DigiPen
INSTITUTE OF TECHNOLOGY

CS230
Game Implementation Techniques

Lecture 5

Questions?

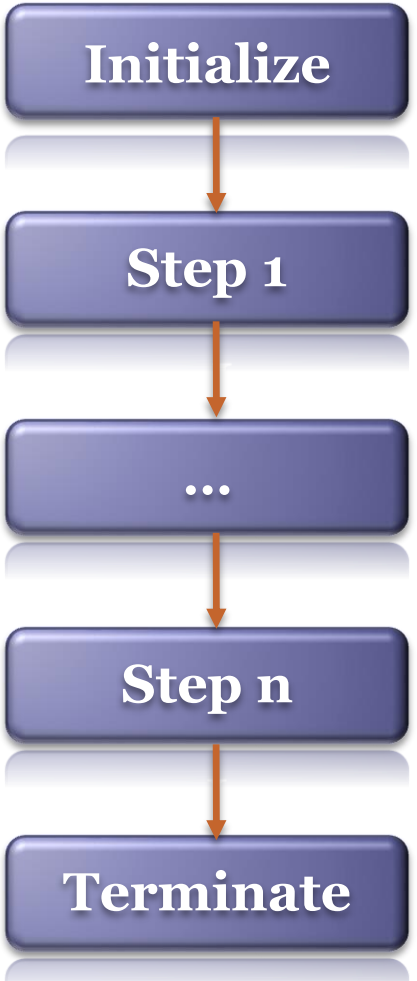
- Game State Manager
- Function Pointers
- Frame Rate Controller

Overview

- Procedural Programming
- Control Driven Programming
- Event Driven Programming

Procedural Programming (1/2)

- Definition:
  - Divide and conquer
- Example:
  - Cooking
  - Making a car
  - Making a game
  - Etc…



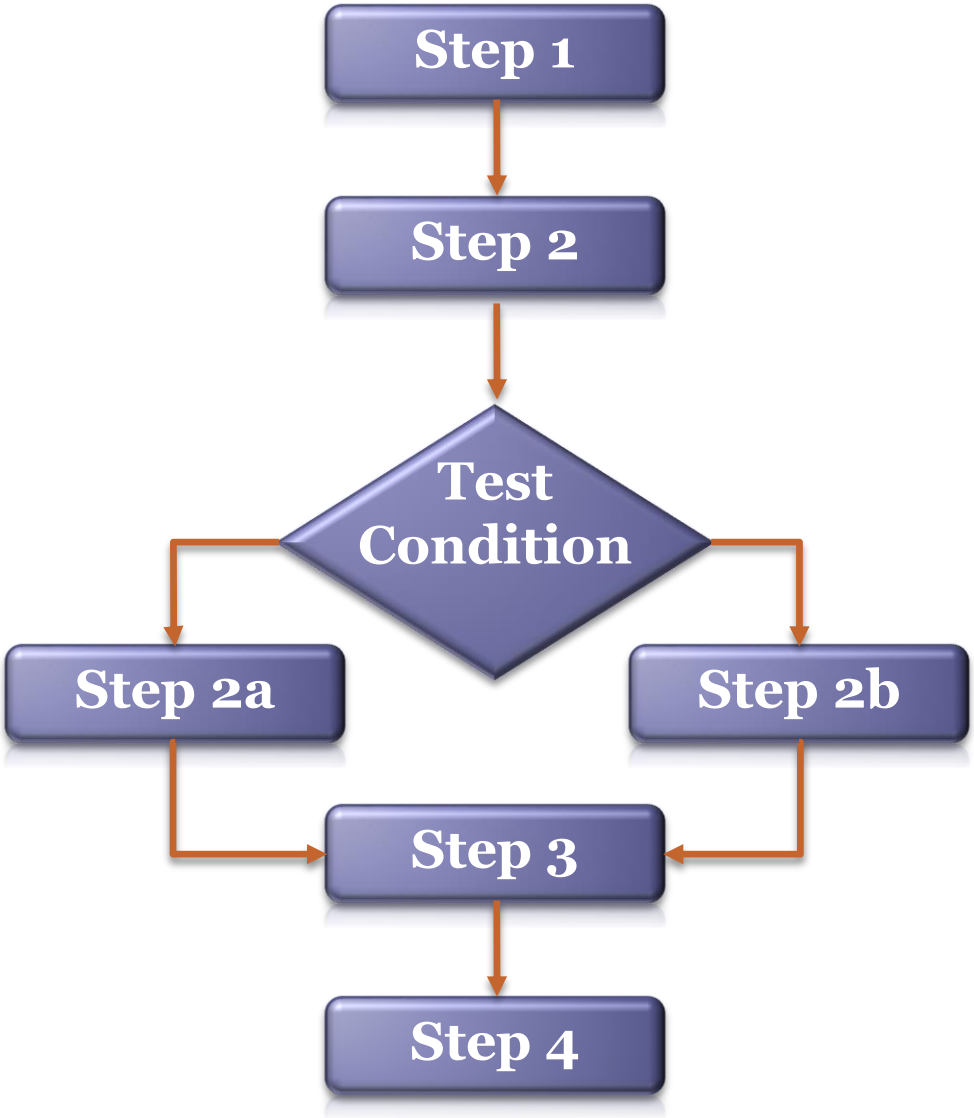
Procedural Programming (2/2)

