EECS 192: Mechatronics Design Lab
Discussion 3: Motor Driver and Servo Control

GSI: Andrew Barkan

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- Oscilloscope Basics
- Brief Code Segue
We can display a graph of voltage over time!

.... how is this useful?

Example scope capture
We can display a graph of voltage over time!
  .... how is this useful?
Provides visibility into your system
Verify signals are what you expect:
  Is your motor turning on?
  Is your speed sensor outputting counts?
Provide insights into subsystems:
  See how line camera output works
If you ever get stuck...
  Don’t debug by brute force
  Turn on the scope and figure out the root of the problem
WaveForms Software

Do you have WaveForms installed?

- Make sure your AD2 is connected
- Then start WaveForms
- WF will let you know if device is not recognized
- If you don’t have an AD2, you can still follow along in demo mode!

blog.digilentinc.com
Viewing Window

- You should always adjust to fit your data
  - very possible you’ll scope something you don’t want to
  - or have no idea what you’re looking at

- Know how to manually set the scope
  - You should know what to expect
  - Set the per-channel vertical scale based on the expected voltage range
  - Set the global horizontal scale based on expected timescale

ESC startup in factory condition
You have two different channels (1 and 2) 
Each channel will display as separate color in window unless deselected
  ▶ Vertical  = Voltage
  ▶ Horizontal  = Time

Adjustments
  ▶ Scaling per division (i.e. s/div, V/div)
  ▶ Voltage offset
  ▶ Position in time

Lots of other functions that we won’t go into here, but feel free to explore on your own!
Triggering

- Triggering functions allow us to capture signal edges for inspection
- Useful for tracking signals like PWMs

Adjustments

- Channel for Triggering
- Type of scanning
- Trigger condition (rising, falling, either)
- Level for trigger (V)

Either run continuously or trigger single acquisition sets
AD2 Pinout
New UDP Command Interface

Keyboard input

 recvfrom UDP socket

 cmd_queue

 control_task

 user_task

 To be added

 heartbeat

 timer_evt_task

 uart_log_task

 log_queue

 wifi_log_task

 LED

 UART

 sendto UDP

 Andrew (UCB ME)
Let’s say we want to take our code from last checkpoint (PWM fade) and control the frequency

- This function lives in our control task
- Need to define our own command set that makes use of existing infrastructure!
- Use the same format as the skeleton code
- Question: what is the **safest** way to exchange info between tasks in FreeRTOS?
Let’s say we want to take our code from last checkpoint (PWM fade) and control the frequency

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- Use the same format as the skeleton code
- Question: what is the **safest** way to exchange info between tasks in FreeRTOS?
- A queue!
Let’s see an example of a control command in the code!

Then we will inspect with our oscilloscope!