Multimedia-Programmierung
Übung 4

Ludwig-Maximilians-Universität München

Sommersemester 2017

Today

Overview – Alternative Engines

https://libgdx.badlogicgames.com/

http://www.pygame.org/hifi.html

https://unity3d.com/

http://www.yoyogames.com/

SpriteKit for Apple platforms:
https://developer.apple.com/spritekit/

https://coronalabs.com/

And many more…

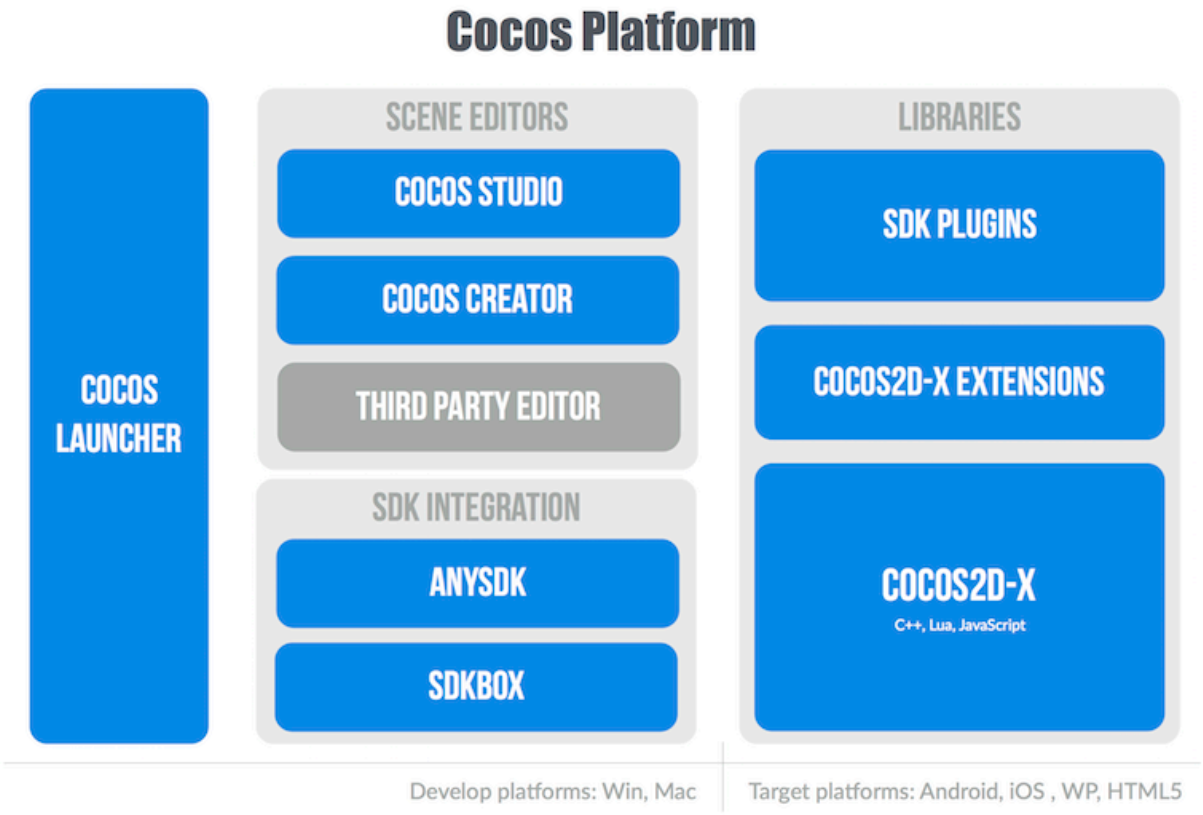
What is Cocos and where does it come from?

- **Cocos2d-x** is an open source, cross-platform game engine

- **Cocos** is a platform to create games, including **Cocos2d-x,** editors, SDK integration

Los Cocos, Argentina

The Platform



http://www.cocos2d-x.org/docs/cocos/cocos/index.html

What is a game engine?

http://www.cocos2d-x.org/docs/programmers-guide/1/index.html

- A piece of software providing common functionality that all games need
- Important components:
  - Renderer
  - 2d/3d graphics
  - Collision detection
  - Physics engine
  - Animations
  - Sound
- Cross-platform: develop once and deploy to multiple platforms.

Cocos street credibility!?