- Also known as structured programming (concept by Edgar Dijkstra)

- In this concept, a program has a basic structure and facilities such as:
  - Branching
  - Looping
  - Functional decomposition

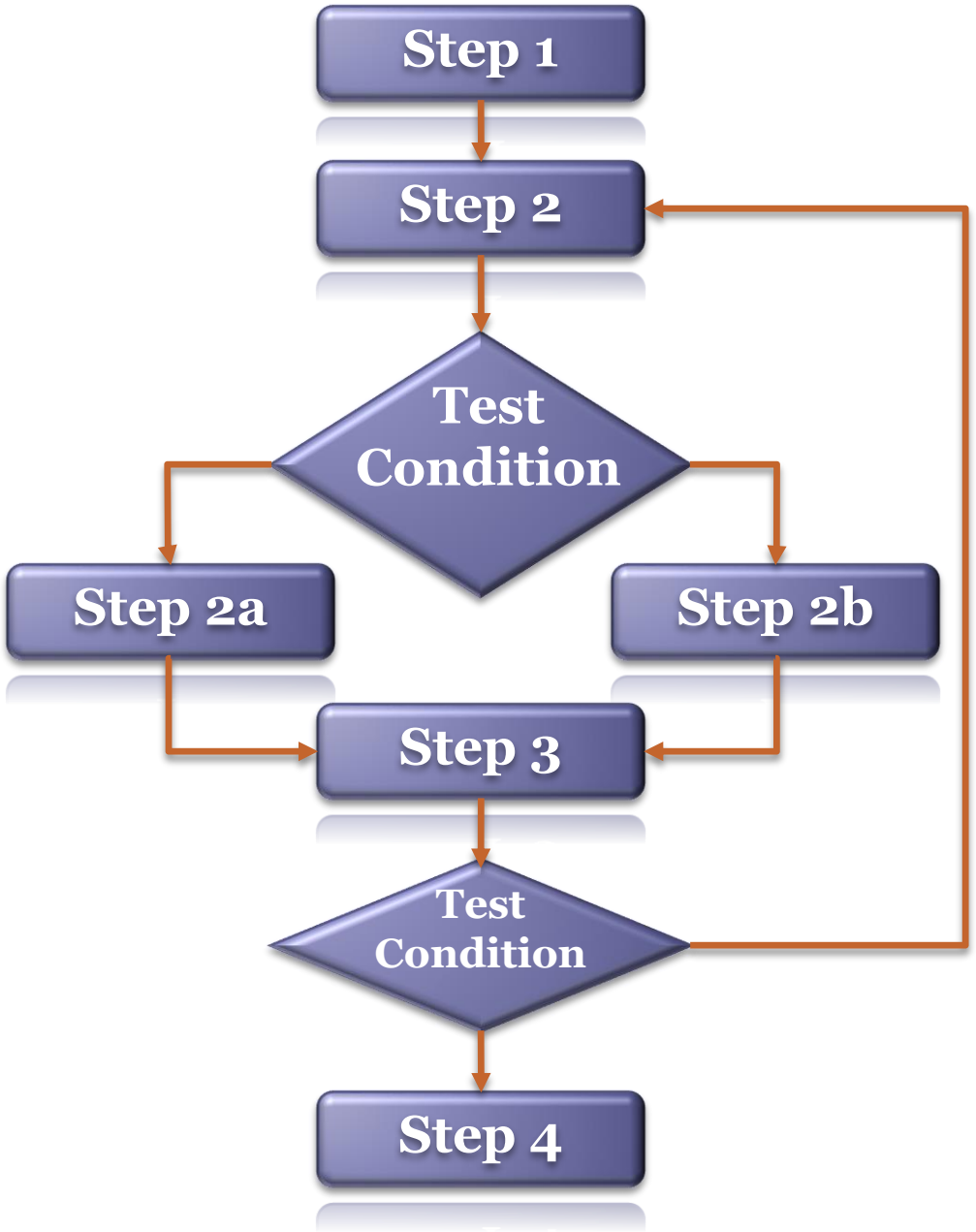
Branching

- Flow of control is dependent on results of conditions.



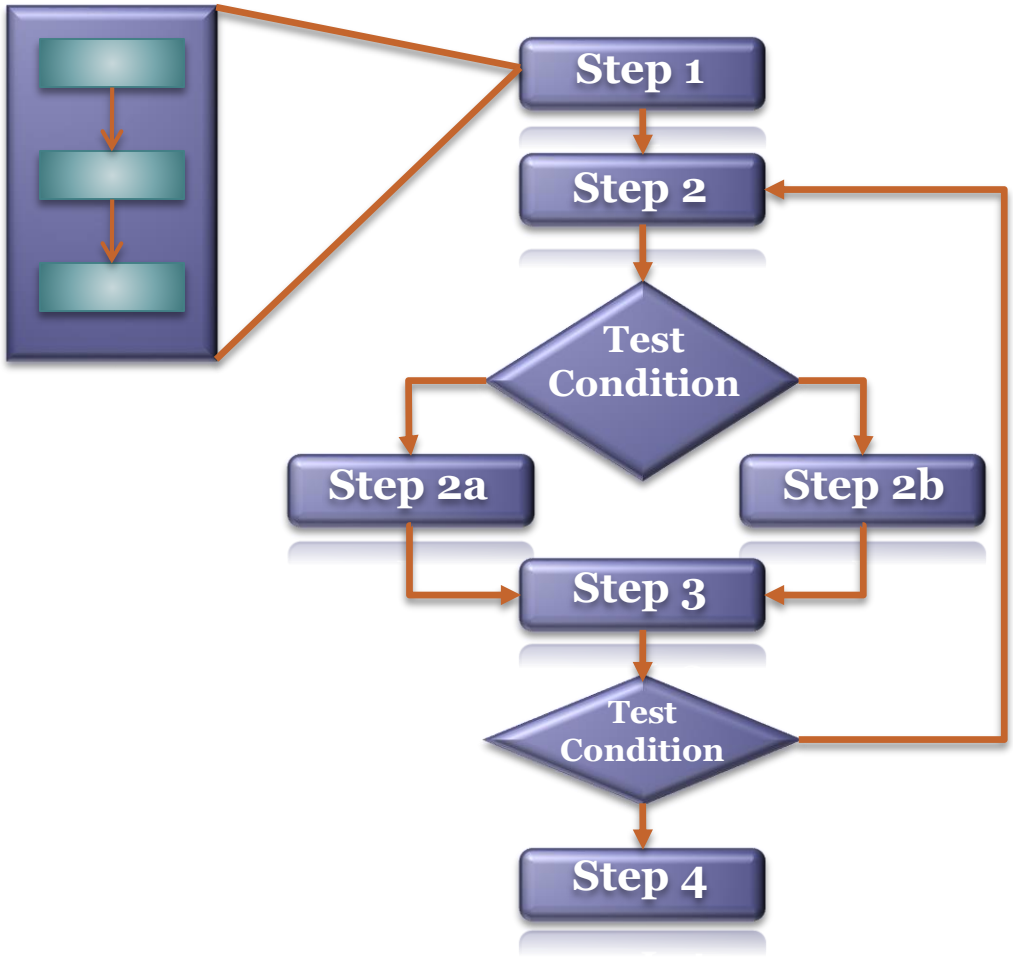
Looping

- Repeat certain steps continuously until some test condition is reached.



