
# Quick game development with **C++11/C++14**

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# About **myself**

- **Computer Science** student at the **University of Messina**
- **Autodidact** programmer
- Interests:
  - **Software development**
  - **Gaming** and **game-development**
  - **C++** and its evolution
  - **Open-source** software
  - **Sharing** my knowledge




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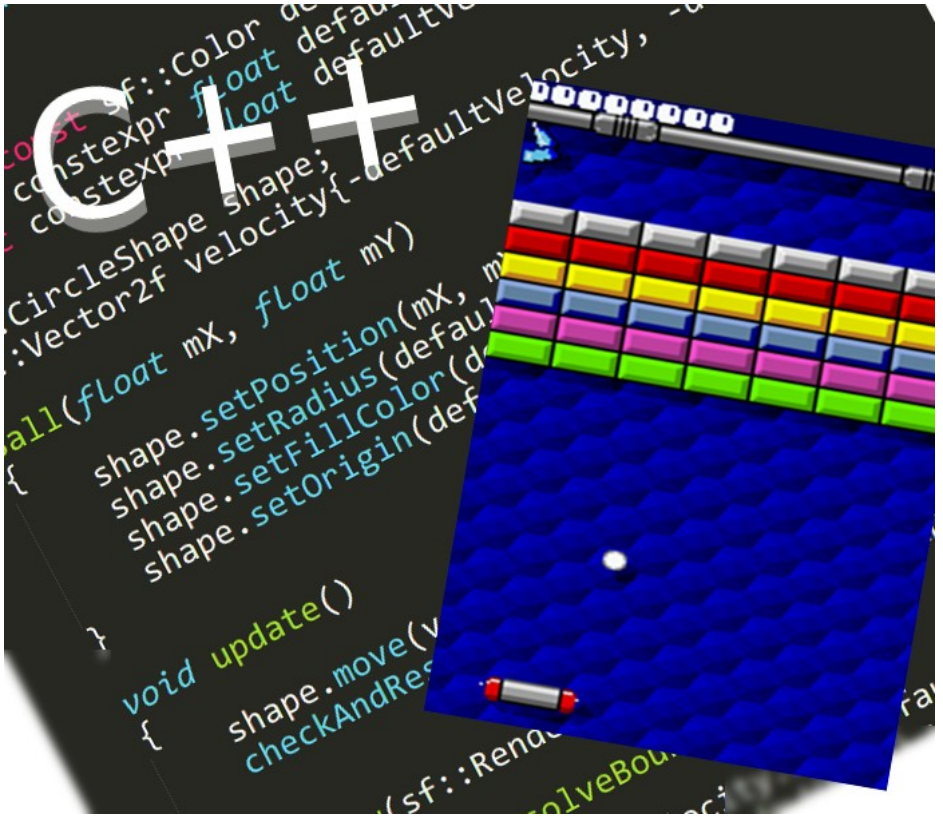
# About **this talk**

- **Introductory part:**
  - Game development: **why?**
    - **Why C++?**
    - **Why C++11/C++14?**
- **Live coding part:**
  - Preparation: **goals, compilers, resources**
  - **Live coding**: development **analysis/walkthrough** of a complete playable simple game



