Multimedia-Programmierung
Übung 2

Ludwig-Maximilians-Universität München

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Today

- Fortsetzung 

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Exceptions

- Baseclass BaseException
- Own exceptions should be extended from class Exception
- Exceptions can be raised:

```
raise NameError("unknown name")
```

- try ... except to handle exceptions

```
try:
    test = open("test.txt", "r")
except IOError:
    print  "file doesn‘t exist"
```

Random Module

- The module random contains functions to create random numbers, lists etc.
- randint(a,b) creates a random number of the interval [a,b]
- random() creates a random float of the interval [0.0,1.0]
- shuffle(list) randomly shuffles a list
- Etc.
- Object Random() contains all those functions as well

```
import random

test = random.Random()
print test.random()
print random.randint(0,3)
```

- Sam Lantinga, 1998: Simple DirectMedia Layer (SDL) framework, to simplify porting games among platforms
  - Common and simple way to create displays and process input abstracting from platform particularities
  - Originally written in C
- Pygame is a language binding for SDL to the Python language

Literature: W. McGugan, Beginning Game Development with Python and Pygame, Apress 2007

Where is the Pygame API?

- http://pygame.org/docs/ref/index.html

Pygame Modules

pygame.cdrom Accesses and controls CD drives
pygame.cursors Loads cursor images
pygame.display Accesses the display
pygame.draw Draws shapes, lines, and points
pygame.event Manages external events
pygame.font Uses system fonts
pygame.image Loads and saves an image
pygame.joystick Uses joysticks and similar devices
pygame.key Reads key presses from the keyboard
pygame.mixer Loads and plays sounds
pygame.mouse Manages the mouse
pygame.movie Plays movie files
pygame.music Works with music and streaming audio
pygame.overlay Accesses advanced video overlays
pygame Contains high-level Pygame functions
pygame.rect Manages rectangular areas
pygame.sndarray Manipulates sound data
pygame.sprite Manages moving images
pygame.surface Manages images and the screen
pygame.surfarray Manipulates image pixel data
pygame.time Manages timing and frame rate
pygame.transform Resizes and moves images

Pygame Modules

Testing if Modules are available on a Platform

Test:

```
if pygame.font is None:
    print “no font module“
```

Some modules might not be available on a platform depending on the hardware settings. In this case Pygame sets them to None.

```
import pygame
from pygame.locals import *
from sys import exit

player_image = 'cursor.gif'

pygame.init()
screen = pygame.display.set_mode((640, 480), 0, 32)
pygame.display.set_caption("Hello, Pygame!")

mouse_cursor = pygame.image.load(player_image).convert_alpha()

while True:
    for event in pygame.event.get():
        if event.type == QUIT:
            exit()
    screen.fill((255,255,255))
    x, y = pygame.mouse.get_pos()
    x-= mouse_cursor.get_width() / 2
    y-= mouse_cursor.get_height() / 2
    screen.blit(mouse_cursor, (x, y))
    pygame.display.update()
```

import locals, mainly constants (e.g. QUIT)

initializes ALL python modules (loads drivers etc.)

initialize a display (Surface object)

only necessary if alpha channel exists

event loop

used to update the display

Events

- Module pygame.event
- Generated all the time by different entities
- Stored in an event queue
- pygame.event.wait() waits until the list is not empty
- pygame.event.get() returns a list of the last events
- pygame.event.poll() returns the next event of the queue
- The type of the event is specified by event.type

Print all events in the list:

```
for event in pygame.event.get():
    print event.type
```

Events

Parameters

- Events can have parameters
- Examples:
  - QUIT: no parameters
  - MOUSEBUTTONDOWN: pos, button
  - VIDEORESIZE: size, w, h
  - Etc.

Left click with the mouse:

```
if event.type == MOUSEBUTTONDOWN:
    if event.button == 1:
print event
```

Output:

```
<Event(5-MouseButtonDown {'button': 1, 'pos': (231, 207)})>
```

Events

Mouse Events

- MOUSEMOTION: pos, rel, buttons
  - Example print event:

```
<Event(4-MouseMotion {'buttons': (1, 0, 0), 'pos': (660, 313), 'rel': (-4, -4)})>
```

- MOUSEBUTTONDOWN: pos, button
- MOUSEBUTTONUP: pos, button
- Example: check whether the left mouse button is pushed during mouse movement

```
if event.type == MOUSEMOTION:
    if event.buttons[0] == 1:
pass # or do something
```

Events

Keyboard Events

- KEYDOWN: unicode, key, mod
- KEYUP: key, mod
  - key is the number of the key that has been pressed
  - mod represents combination keys like alt, ctrl and shift
  - unicode is the unicode value of the pressed key

- Example: check whether the left key has been pressed

```
if event.type == KEYDOWN:
    if event.key == K_LEFT:
pass # or do something
```

Events

(un)blocking events

- pygame.event.set_blocked(events) blocks events from the event queue
- pygame.event.set_allowed(events) unblocks the events

- Example: block all keyboard events

```
pygame.event.set_blocked([KEYDOWN,KEYUP])
```

Events

custom events

- pygame.event.post(event) posts a user event
- The value for events created by the user must have the value of USEREVENT or higher

- Example:

```
MMPROCKS = USEREVENT+1
new_event = pygame.event.Event(MMPROCKS, message="MMP Rocks")
pygame.event.post(new_event)
```