Functional Decomposition

- Problems are decomposed into the functional steps



Overview

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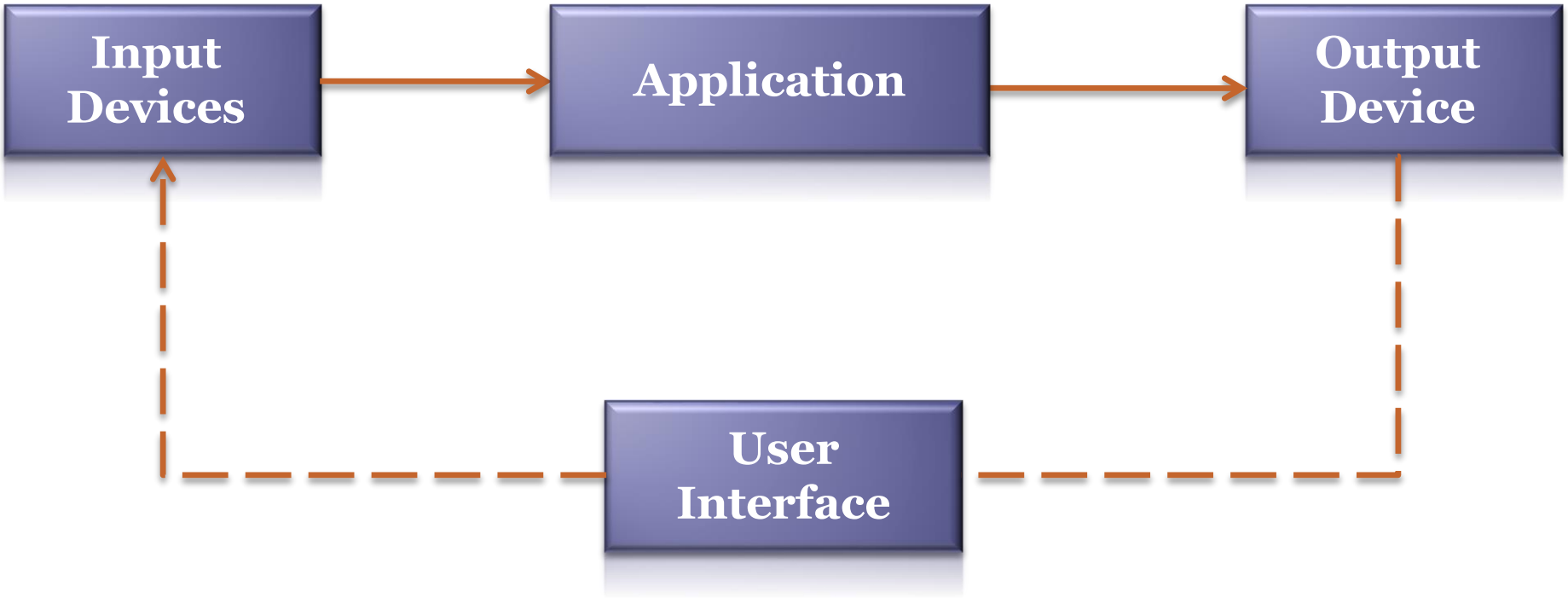
Interactive Applications (1/2)