Many more: http://www.cocos2d-x.org/games

Prerequisites

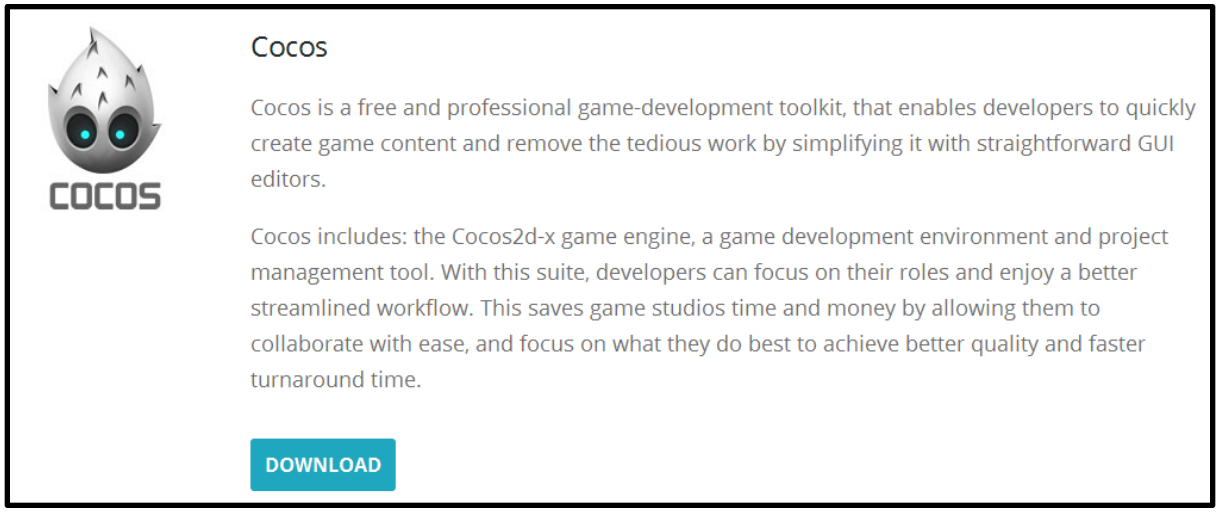
- A working C++ compiler
- Windows: Visual Studio Express
- Mac OS: Xcode
- Python **2.7.x** (version matters!)
- Optional: Android SDK
- And of course: cocos2d-x

http://www.cocos2d-x.org/docs/static-pages/installation.html

http://www.cocos2d-x.org/docs/installation/A/index.html

Installation and Use of Cocos

http://www.cocos2d-x.org/products

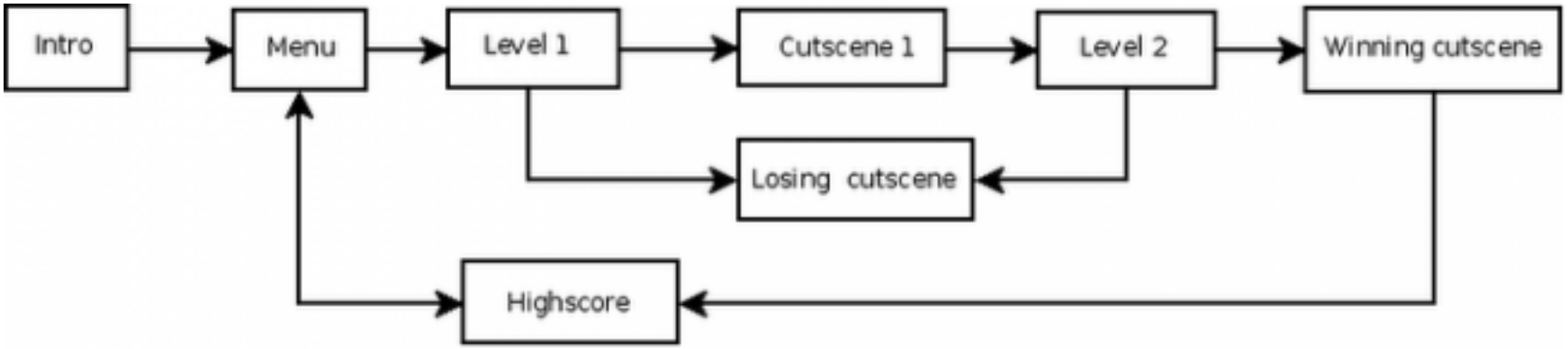


Cocos2d-x basics

Core concepts:
Director, Scene, Node, Sprite, Action

Cocos2d-x basics: Director

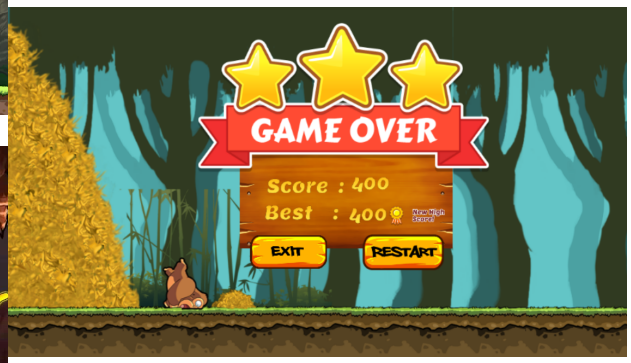
- Singleton object, always accessible
- Used to control game flow