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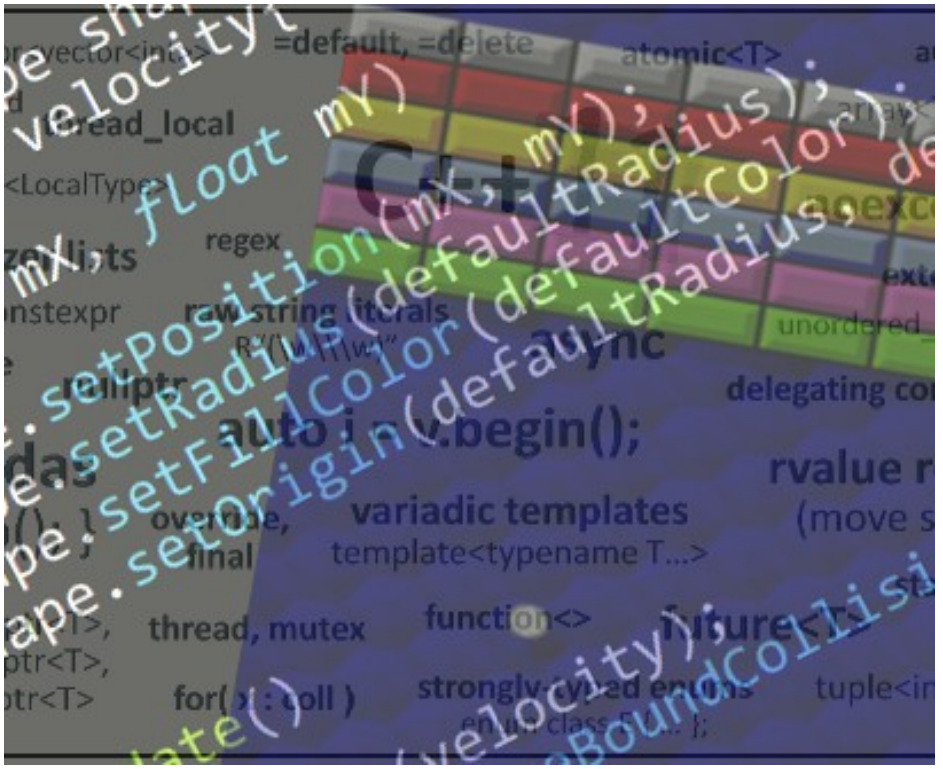
# **Goals** of this talk

- **Encouraging** everyone to try **game development**
- **Demonstrating** how **C++** and its **newer standards** make game development **a breeze**



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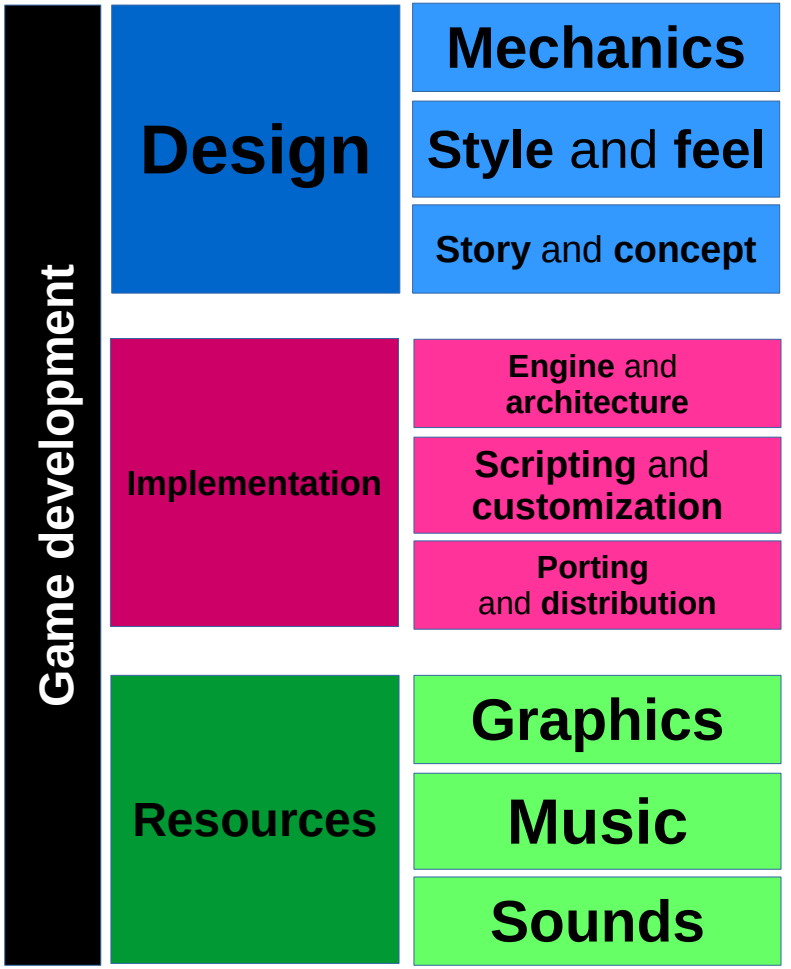
**Game development:**
all-around development experience