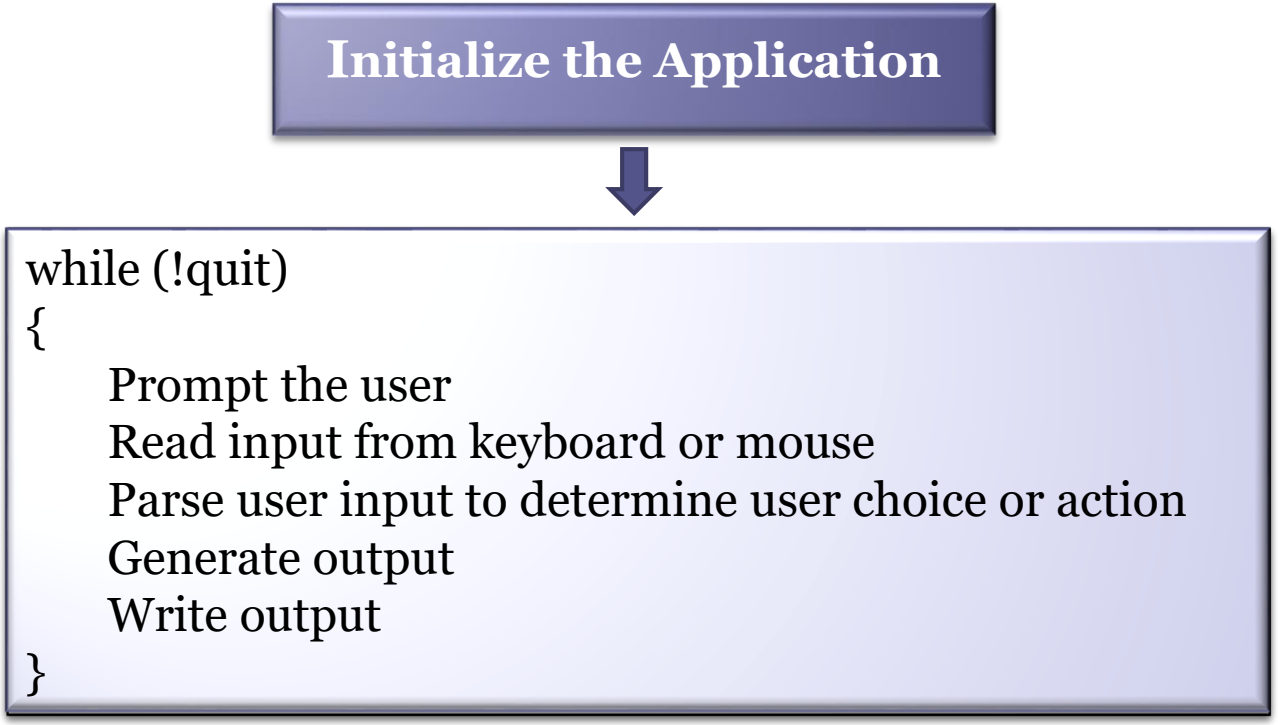
Interactive Applications (2/2)

- They require three functionalities:
  - Reading input
  - Writing or drawing output
  - Data handling and management

- Ex:
  - Games
  - Training Simulators
  - GUI-Based Application (MS Word)

Control-Driven Programming

- The control of execution is within the program



Advantages

- Straightforward development
- Interactions between users and programs can be easily modeled

Disadvantages

- Polling (continuous checking) for user input leads to wasting system resources.

- Complex interfaces and asynchronous interactions cannot be implemented.
  - Example:

    If an application is waiting for a key press and a mouse is clicked, the mouse click is ignored

