
Advantages using NI products

- Efficient and cost-effective way of acquiring and analyzing these signals.
- The advanced analysis techniques becoming invaluable to the practicing physician
- Diagnostic decision accurate.
- Lot of in build signal processing algorithms
- Filtering biomedical signals in different ways is a challenge that has to be solved.
Introduction to DAQ

• Data Acquisition – “Sampling of the real world to generate data that can be analyzed and presented by a computer.”
Biomedical Fields for DAQ

- Common mechanical stimuli
  - Pressures, flows, temperatures
- Biopotentials
  - ECG, EMG, ERG, EEG, ENG, etc
  - $\mu$V/mV levels, > 20 kHz sample rate
- Imaging techniques
  - Echocardiogram, blood vessel contraction
  - Edge detection, microscopic imaging
- Clinical instrumentation
  - Acquisition from existing equipment (mostly serial)
Brain-Computer interface using Electroencephalograph (EEG)
EOG Signal Analysis – Horizontal Eye Movement

Right eye
Microcontroller
Processing

Left eye

Horizontal Channel
iBioSAQ - NI LabVIEW based ECG, EMG, EEG, EOG signal acquisition & analysis product (works on NI ELVIS)
Pulmonary Data Acquisition
(Others work)

- Classical Pulmonary Function Testing
Further Applications

- Artificial intelligence programming with LabVIEW: genetic algorithms for instrumentation control and optimization
- Comparison of STFT and wavelet transform methods in determining epileptic seizure activity in EEG signals for real-time application:
- Virtual instrumentation for human factors studies in surgery and anesthesia
- The Eye Tracker System – A System to Measure and Record Saccadic Eye Movements
How are NI products being used in Biomedical field....

• Automating a Capillary Electrophoresis DNA Spectrometer with LabVIEW

• Lookout and FieldPoint Provide Around-the-Clock Monitoring of Biotech Experiment Storage Environments

• Celera Genomics Uses LabVIEW in Human Genome Sequencing

• Endothelial Evaluation of Corneal Transplants by Knowledge-Based Digital Image Processing

• Prototyping of a Digital Flow Cytometer the NI Way

• Development of a Virtual Instrument for Control and Data Acquisition of a Cardiovascular Pulse Duplicator System Using LabVIEW
Using LabVIEW for Heart Rate Variability Analysis

- HRV analysis a quantitative marker of the autonomic nervous system (ANS)
Thank You

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