Cocos2d-x basics: Scene

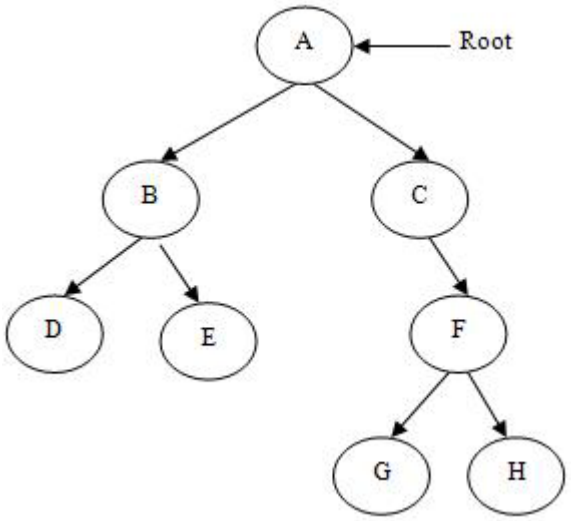
- Typical scenes: main menu, levels, game over
- Renders graphical scene objects

Game example: Banana Kong



Cocos2d-x basics: Scenegraph

- Tree structure
- Arranges graphical scene objects in parent-child relationships
- Contains *node* objects



Nodes in this scene?

Cocos2d-x basics: Sprites

- 2D images that can be moved and transformed
- Example: main character, enemies etc…
- Configurable properties: position, rotation, scale, opacity, color

Cocos2d-x basics: Actions

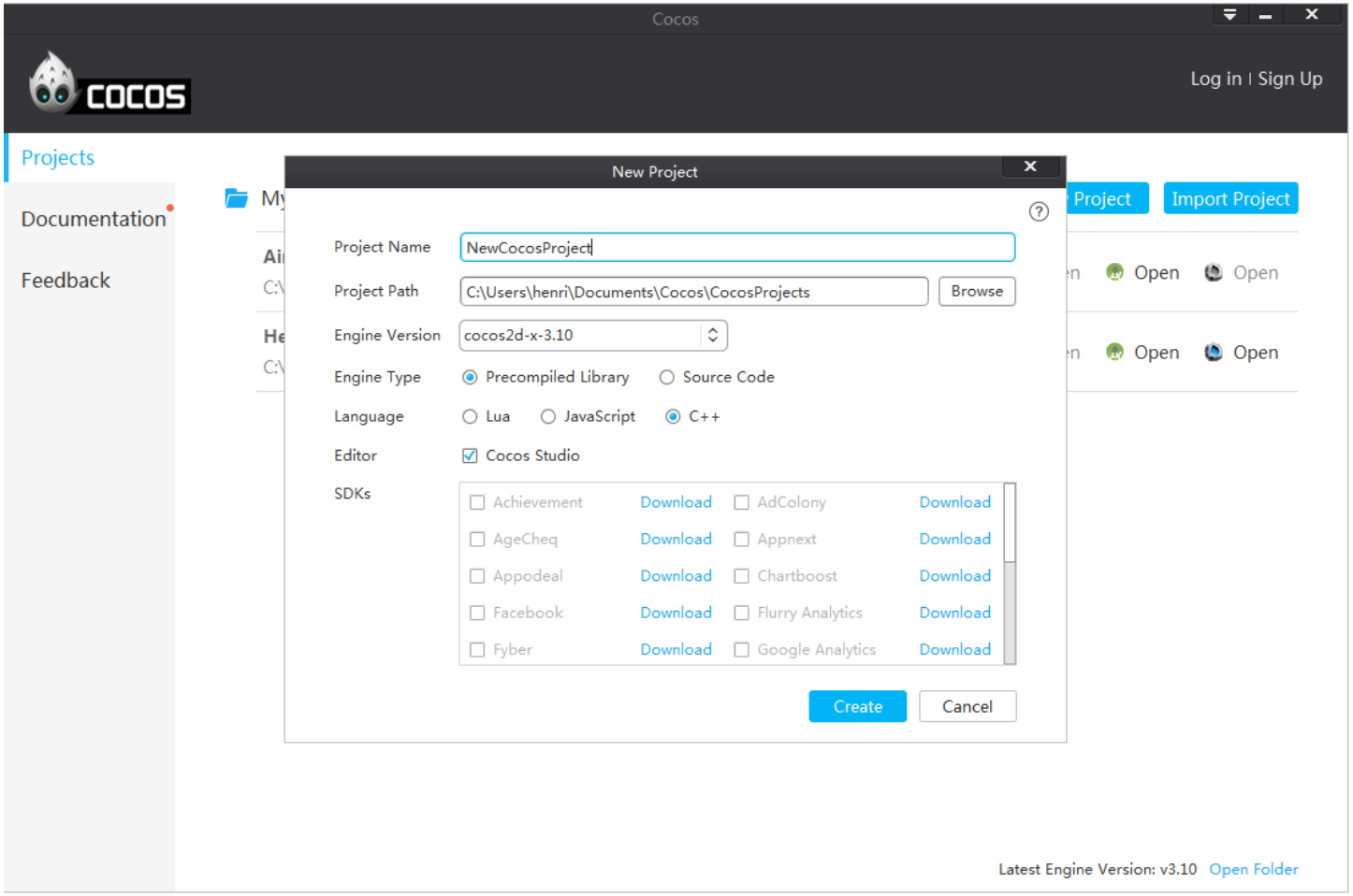
- Action objects make a *Node* perform a change to its properties over time
- Example: move a sprite from one position to another over a span of time
- Example Actions: *MoveBy*, *Rotate*, *Scale*
- Applicable to all Node objects
- Also available: *sequences* and *spawns* of actions

