Live Demonstration: FPAA Demonstration Controlled through Android-Based Device

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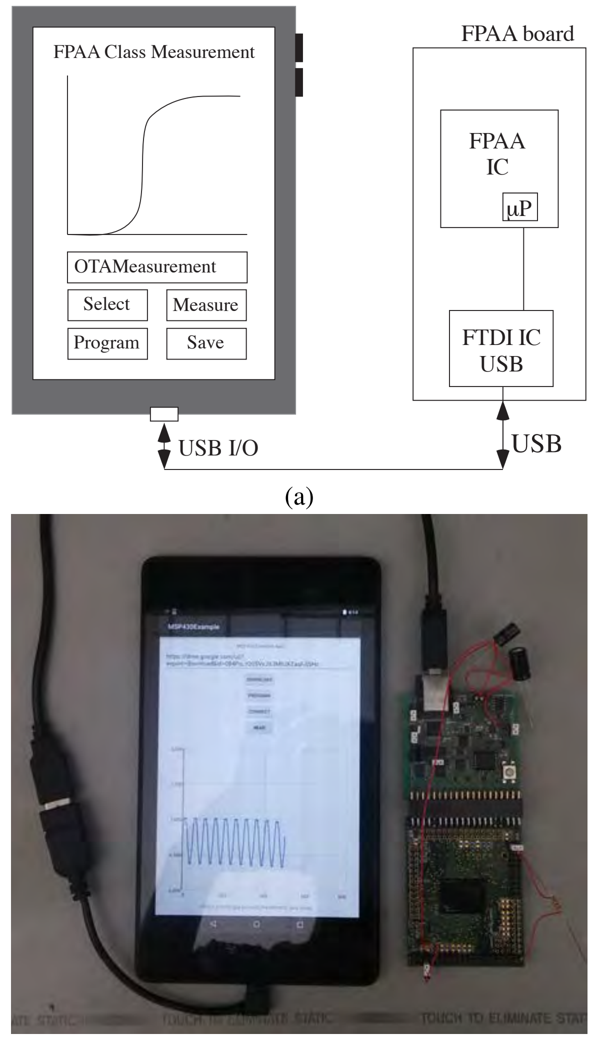
This document describes the live demonstration of FPAA Demonstration Controlled through Android-Based Device [1]. This demonstration requires no additional resources other than the basic resources (power plug, a table and pin wall) to be provided to each demonstration [2]. The demonstration will use a Google Nexus 7 tablet and a RASP 3.0 board (most likely multiple boards), which the authors will transport. The demonstration application to interface with the board runs on the tablet, as well as laptops, to show the relevant design tools to interested users. This application could be downloaded to individual devices (our long term plan), although it is harder to predict if these options will be ready during the demonstration.

Figure 1 illustrates part of what the participant in the demonstration space will encounter, an FPAA IC and associated board we designed, fabricated, and characterized, connected to a Nexus 7 tablet running Android [3] for power, communication, and control, with an application (App) for the user interface into the system. One user experience will be to use the App to select and operate one of multiple circuits / systems on the FPAA device, such as filters, basic classifiers, and mixed-signal computation. For those interested, we will go through the process of the design process, from the FPAA tools and resulting high-level design, compilation, testing, and connecting this design into such an App. These steps allow a view of the App tools and the resulting parameters required for the system interfacing, such as specifying what should be graphed, how much to read from what memory address, and other things that require more user input. Further, we can for the expert user demonstrate making a design (say one we have working), allowing them to upload the design to a server, downloads it to the tablet, and run it on that device.

The technical work presents a package for communicating with an FPAA board using an Android tablet. The package is written exclusively in Java and makes use of the Android API to access the device's serial port, making it is easily portable to other devices. This Android interfacing integrates with already-existing FPAA design tools. To demonstrate the process of an Android-based device controlling an FPAA device, we programmed a low-pass filter to the board, as well as supplied and measured waveforms (e.g. sinusoidal response), plotting them on the Android device. This design flow is compatible with other compiled FPAA circuits and systems, including simple classifiers and sub banding filter bank applications. These tools lay the foundation for integrating our lab's FPAA boards with mobile devices, paving the way towards novel applications of analog-digital signal processing.



(b)

Fig. 1. Connecting the FPAA board to Android tablet. An OTG cable is used to handle USB I/O, allowing the device to recognize the FTDI IC's serial port. The tools described in this paper allow programs to communicate at a high level with the FPAA μP.

[1]ID 2279, track 13.2 CAS Educational Technology, 1.8 and/or 12.13 SubVT Devices and Circuits for Ultra-Low-Power Apps

[2]Dr. Hasler's group submitted related FPAA demos. If accepted, we will build interaction between these separate demonstrations, even if in different locations.

[3]We may use additional Android-based devices for the demonstration