# Game development: **why?**

- Game development
  - Requires **knowledge** and **skills** in multiple areas
  - **Involves** the programmer **with the community**
  - **Touches** a **vast number** of **specific programming topics**



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# Game development: **why C++?**

- **Efficient**: *zero-cost abstractions* and *"low-level" code*
- **Portable**: standard-compliant code can *target many architectures*
- **Widespread**: huge number of *libraries and resources* available




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# Game development: **why C++11/C++14?**

- **Convenience**, **safety** and **expressiveness**
  - **Initializer lists** and **uniform initialization**
  - `auto`, **range-based for loops**
  - **Lambdas**, **variadic templates**, `decltype` → *factory functions*
  - `override`, `final`, `enum class`, `explicit`, `nullptr`
  - `default`, `delete`
- **Memory management** (**!**)
  - `std::unique_ptr`, `std::shared_ptr`, `offsetof` → *entity management*
- Possible **performance** improvements
  - `constexpr`, `std::move`, `noexcept`
- Other **improvements/additions**
  - **Multithreading** library facilities
  - `std::tuple`, **variadic macros**, `<random>`, `<chrono>` → *game loop timing*
  - **Generic lambdas**, **lambda capture expression**
  - `auto` functions, **relaxed constexpr**, `std::tuple::get<...>`



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Let's **get started**, then!

# Live coding: **what is our goal?**

- Our goal is **creating** an **arkanoid/breakout clone** almost from scratch.
- **Step by step**, I'll demonstrate how easy it is to create a playable game, in **around 200 lines of code**.



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# Live coding: **what compiler?**

- **C++11** support is mandatory
  - `g++ 4.7.2` or `clang++ 3.0` (or newer) fully support the **C++11 standard**
- Some **C++14 features** will be used
  - `clang++ 3.4` fully supports the **C++14 standard**
  - `g++ 4.9` supports all the **C++14 features** we'll be using
- Standard compliance information
  - `http://gcc.gnu.org/projects/cxx1y.html`
  - `http://clang.llvm.org/cxx_status.html`



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# Live coding: **SFML library**

- To **interface** ourselves with the **input**, **audio**, **graphics** components of our computer and our operating system we'll use the **SFML 2.1** open-source C++ library available at http://sfml-dev.org




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# Live coding: **code and resources**

- You can download the **code** and the **resources** that are going to be used here:
  - http://github.com/SuperV1234/cppcon2014

- The **SFML 2.1** library is available here:
  - http://sfml-dev.org



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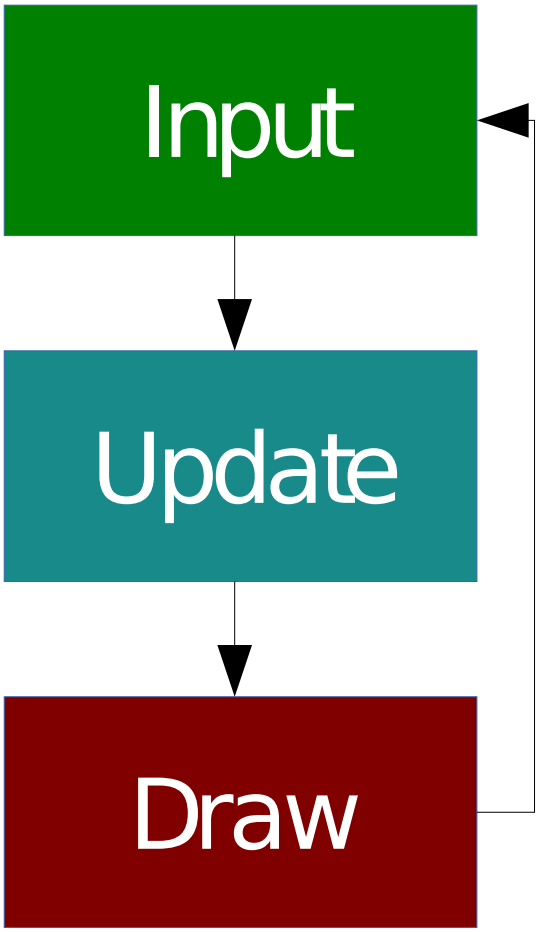
# Info: **game loop**