Building a new Project

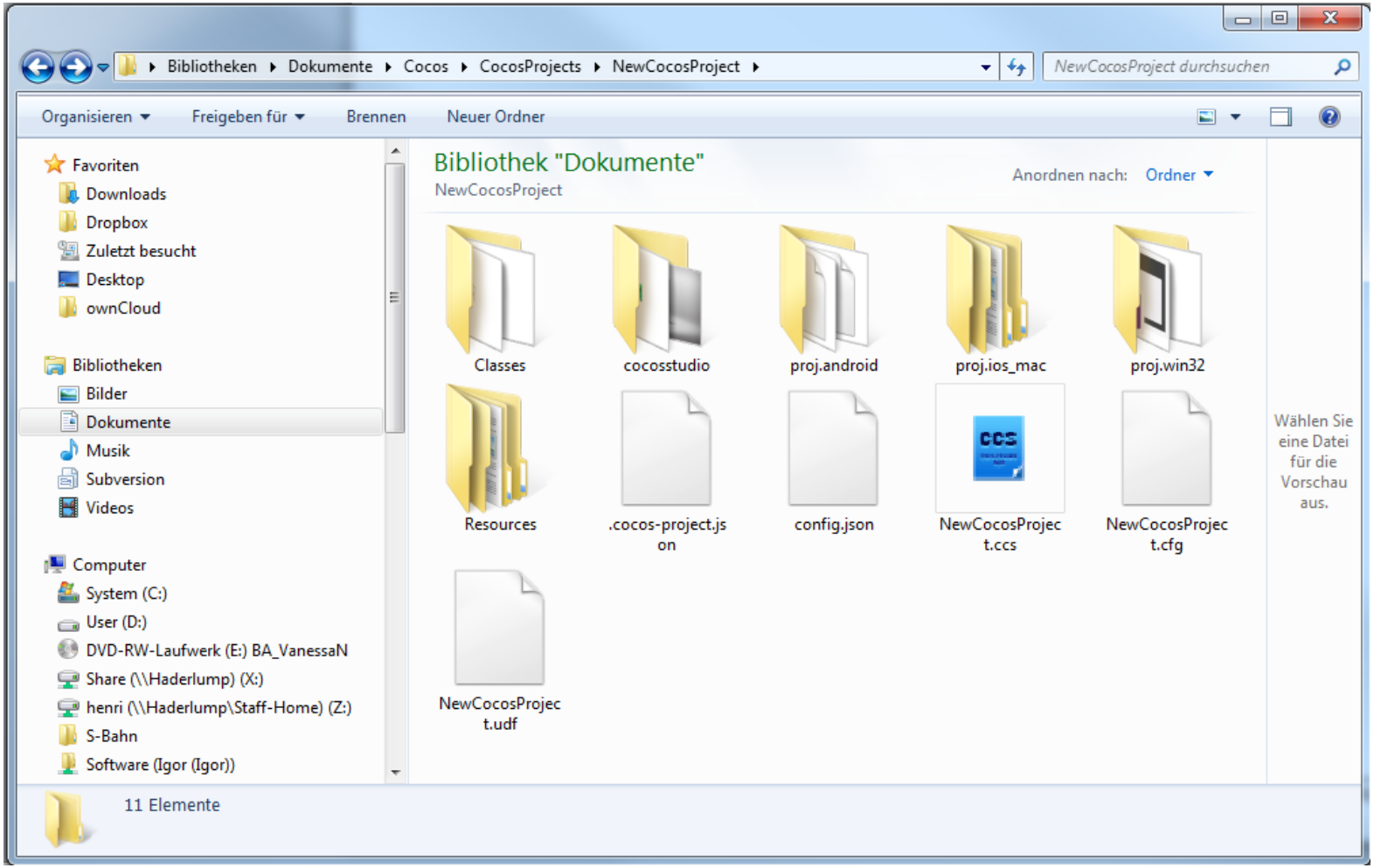
Using Cocos GUI:
http://www.cocos2d-x.org/docs/cocos/cocos/index.html#using-cocos

