USB Logic Analyzer

Functional Description

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Introduction

A logic analyzer displays logic level of digital signals. A logic analyzer differs from an oscilloscope which is a more powerful instrument but typically only has a few channels. This project seeks to continue work on a digital logic analyzer which has sixteen channels. The logic analyzer will display four logic levels: low, high, tri-state and indeterminate. The sixteen channels are sampled by an external conditioning hardware called a POD. The POD consists of an Opal Kelly XEM 3001 FPGA board and some external hardware. The POD interfaces to the computer using Universal Serial Bus [USB] protocol. The graphical user interface [GUI] on the computer will display one of the four possible logic levels sampled by the POD. The overall system block diagram can be seen in Figure 1: Overall system block diagram for USB Logic Analyzer.

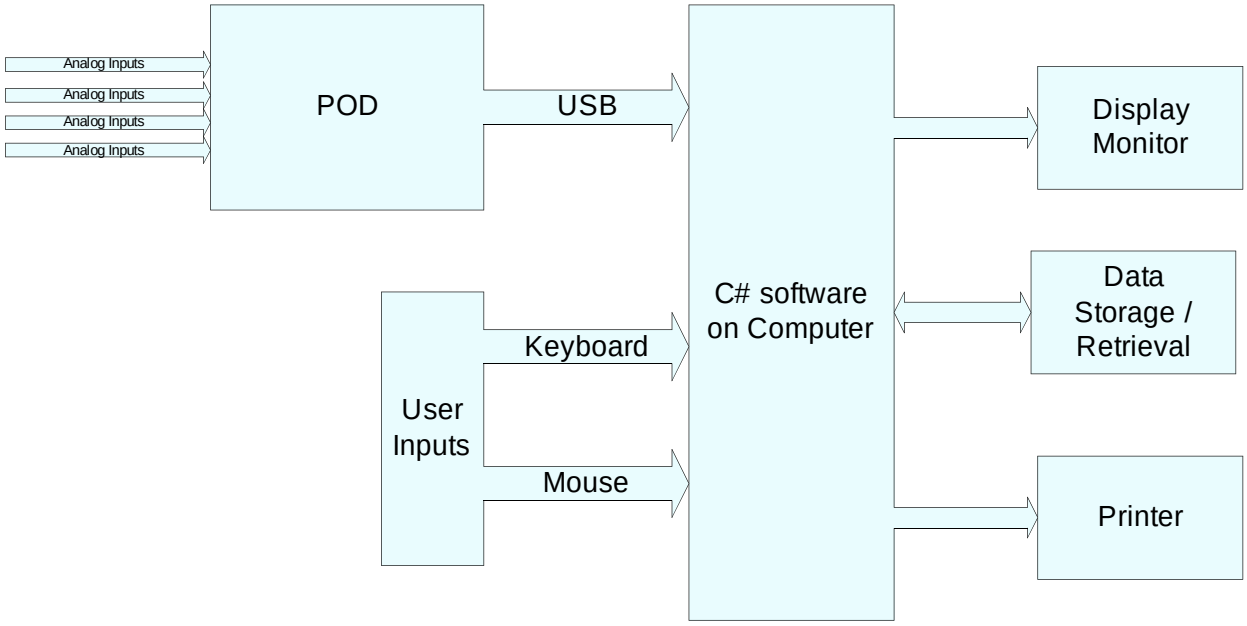

Figure 1: Overall system block diagram for USB Logic Analyzer

Inputs

Analog inputs:	These are the analog voltages on the probes of the POD. The POD handles CMOS or TTL levels.
User inputs:	The user interacts with the software GUI using the keyboard and mouse, and is able to select options, change display parameters, and access additional features like zoom, scroll and save.

Outputs

Display Monitor:	Displays the GUI. The user can see the current logic levels, triggering points and also observe the effects of their interactions with the GUI.
Data Storage/Retrieval:	Saves the captured data frame to disk. The GUI can also open and display previously saved captures.
Printer:	Prints the current screen.

Operation Modes

Option selection:	Allows the user to select from the available options, such as logic type (TTL or CMOS), display window range, etc.
Single Capture:	Captures and displays information from the time the capture was started till the time software buffer was filled.
Continuous Capture:	Continuously captures information into the buffer and displays the current buffer, so the logic levels are shown at “pseudo real-time”.

Goals

- Primary
    - New display engine
    - DLL interface for USB
    - Efficient data processing
    - Print/Save data capture
    - Continuous Update (Pseudo Real Time)
- Secondary
    - Remote Viewing
    - Reverse Assembly code decoding