- The **game loop** is a continuously running loop *(until the end of the game)*
  - 1. Get **input**
  - 2. **Update** game logic
  - 3. **Draw** game entities



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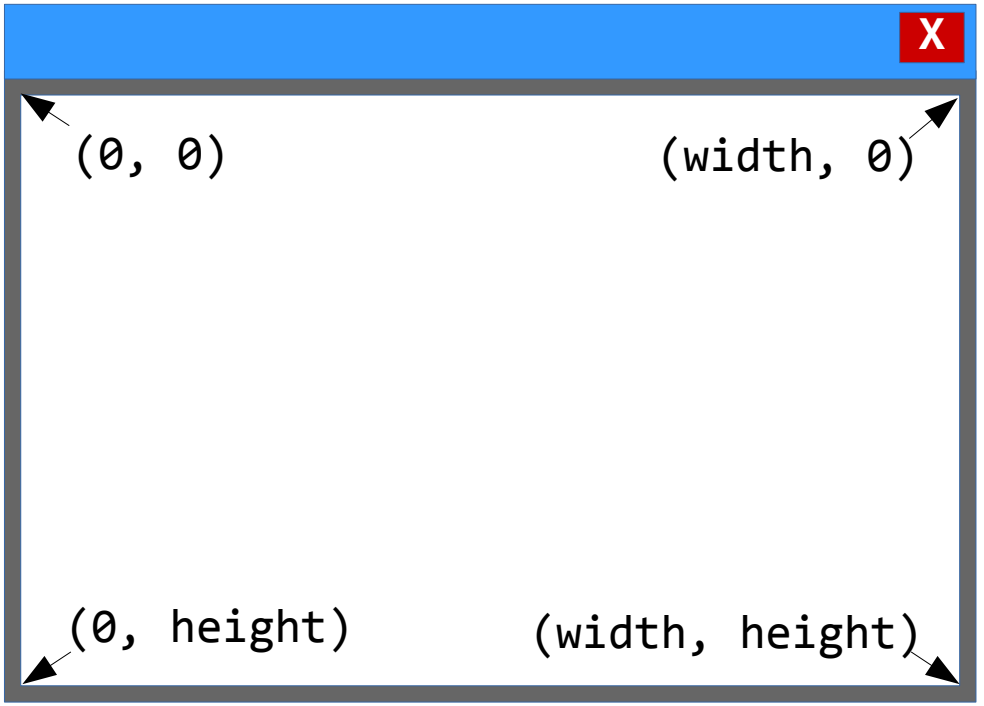
# Info: **coordinate system**

- **SFML**'s **coordinate system** sets the **origin** in the top-left corner of the window.