Using the command line tool (only for Python 2.7):
http://www.cocos2d-x.org/docs/editors_and_tools/cocosCLTool/index.html

Building a new Project using the GUI



Result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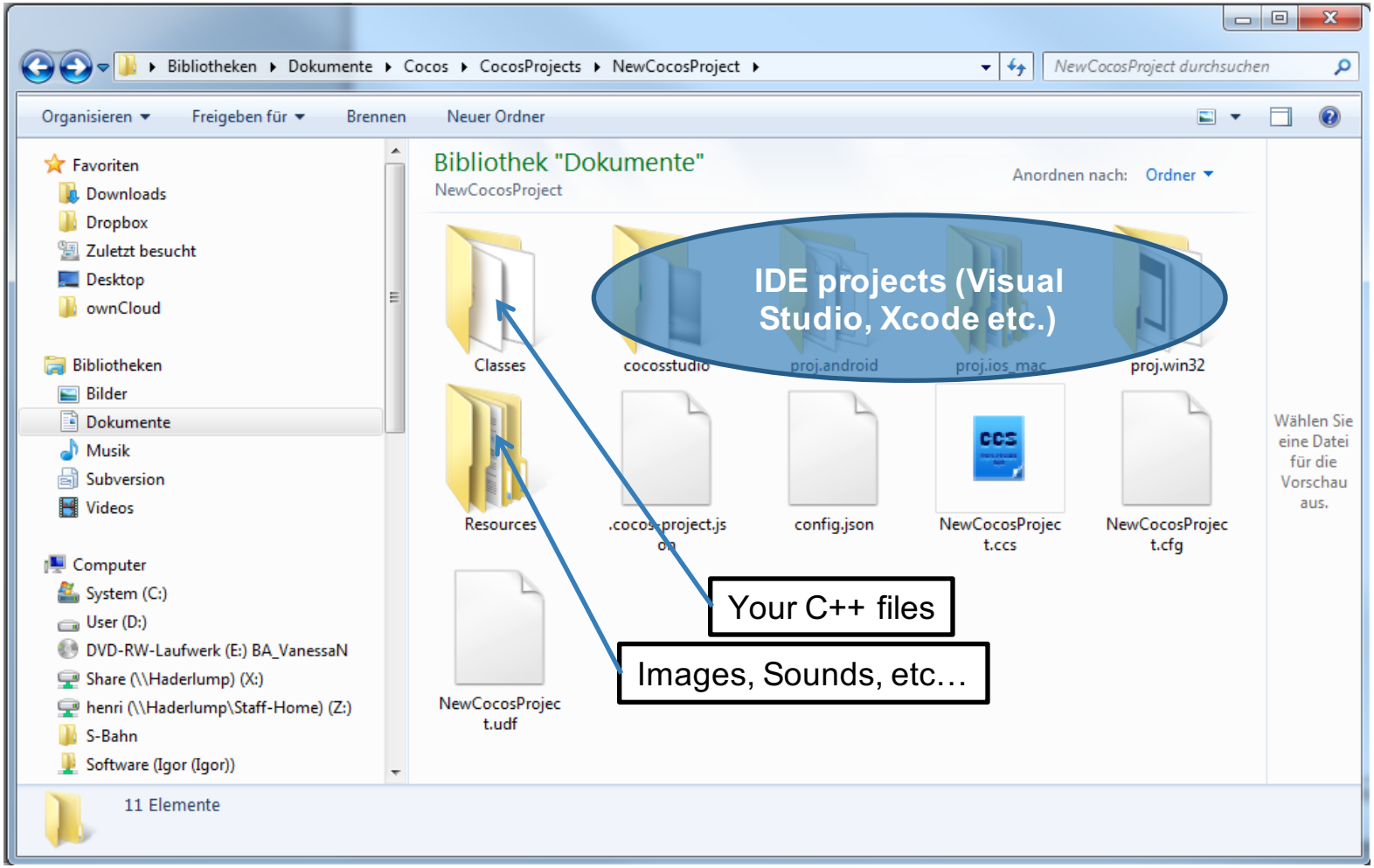
proj.android
proj.ios_mac
proj.win32
Resources
.cocos-project.json
config.json
NewCocosProject.ccs
NewCocosProject.cfg
NewCocosProject.udf
Wählen Sie eine Datei für die Vorschau aus.
11 Elemente

