COMP1021
Introduction to Computer Science

Clicking and Dragging Turtles

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Outcomes

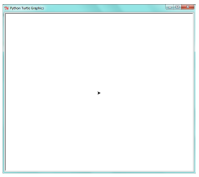
- After completing this presentation, you are expected to be able to:
  1. Explain what turtle window events are and how to handle them
  2. Write code to handle mouse click events
  3. Write code to handle mouse drag events

Using Text Input

- In a text-based program the user interacts with the program through text only
- You have already learned text input and output using `input()` and `print()`

```
>>> age = input("How old are you? ")
How old are you? 7
>>> print(age)
7
```


Graphical User Interface

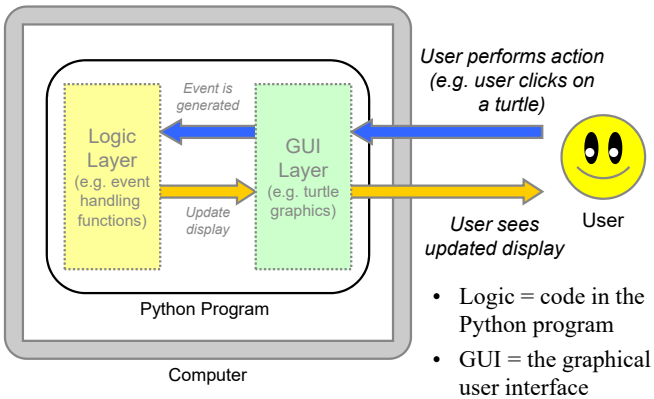


- When you use turtle graphics programming you have a visual component, the turtle window
- The turtle window is the *graphical user interface* (GUI) of a turtle graphics program
- With a GUI, you can have many different kinds of interactions with the program

Event Handling

- When a user performs a certain action the corresponding event is generated
  - For example, if a user clicks on a turtle it will generate a 'click' event
- You can write code to handle the event
- For example, you can write code so that when there is a 'click' event the position of the turtle is shown on the screen

Flow of Event Processing



- Logic = code in the Python program
- GUI = the graphical user interface

Turtle Graphics and Event Handling

- You write *event handling functions* to handle events
- An event handling function is a Python function containing the code you want to run when a particular event occurs
- Sometimes we simply call an event handling function an *event handler*

Event Handling Functions

- You need to tell Python what function it should use to handle an event
- We say this is 'assigning an event handling function to an event'
- At the end of your program you need `turtle.done()`

```
import turtle
...
Assign event handling
functions to events
...
turtle.done()
```

- Basically, this means 'the turtle system has finished doing things'
- You must have this line of code when you do event handling

Assigning a Function

- This is how you assign a Python function to an event:

turtle_name`.on(` *event_name* `,` *event_handling_function* `)`

The name of the event the Python function is being assigned to (e.g. click, drag, also others)

This is the Python function which will be used to handle the event

Types of Event in Turtle Graphics

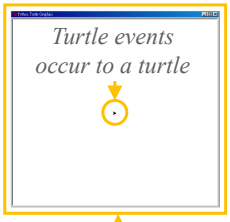
- For turtle graphics programming there are two types of event:

We will look at these in this presentation

- Turtle events
  - These events occur to a turtle ➤

We may look at these in another presentation

- Screen events
  - These events occur to the turtle window



Screen events occur to the turtle window

Turtle Events

- Let's look at the following turtle events:
  1. The Mouse Click Event
     - This event is generated when the user clicks on a turtle
  2. The Mouse Drag Event
     - This event is generated when the user clicks and drags a turtle

1. The Mouse Click Event

- The `onclick()` function assigns a function which does things when a turtle is clicked
- For example:

```
def myclickfunc(x, y):
    . . .
```

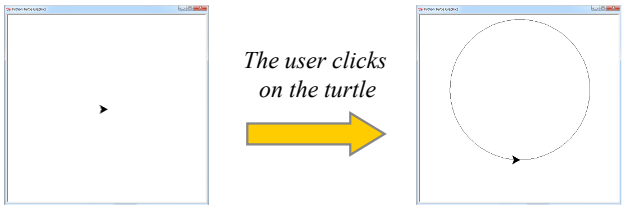
The turtle system automatically gives the x and y values where the turtle was clicked to the function

turtle_name`.onclick(` `myclickfunc` `)`

We are setting up a click event handling function for this particular turtle

The `myclickfunc` *function will be executed when this turtle is clicked on*

Click Event Example



The user clicks on the turtle

The turtle doesn't do anything when the program begins

After the user clicks on the turtle a circle is drawn

Click Event Example

```
import turtle

def drawcircle(x, y):
    turtle.up()
    turtle.goto(0, -180)
    turtle.down()
    turtle.circle(250)

turtle.onclick( drawcircle )

turtle.done() # The turtle system has finished
```

The turtle system automatically gives the x and y values where the turtle was clicked to the function

This is the event handling function. It can do whatever you like. Here it simply draws a circle.

In this example we use the default turtle

The `drawcircle` *function will be executed when the turtle is clicked on*

2. The Mouse Drag Event

- The `ondrag()` function assigns a function which does things when a turtle is dragged
- For example:

```
def dragturtle(x, y):
    . . .
```

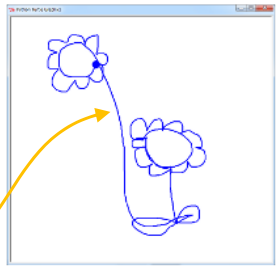
The turtle system automatically gives the x and y values of the drag position to the function

turtle_name `.ondrag(` `dragturtle` `)`

The `dragturtle` *function will be executed when this turtle is dragged*

Mouse Drag Event Example

- In this example you can draw things by dragging the turtle
- For this program you cannot tell the turtle to stop drawing
- That means the drawings are connected in a big long line
  - For example, the sun and the flower are connected by a line



Drag Event Example 1

- This slide shows all the code

In this example we use the default turtle

```
import turtle

def dragturtle(x, y):
    turtle.goto(x, y)

turtle.speed(0)
turtle.shape("circle")
turtle.color("blue")
turtle.pensize(3)
turtle.ondrag( dragturtle )
turtle.done() # The turtle system has finished
```

The turtle system automatically gives the x and y values of the position where the turtle was dragged to the function

This is the event handling function. It simply moves the turtle to the position where it is dragged.

Use the fastest turtle speed so the drawing is shown instantly

The `dragturtle` *function will be executed when the turtle is dragged*

Drag Event Example 2

- In the next example *turtle_name*`.goto(x, y)` (which you have used many times before) is used for the event handler function

The x and y values of the turtle drag position are automatically given to turtle.goto()

the default turtle

```
turtle.ondrag( turtle.goto )
```

Drag Event Example 2

- In this example we use the default turtle

```
import turtle

turtle.shape("circle")
turtle.color("blue")
turtle.pensize(3)
```

the default turtle

```
turtle.ondrag( turtle.goto )
```

```
turtle.speed(0)
```

Use the fastest turtle speed so that the drawing is shown instantly when the turtle is dragged

```
turtle.done() # The turtle system has finished
```

- This slide shows all the code
- The x and y values of the turtle drag position are automatically given to `turtle.goto()`
- So the turtle follows the movement of the drag