Overview

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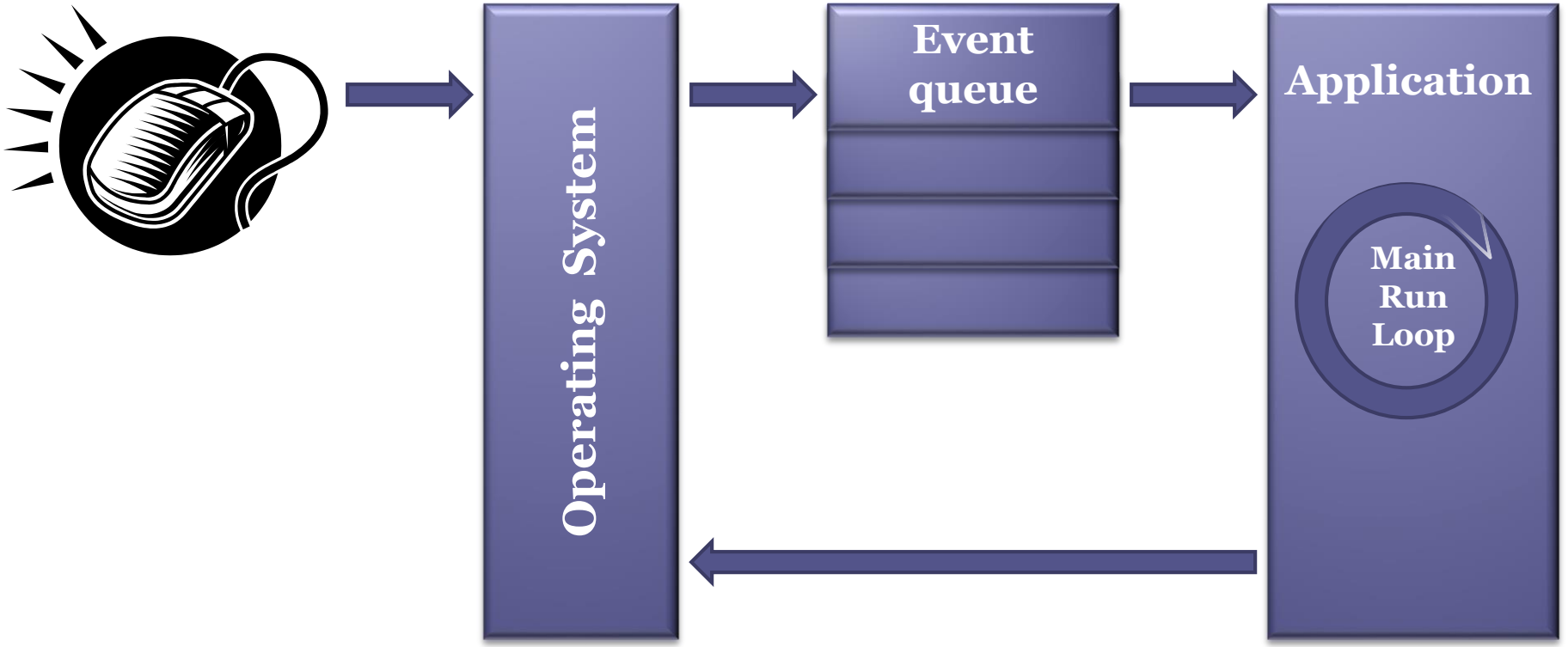
What is an Event?

- Defined as a type of signal to the program that something has happened
  - Example:
    - Mouse click
    - Joystick movement
    - Keyboard is pressed
    - Two objects collided
    - Etc…

What is an Event Handler?

- Defined as functions that encapsulate response to events of that type.

Event-Driven Programming (1/3)



Event-Driven Programming (2/3)

- Functions are executed when the user interacts with the program's interface.
- User is in control of the application
- The so called Hollywood principle