Result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IDE projects (Visual Studio, Xcode etc.)
Your C++ files
Images, Sounds, etc…
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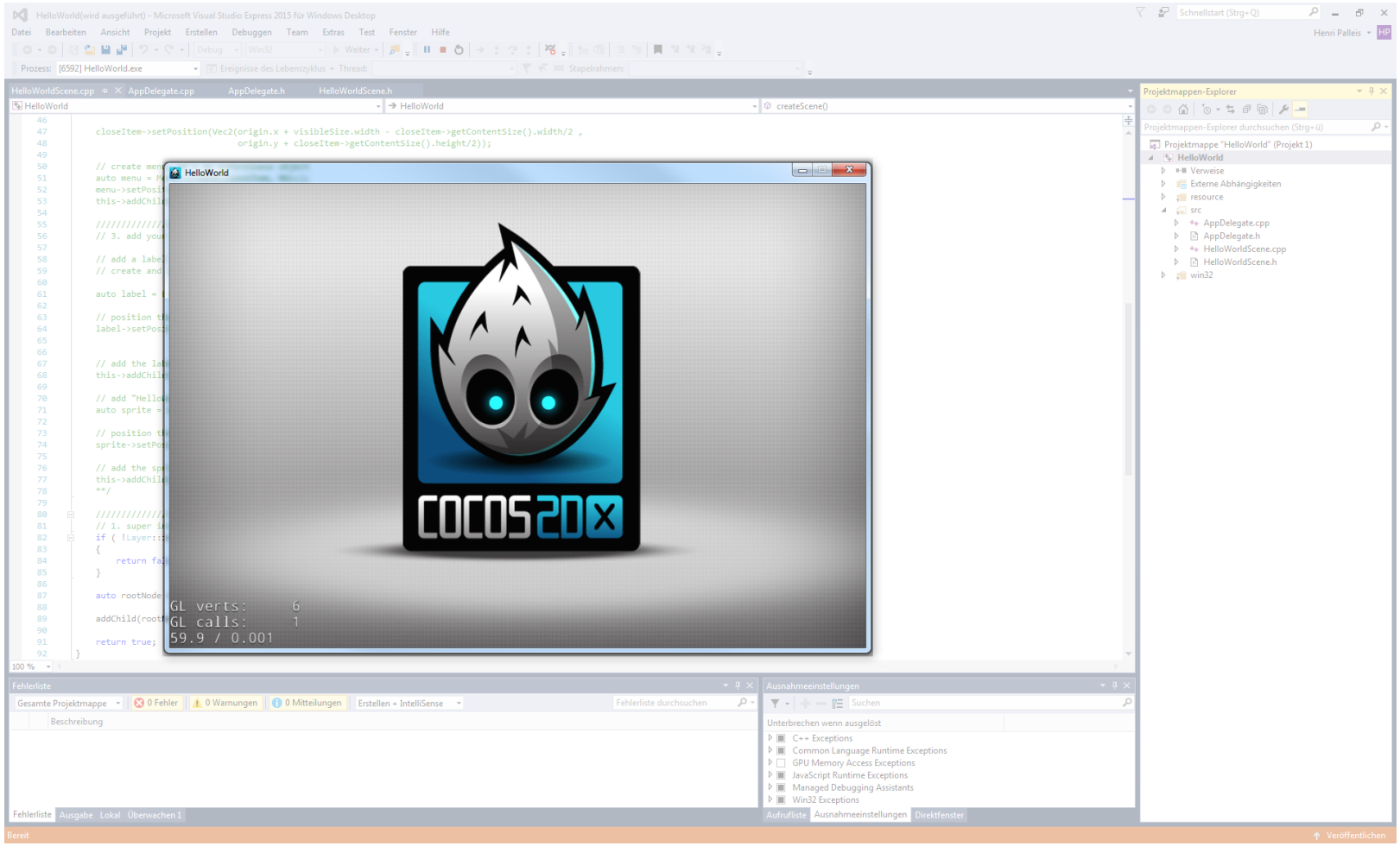
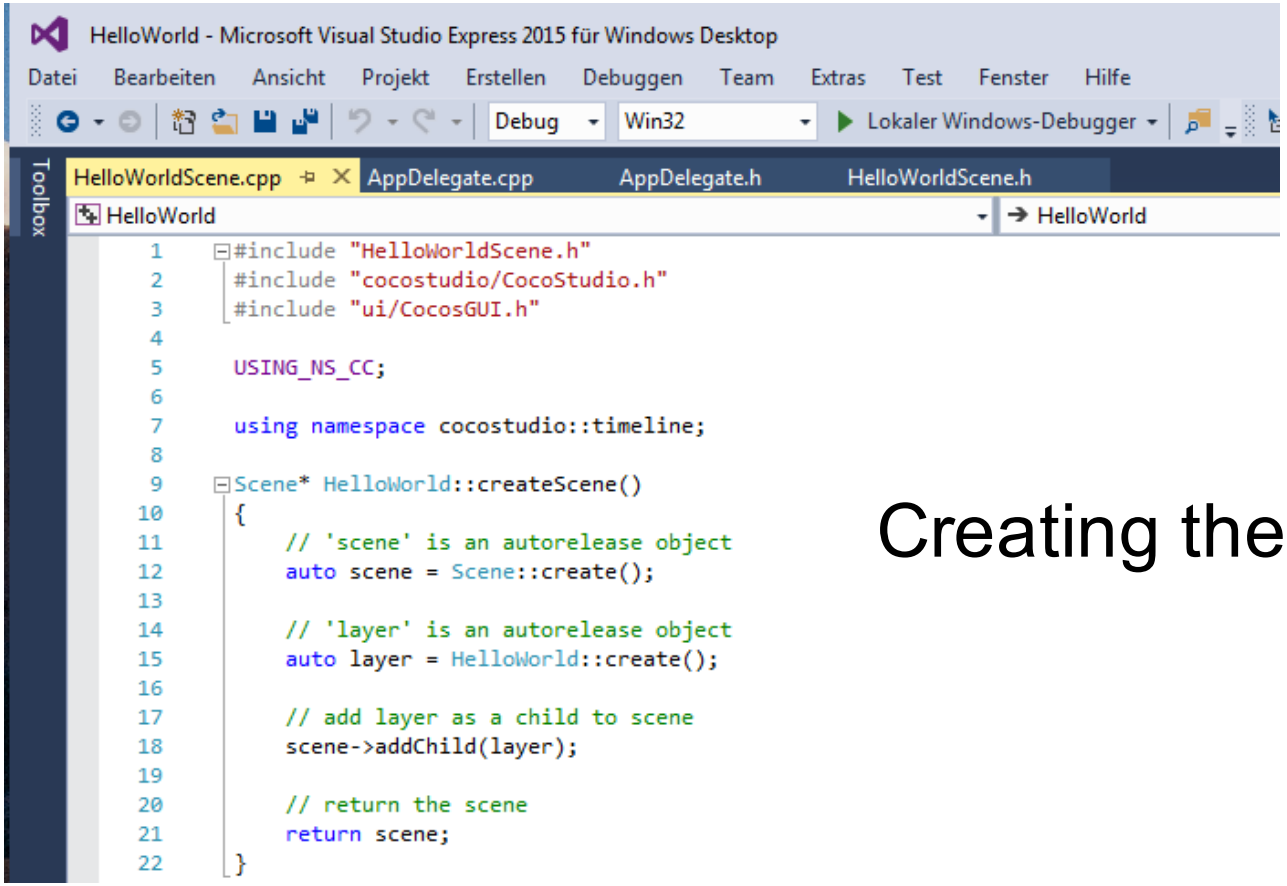
11 Elemente

