

Delta Timing and Exam 1 Review

CSE 132

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Today's Outline

- Delta timing
- Exam 1 Logistics and Review
- Open time for Q&A

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Review of Delta Timing

```

while (true)
  → now = millis()
  if (now >= loopEndTime) then
    loopEndTime += deltaTime
    do some work
    output results
  end if
end while

```



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What if work takes a while?

```

while (true)
  now = millis()
  if (now >= loopEndTime) then
    loopEndTime += deltaTime
    → do some work
  end if
end while

```

Especially if work sometimes takes longer than
deltaTime!

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What if work takes a while?

```

while (true)
  now = millis()
  if (now >= loopEndTime) then
    loopEndTime += deltaTime
    do some work
  end if
end while

```



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Alternative approach

```

while (true)
  now = millis()
  if (now >= loopEndTime) then
    → loopEndTime = loopEndTime + deltaTime
      OR
    → loopEndTime = now + deltaTime
    do some work
  end if
end while

```

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Alternative approach

```
while (true)
  now = millis()
  if (now >= loopEndTime) then
    loopEndTime = now + deltaTime
    do some work
  end if
end while
```



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Think Like a Finite-State Machine

```
while (true)
  → if (millis() > loopEndTime) then
    loopEndTime += deltaTime
    do some work
  end if
end while
```

Do some (but not all) of the work

Remember "state" information (in one or more variables)

Inside delta time conditional if, add switch statement

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Back to Pushbutton Debouncing

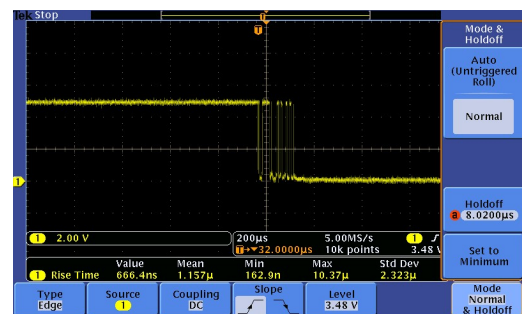
- Switch between input pin and GND
 - Input goes LOW when switch is pressed
 - Input goes HIGH when switch is not pressed

```
setup() {
  pinMode(pin, INPUT);
}

loop() {
  inputVal = digitalRead(pin);
}
```

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Let's See What Happens



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Switch "Debouncing"

```
Read switch state
Wait enough time for switch to quit bouncing ←
Read switch state again
if two switch states agree
  Done
else
  Start over
```

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Delta-time Debouncing

```
while (true)
  now = millis()
  if (now >= dloopEndTime) then
    dloopEndTime = dloopEndTime + debounceTime
    switch (whichRead)
      case 1: read1 = digitalRead(pin)
      case 2: read2 = digitalRead(pin)
    whichRead = !whichRead
    if (read1 == read2)
      inputVal = read1
    endif
  end if
  if (now >= otherLoopEndTime) then ...
```

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Upcoming Calendar

- Today
 - No Quiz 5A, review for exam is next
- Monday Feb 17
 - No assigned studio, help available in lab
- Wednesday Feb 19
 - Exam 1 in class
- Monday Feb 24
 - Assignment 4 due, Quiz 4B due
 - Studio 5 in lab

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Exam 1 Review

Exam is next Week!

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Exam Logistics and Style

- Date and Time
 - Feb 19, here, Hillman 60
 - 1pm to 2:20pm, starting right at 1!
- Questions
 - Question 1 will be a collection of short answer things (e.g., true/false, fill in the blank, quick definition)
 - Questions 2 through N will be longer (going more in depth on a particular subject)
- One-page “crib sheet” is allowed
 - 8.5 x 11 sheet, front and back, whatever you want to include (content-wise)

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Practice and Help

- B quiz questions are mostly from old exams
- Extra credit opportunity
 - “Extra Credit Quiz 1E,” on Canvas, due before exam
 - Practice exam questions (from old exams)
- Studio on Monday (Feb 17)
 - Attendance *not* required
 - Available for demos of assignment (late 3 or early 4)
 - We are available for Q&A
 - Exam subject matter
 - Assignment 4 help

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Information Representation

- Number systems
 - Binary, two’s complement, hex – conversions
 - Other negative representations
 - Fixed point – Q notation
 - Floating point – definitions
- Text representations
 - ASCII (if you need ASCII table, I will provide it)
 - UTF (-8, -16, -32)

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Finite State Machines

- What are they? What are they good for?
- Bubble diagrams
 - Reading (i.e., what does this FSM do?)
 - Writing (e.g., author an FSM to do X)
- Implementation
 - Authoring in Arduino C
 - What constitutes/triggers a state transition?

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Programming When Time Matters

- Simple delays
 - Advantages and disadvantages
 - How to program
- Delta time
 - When it really matters
 - Advantages and disadvantages
 - How to program

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Input and Output

- Analog Input
 - Linear calibration, scaling, units, ranges
 - Simple filtering
 - Programming interface
- Digital Input/Output
 - Meaning, polarity
 - Programming interface
- Physical construction
 - Wiring
 - Components – resistors, LEDs, potentiometer, temperature sensor

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Practicalities

- How to use development environment(s)
- Commonly used library functionality
 - Controlling pins (in and out)
 - Printing to attached PC
 - Timing
- Details of Arduino C language
 - Standard data types
 - Similarities and differences relative to Java
 - Bit-level and logical manipulation

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Not Covered in Exam 1

- Communications topics
 - Slides 4-12 in last week's lecture
- This material will be on exam 2

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Q&A

- Questions?

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