



XinuPi: Audio and USB Keyboard Support

Tyler Much & Dr. Dennis Brylow



Project Overview

- This project is an effort to improve the usefulness of Xinu on the Raspberry Pi as an educational tool.
- Add audio output functionality
- Add USB keyboard support
- Other efforts include:
 - USB/Ethernet support
 - Graphics support



Audio Support

Motivation

Provide audio functionality that is made possible by the Raspberry Pi and has never been fully supported by Embedded Xinu.

PCM Module

- PCM = Pulse Code Modulation
- Three output signals
 - PCM_CLK (Bit clock)
 - PCM_FS (Frame Sync)
 - PCM_DOUT (Data out)
- 9 interface registers for module
- 2 audio clock control registers

USB Keyboard Support

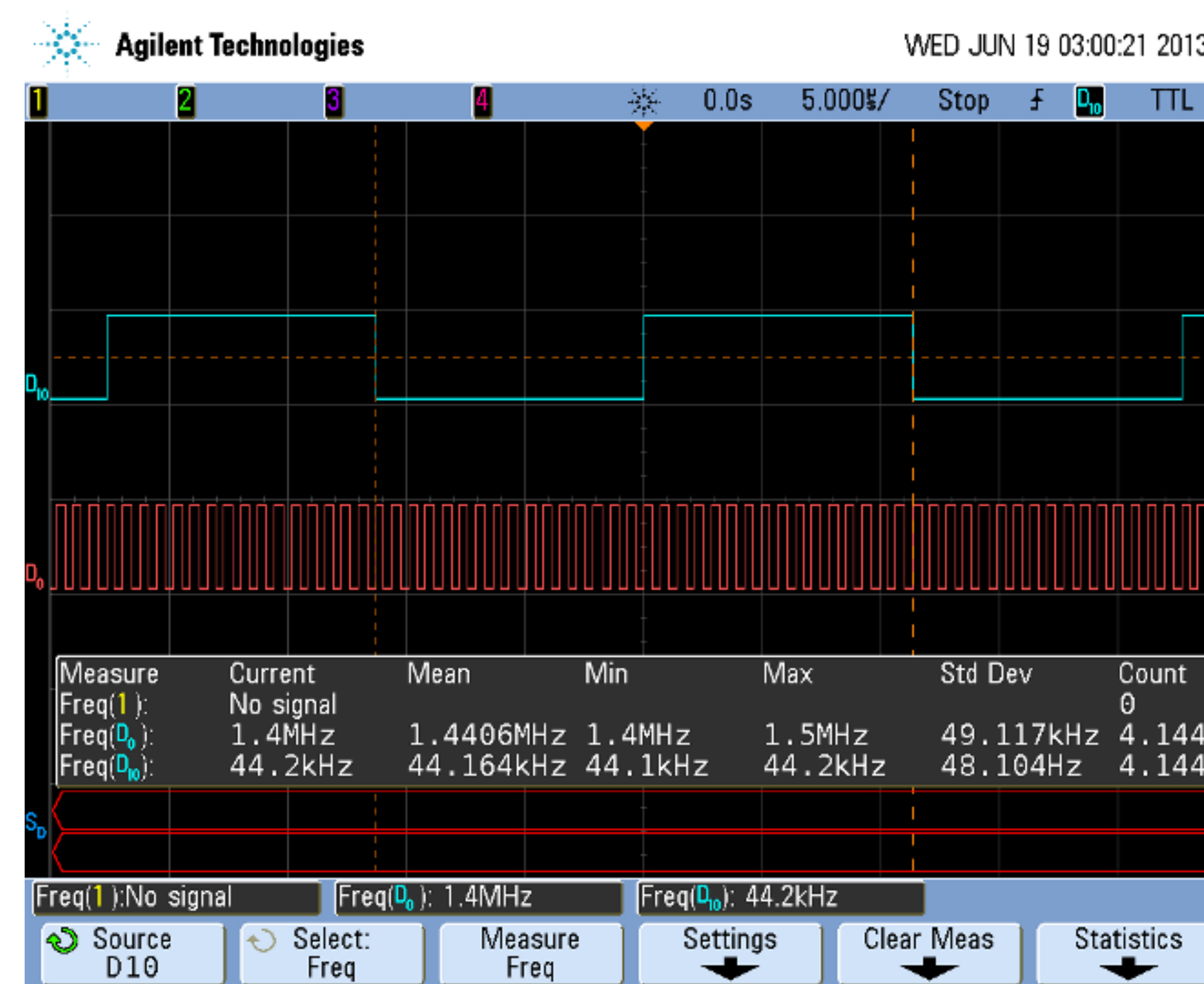
- With our newly implemented lightweight USB drivers, XinuPi can now support various USB devices.
- Devices of interest may include:
 - USB data storage
 - HID devices (keyboard, mouse,...)

Why?

Along with graphics support, a USB keyboard will allow Xinu to act as an experimental embedded laboratory platform that does not rely on remote booting or serial output. A "standalone" system like this might be better suited for smaller educational environments.

Future Work

- Continue work on PCM audio
- Complete HID driver that is simple enough Xinu and allows for expansion
- Implement simple keyboard-specific structure so that a USB keyboard can be read from like other devices in Xinu.



PCM_FS and PCM_CLK output signals

References

Broadcom. BCM2835 ARM Peripherals, 2012.

G. J. V. Loo. BCM2835 Audio & PWM clocks, February 2013.