Fonts

- pygame.font.SysFont(font,size) loads a system font
- pygame.font.Font(font,size) loads a font from a file
- Font.render(text,aliasing,color,bg_color) creates a surface of a text

- Example:

```
test_font = pygame.font.SysFont("arial", 16)
test_surface = test_font.render("test",True,(0,0,0))
screen.blit(test_surface,(0,0))
```

Images

- Pygame can load different image types:
- JPG
- PNG
- GIF (non animated)
- BMP
- PCX
- TGA (uncompressed)
- TIF
- LBM (and PBM)
- PBM (and PGM, PPM)
- XPM

- Images are loaded by pygame.image.load(image) (returns a Surface object)

Images

- Saving is limited to:
  - BMP
  - JPEG
  - PNG
  - TGA

- Images are saved by pygame.image.save(surface,file)

Surfaces

Creating a Surface

- Surface objects are containers for images
- Used as canvases
- Even the Pygame screen is represented as a Surface

- Several functions return a Surface object
  (e.g. pygame.image.load(image))
- Blank surfaces can be created by calling the constructor
  pygame.Surface((100,100))

Surface 2 Image

- Any surface can directly be stored as an image
- pygame.image.save(surface, name)

Example:

```
pygame.image.save(screen, "name.png")
```

Surfaces

Converts

- Converts are used to convert surfaces to an efficient format
- Use convert() or convert_alpha() if the image contains transparency

Example:

```
mouse_cursor = pygame.image.load(player_image).convert_alpha()
```

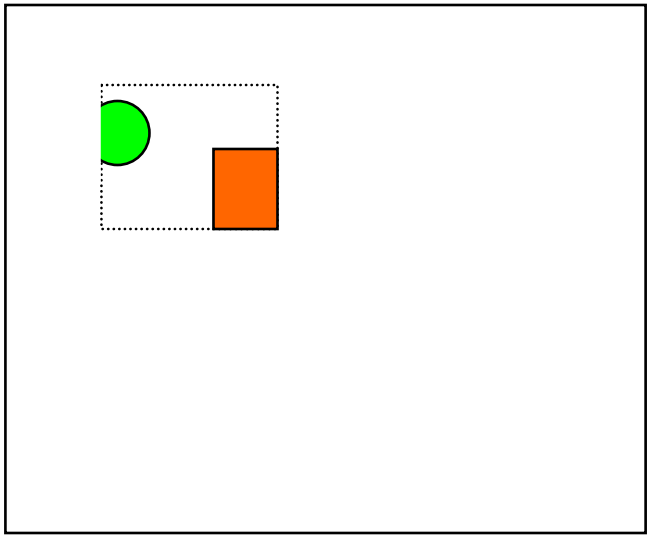
Surfaces

Clipping

- If clipping is set, only pixels in that area will be displayed
- set_clip(Rect)
- set_clip() resets the clipping area

Example:

```
screen.set_clip(100,100,200,200)
```



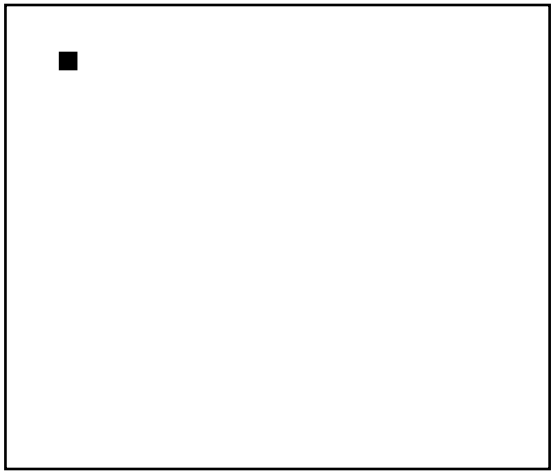
Surfaces

Filling and Setting and Getting Pixels

- fill(color) fills the surface with the defined color
- set_at(pos,color) can be used to manipulate single pixels
- get_at(pos) returns the pixel color of a surface

Set pixel 10,10 to black:

```
screen.set_at((10,10),(0,0,0))
```



Surfaces

Blitting

- blit(source,pos,sourcerect=None) copies pixel data from one surface to another

Copy test_surface to 0,0:

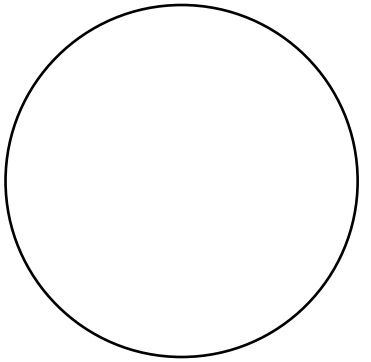
```
mouse_cursor = pygame.image.load("cursor.gif").convert_alpha()
screen.blit(mouse_cursor, (0, 0))
```

Drawing

- pygame.draw.rect(surface,color,rect,width=0) draws a rectangle to a surface
- pygame.draw.polygon(surface,color,pointlist,width=0) draws a polygon to a surface
- pygame.draw.circle(surface,color,pos,radius,width=0) draws a circle to a surface
- pygame.draw.arc, pygame.draw.ellipse, pygame.draw.line etc.

Draw an empty circle:

```
pygame.draw.circle(screen,(0,0,0),(100,100),100,1)
```



Useful Links

- Pygame API !!!!

http://pygame.org/docs/

http://pygame.org/docs/ref/index.html