Hello World – Auto-generated App



Hello World – HelloWorldScene.cpp



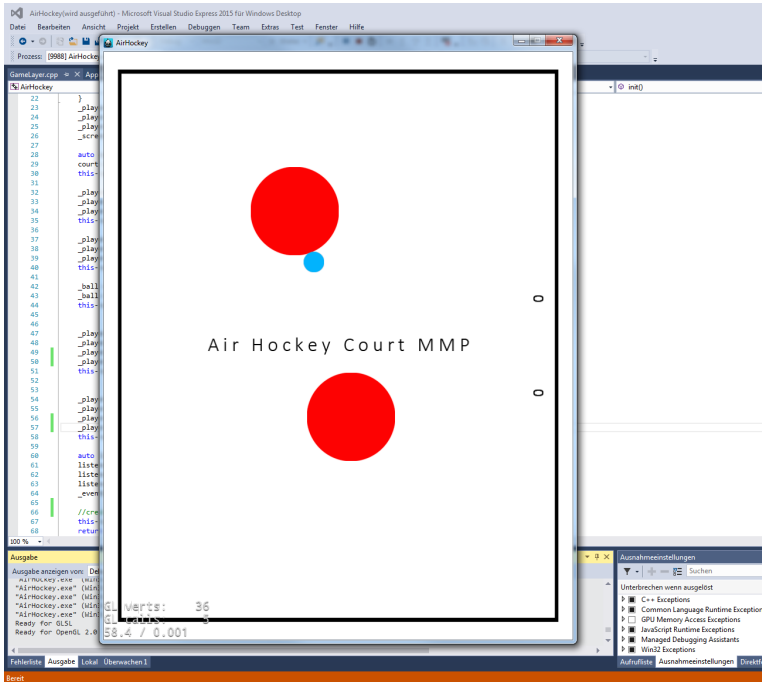
Creating the scene

Hello World – AppDelegate.cpp

```
24
25  bool AppDelegate::applicationDidFinishLaunching() {
26      // initialize director
27      auto director = Director::getInstance();
28      auto glview = director->getOpenGLView();
29      if(!glview) {
30          glview = GLViewImpl::createWithRect("HelloWorld", Rect(0, 0, 960, 640));
31          director->setOpenGLView(glview);
32      }
33
34      director->getOpenGLView()->setDesignResolutionSize(960, 640, ResolutionPolicy::SHOW_ALL);
35
36      // turn on display FPS
37      director->setDisplayStats(true);
38
39      // set FPS. the default value is 1.0/60 if you don't call this
40      director->setAnimationInterval(1.0 / 60);
41
42      FileUtils::getInstance()->addSearchPath("res");
43
44      // create a scene. it's an autorelease object
45      auto scene = HelloWorld::createScene();
46
47      // run
48      director->runWithScene(scene);
49
50      return true;
51  }
```

Using the director to run the game with the scene

Today's Project: A small game!



Airhockey-Game

3 Classes:

- AppDelegate
  to run the Game

- GameLayer
  includes the game function

- GameSprite
  for the movable objects (players + ball)

Airhockey-Game: GameLayer

Create init () which includes

- 2 player and 1 ball

```
_player1 = GameSprite::gameSpriteWithFile("res/mallet.png");
_player1->setPosition(Vec2(_screenSize.width * 0.5, _player1->radius() * 2));
_players.pushBack(_player1);
this->addChild(_player1);
```

- EventListener

```
auto listener = EventListenerTouchAllAtOnce::create();
listener->onTouchesBegan = CC_CALLBACK_2(GameLayer::onTouchesBegan, this);
listener->onTouchesMoved = CC_CALLBACK_2(GameLayer::onTouchesMoved, this);
listener->onTouchesEnded = CC_CALLBACK_2(GameLayer::onTouchesEnded, this);
_eventDispatcher->addEventListenerWithSceneGraphPriority(listener, this);
```

Airhockey-Game: GameLayer (2)

Create update()

```
void GameLayer::update(float dt) {
    auto ballNextPosition = _ball->getNextPosition();
    auto ballVector = _ball->getVector();
    ballVector *= 0.98f;
    ballNextPosition.x += ballVector.x;
    ballNextPosition.y += ballVector.y;
    float squared_radii = pow(_player1->radius() + _ball->radius(), 2);
    for (auto player : _players) {
        auto playerNextPosition = player->getNextPosition();
        auto playerVector = player->getVector();
        float diffx = ballNextPosition.x - player->getPositionX();
        float diffy = ballNextPosition.y - player->getPositionY();
        float distance1 = pow(diffx, 2) + pow(diffy, 2);
        float distance2 = pow(_ball->getPositionX() - playerNextPosition.x, 2)
            + pow(_ball->getPositionY() - playerNextPosition.y, 2);
        if (distance1 <= squared_radii || distance2 <= squared_radii) {
            float mag_ball = pow(ballVector.x, 2) + pow(ballVector.y, 2);
            float mag_player = pow(playerVector.x, 2) + pow(playerVector.y, 2);
            float force = sqrt(mag_ball + mag_player);
            float angle = atan2(diffy, diffx);
            ballVector.x = force * cos(angle);
```

Airhockey-Game: GameLayer (3)

Define Eventlistener

- onTouchBegan
- onTouchMoved
- onTouchEnded

```
void GameLayer::onTouchesBegan(const std::vector<Touch*> &touches, Event* event)
{
    for (auto touch : touches) {
        if (touch != nullptr) {
            auto tap = touch->getLocation();
            for (auto player : _players) {
                if (player->boundingBox().containsPoint(tap)) {
                    player->setTouch(touch);
                }
            }
        }
    }
}
```

Links

http://www.cocos2d-x.org/wiki/External_Tutorials

http://wizardfu.com/book/cocos2d-x/tutorial/

http://www.gamefromscratch.com/page/Cocos2d-x-CPP-Game-Programming-Tutorial-Series.aspx