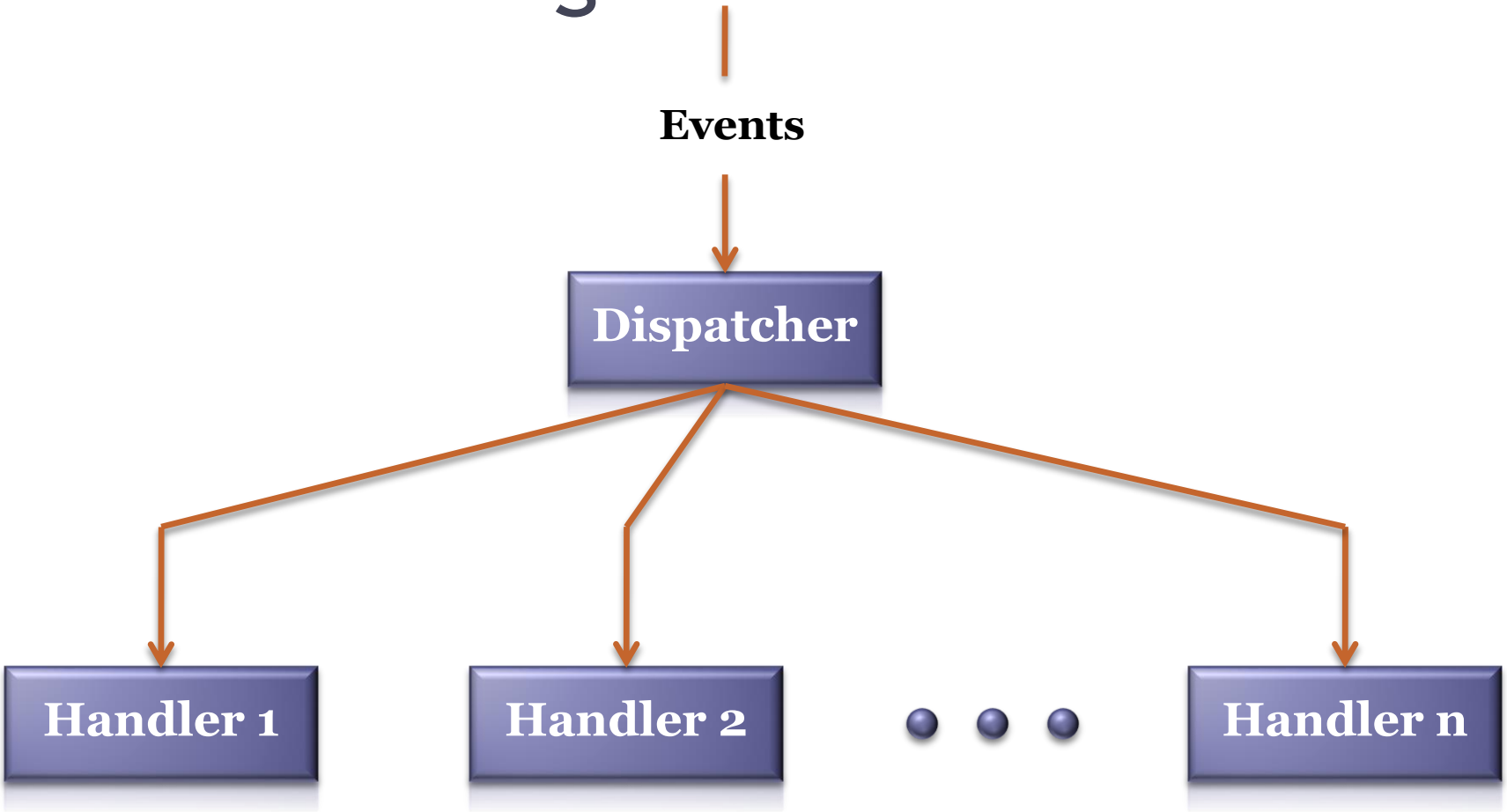
"Don't call us, we'll call you"

Event-Driven Programming (3/3)

- Instead of the programmer dictating the flow of control, the programmer simply writes and registers the functions that are to be executed when a user interacts with the program.

- An application can decide what events to handle **but** it won't know in advance the exact order in which those events will occur.

Event Handling



What is the Dispatcher?

- The job of the *dispatcher* is to take each item that comes to it, analyze the event to determine its event type and then send each event to a handler that can handle events of that type.

Implementation

- The program structure is divided roughly into two groups:
  - Detect actions performed by the user
  - Contain the code associated with these interactions.

Pseudo-Code

```
while (!quit) // do forever
{
        get event from input stream
        if( event type == EndOfEventStream)
                Quit() //Break out of event loop
        else if( event type == EventTypeZero)
                ExecuteEventTypeZero(event information);
        else if( event type == EventTypeOne)
                ExecuteEventTypeOne(event information);
        else    // handle unrecognized event type
                // ignore the event or raise an exception
}
```

Control-Driven VS Event-Driven

- Follows steps (step1…final step)
- Divide and conquer
- Application is in control

- Instructions are **not** executed sequentially from first to last.
- Users are in control of the application