# Usability Studies: Task Design

# Homework Discussion

- Rust error message challenges. What research methods?
- Bank: use Coq instead of COBOL.
  - How will this change affect reliability?
  - How will this change affect recruiting?

# USABILITY STUDY TASKS

- Choose an *interesting* task
  - One that you think might be hard
  - One that is central to the usability of your design
- Can't test everything

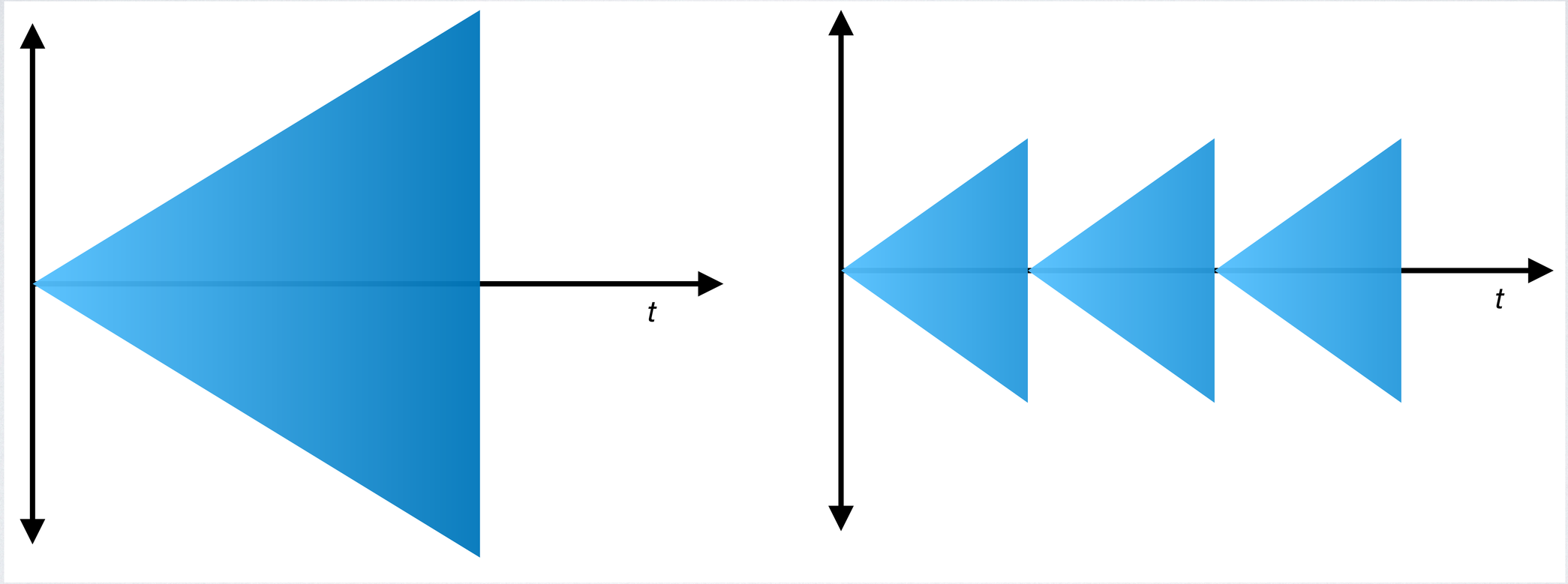
# TASK IDEAS

- Write a program according to this specification.
- Are there bugs in this code? If so, what are they?
- Fill in the missing code…
- What does this code do?
- Answer these questions about this code.

# TASK DESIGN

- Must carefully restrict tasks!
- People will get stuck on irrelevant things
- Decide how much help to provide
- Ideally: scope task to focus on the variable of interest
- *Constrain the task as much as possible.*

# DECOMPOSING TASKS




Monolithic task

Subtasks

# DATA COLLECTION

- Think-aloud
- Audio recordings
- Videos
- Screen capture
- Eye tracking
- Post-study survey

- Take lots of notes!, including timestamps! You do not want to watch the videos.
- Include a clock on the screen.