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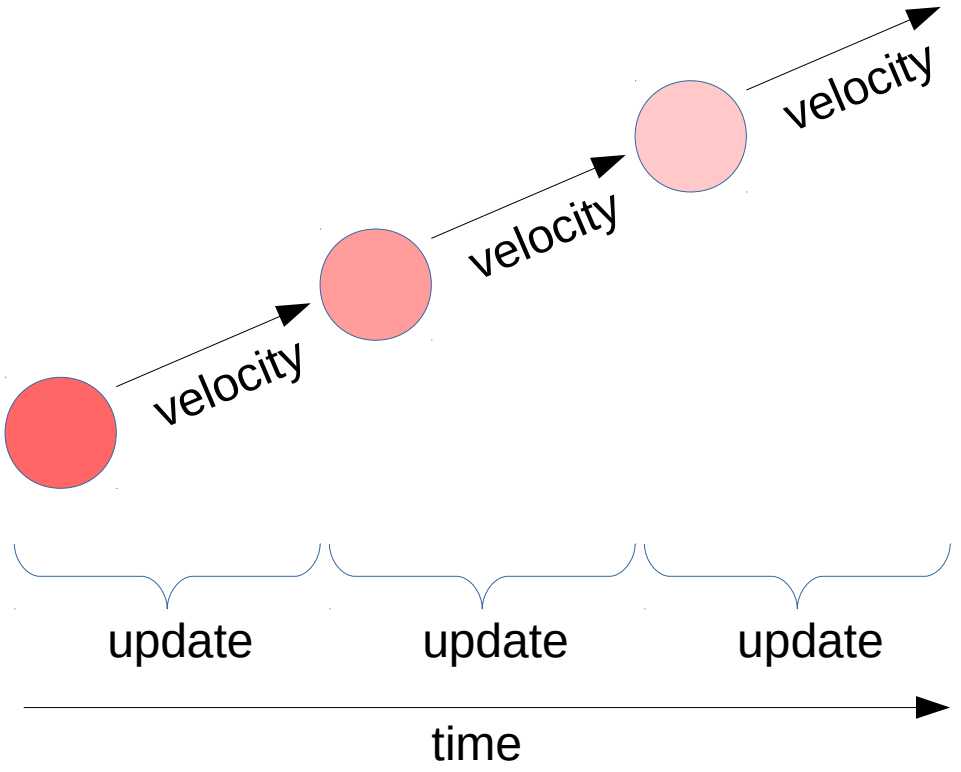
# Info: **ball movement**

- By adding a **velocity vector** to the ball's position **every frame**, the ball appears to move.



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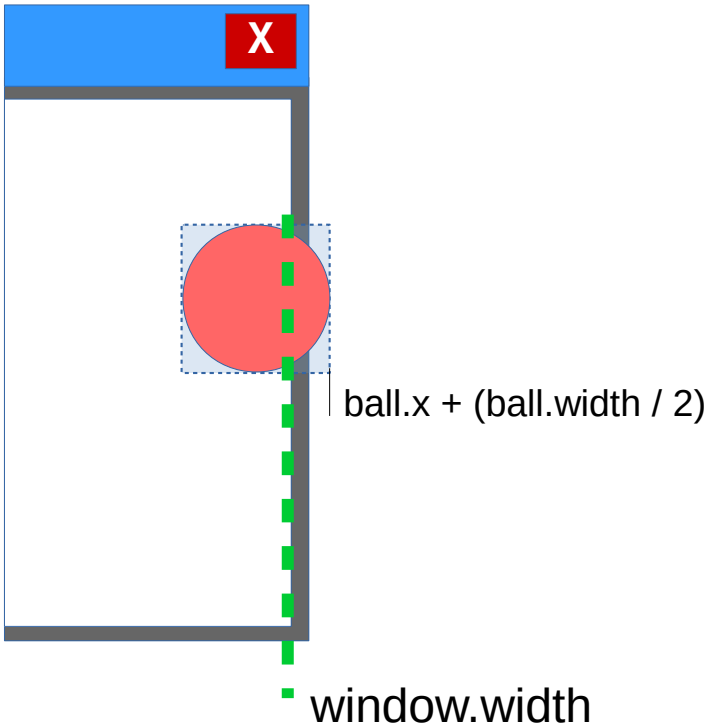
# Info: **ball vs window collision**

- By checking if one of the ball's coordinates is greater or lower than the window's bounds, we can determine if the ball is outside the window.



