Tanner Labs Wearable Sensor/Processor Unit

Architecture Overview

The Tanner Labs Wearable Sensor & Signal Processing Unit represents the latest in inertial-based human-machine interface technology. This unit enables simultaneous data collection and processing from two Wearable Sensor Modules. The unit is designed to be highly robust in computational power and yet small in size.

Wearable Signal Processing Module

The signal processing module is composed of a custom-designed DSP board, a commercial off-the-shelf microcontroller module, a liquid-crystal display, and a keypad. It may operate as a stand-alone system or as an external peripheral device to a host PC.

Wearable Sensor Module

The sensor module is composed of up to three modular sensor boards and a sensor glove. An accelerometer board can be complimented with a magnetic sensor board and / or a rotational rate sensor board. Glove-mounted flex sensors provide finger position indication. The sensor module features 17 A/D channels, including sixteen 12 bit channels operating at up to 100K samples per second and one 16 bit channel operating at audio rates. Two modules can be used to yield 34 total channels.

External Interfaces

Both SPI™ and RS-232 interfaces are provided. The SPI™ ports are used to connect the processor module and the sensor modules or other SPI™–compliant devices. The RS-232 ports provide a standard interface to external host computers with data rates programmable from 600 baud to 230 Kbaud.

Software Development

Application software development for the Tanner Labs Wearable Signal Processor is easily accomplished using the standard software development environment from TI. Code Composer Studio provides the necessary compile and debug tools in an integrated development environment, allowing the user to get a new application up and running quickly.
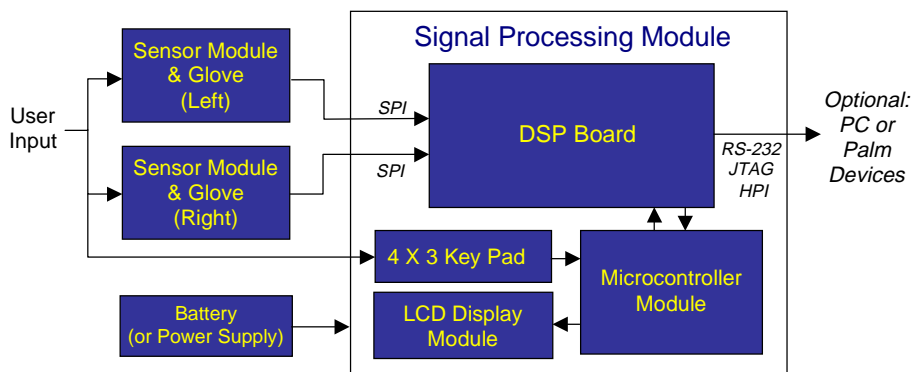
Board Support Libraries

Tanner Research provides the board support libraries that are needed to utilize the RS-232 and SPI™ interfaces and other special capabilities provided by the hardware.

Host Interface

Tanner Labs provides the PC-based software and libraries used for host-DSP communications including application and data download and upload.

Specifications

- **Single 1 GFLOPS, 150-167 MHz TMS320C6701 DSP**
- **Up to 4 Mbyte of FLASH and 16 Mbyte of SDRAM**
- **Standard I/O interfaces including:**
  - ✓ *2 RS-232 ports*
  - ✓ *1 SPI™ port*
  - ✓ *1 JTAG interface*
  - ✓ *1 High Speed Parallel Direct Memory Mapped Host Port Interface (HPI)*
- **Each Sensor Module provides**
  - ✓ *3-axis accelerometer)*
  - ✓ *3-axis magnetic sensor*
  - ✓ *3-axis rate sensor*
  - ✓ *5 glove-mounted resistive sensors*
  - ✓ *audio sensor*
  - ✓ *2 auxiliary sensor inputs*
- **On-board power management**
  - ✓ *A single 7-12 V DC power supply is required*
- **Selectable bootmode or direct execution**
- **Technology Roadmap**
  - ✓ *Support for next-generation TMS320C6711*
  - ✓ *On-board SBSRAM or SRAM*