# THINK-ALOUD

- Two varieties: concurrent and retrospective
- "Please keep talking."
- Can't use timing as a dependent variable due to effect of explanations.

# TASK CONTEXTS

- Pencil/paper
- Text editor
- IDE
- Compiler?
- Debugger?
- Test cases?

# TASK EXAMPLES

- Q: What challenges do web programmers encounter when using Django to write web apps?
  - (who?)
- Plan: Recruit people who say they've made at least one web site in Django
  - (what does one web site mean?)
- Task attempt 1: "write a gradebook app in Django. You have 1 hour."
  - What is a gradebook app?
  - Where do you think people will get stuck?

# TRY 2

- Refine task:
  - Here is a gradebook app, but the component that shows a student their grades is incomplete. Write `displayGrades()`, which will display a student's grades.
  - What format?
  - Are you measuring Django, or the SQL API, or the particular database schema, or something else?

# TRY 3

- Refine research question
- What problems do Django programmers encounter when handling errors?
- Put them in a situation where they will encounter errors!
- What kind of errors?
- Hypotheses:
  - They will forget to check for errors
  - They will misinterpret error codes
  - They will have trouble figuring out the causes of errors they encounter, even when the errors are common (e.g. "server unreachable")

```
main asset contract Auction {
  Participant@Unowned seller;

  state Open;
  state BidsMade {
    // the bidder who made the highest bid so far
    Participant@Unowned maxBidder;
    Money@Owned maxBid;
  }
  state Closed;

  ...


  transaction bid(Auction@Shared this,
                  Money@Owned >> Unowned money,
                  Participant@Unowned bidder) {
      if (this in Open) {
        // Initialize destination state,
        // and then transition to it.
        BidsMade::maxBidder = bidder;
        BidsMade::maxBid = money;
        ->BidsMade;
      }
      else {
        if (this in BidsMade) {
          //if the newBid is higher than the current Bid
          if (money.getAmount() > maxBid.getAmount()) {
            //1. TODO: fill this in.
            //   You may call any other transactions as needed.
            maxBidder.receivePayment(maxBid);
            maxBidder = bidder;
            maxBid = money;
          }
          else {
            //2. TODO: return the money to the bidder,
            //   since the new bid wasn't high enough.
            //You may call any other transactions as needed.
            bidder.receivePayment(money);
          }
        }
        else {
          revert ("Can only make a bid on an open auction.");
        }
      }
    }
}
```

```
contract Auction {
  // the bidder who made the highest bid so far
  address maxBidder;
  uint maxBidAmount;

  // 'payable' indicates we can transfer money to this address
  address payable seller;

  // Allow withdrawing previous money for bids that were outbid
  mapping(address => uint) pendingReturns;

  enum State { Open, BidsMade, Closed }
  State state;
  ...
  function bid() public payable {


    if (state == State.Open) {
      maxBidder = msg.sender;
      maxBidAmount = msg.value;
      state = State.BidsMade;
    }


    else {
      if (state == State.BidsMade) {
        //if the newBid is higher than the current Bid
        if (msg.value > maxBidAmount) {
          //1. TODO: fill this in.
          //   You may call any other functions as needed.
          pendingReturns[maxBidder] += maxBidAmount;
          maxBidder = msg.sender;
          maxBidAmount = msg.value;
        }
        else {
          //2. TODO: return the newBid money to the bidder,
          //   since the newBid wasn't high enough.
          //You may call any other functions as needed.
          pendingReturns[msg.sender] += msg.value;

        }
      }
      else {
        revert ("Can only make a bid on an open auction.");
      }
    }
  }
}
```

# YOUR TURN

- You are interested in studying challenges that programmers have when using pointers.
- Design tasks that you will give your participants in a 1-hour study.
- Two versions:
  - Beginning C programmers (new to pointers)
  - Expert C programmers

# CONCLUSION

- Running usability studies requires:
  - Recruiting
  - Training
  - Task design
  - Data collection/analysis
- Task design is probably the trickiest. Start early and pilot!