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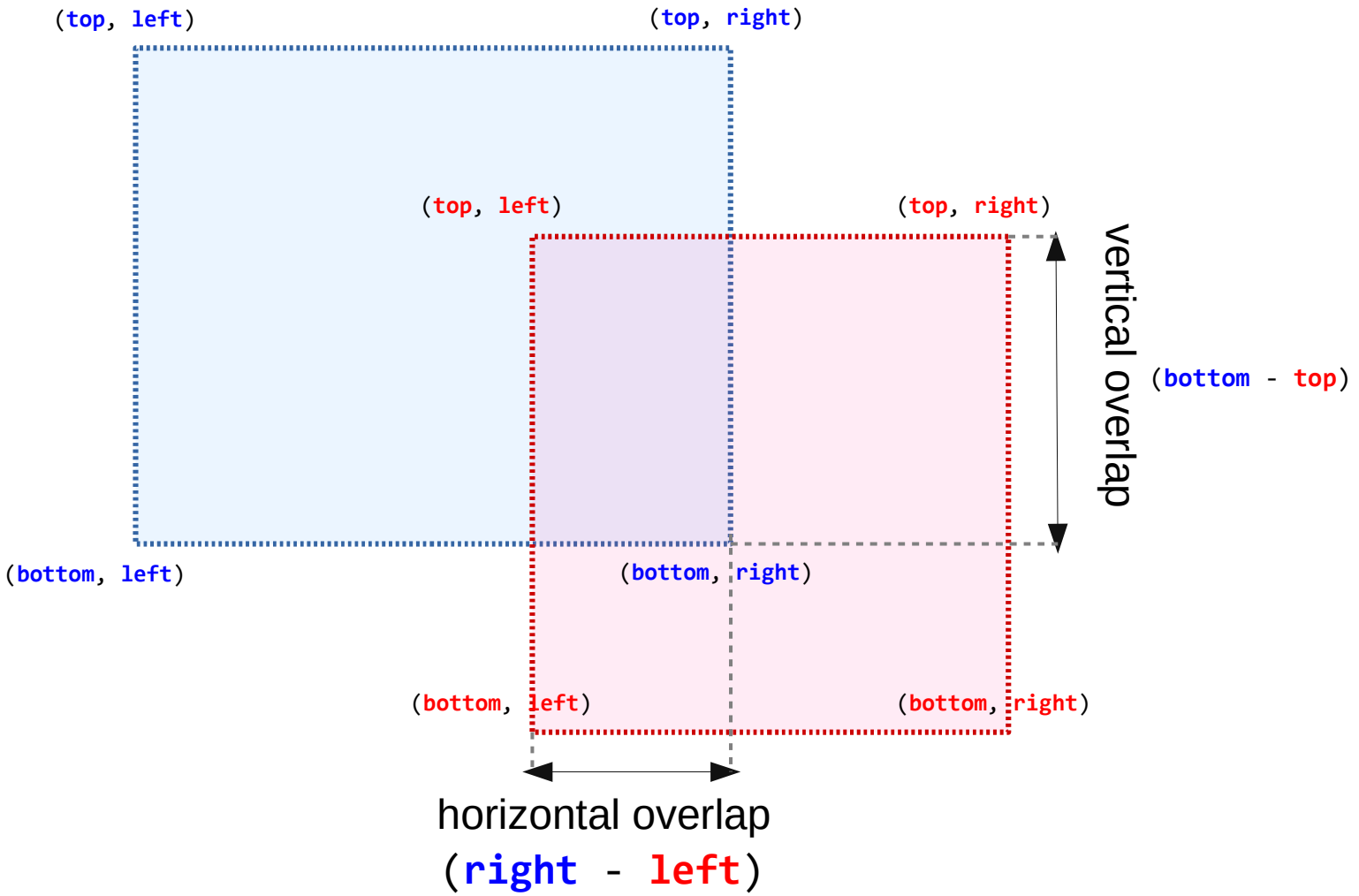
# Info: **AABB vs AABB collision**



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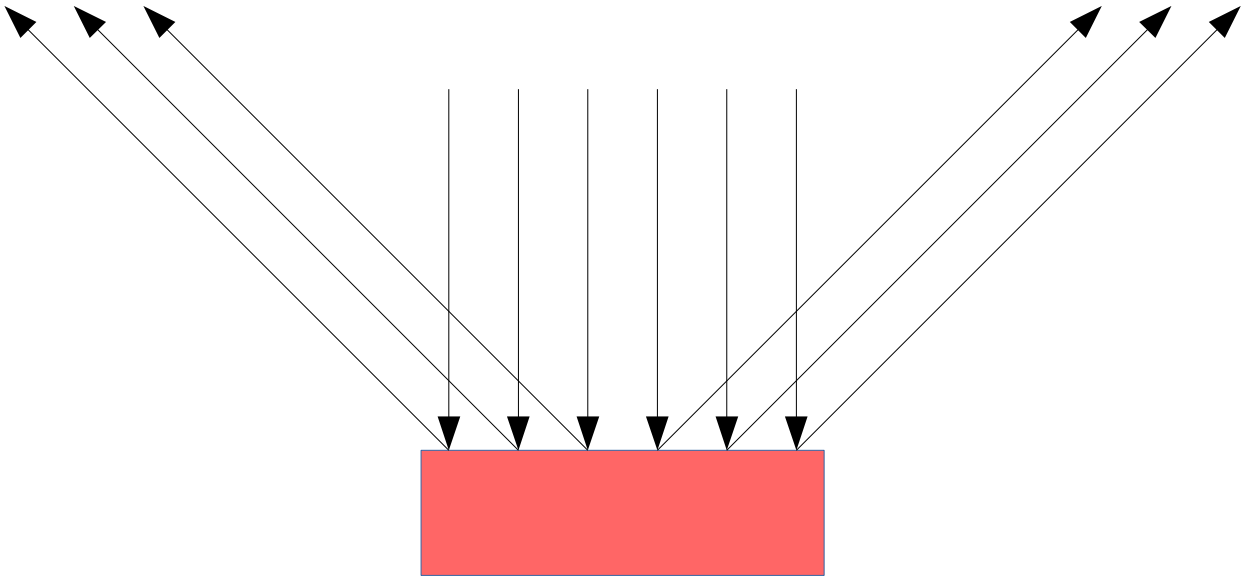
# Info: **ball vs paddle collision**

- Depending on where the paddle was hit, we set the ball's X velocity towards the left or the right.





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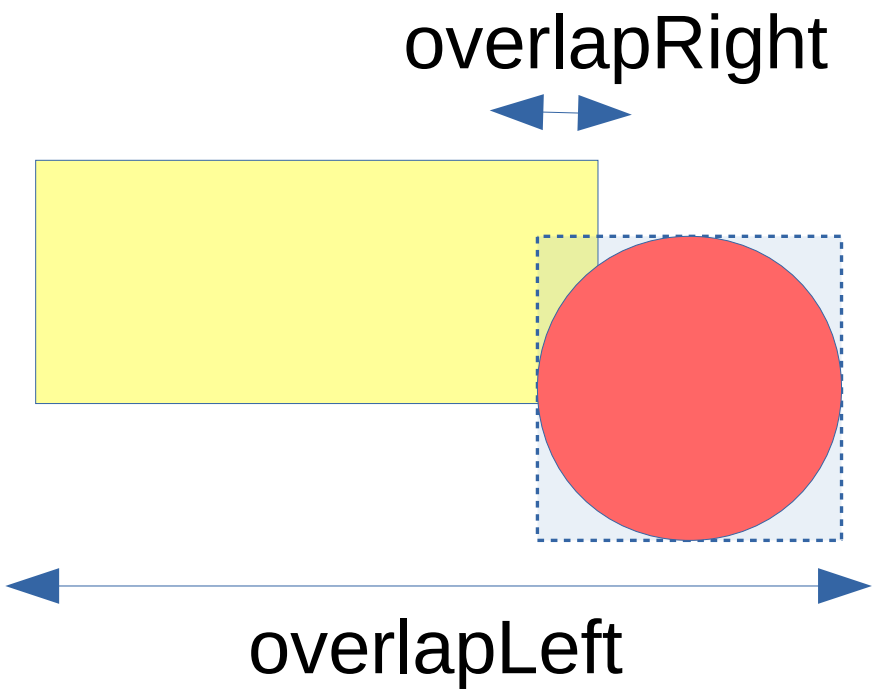
# Info: **ball vs brick collision**

- We need to change the ball's velocity depending on the direction the brick was hit from.



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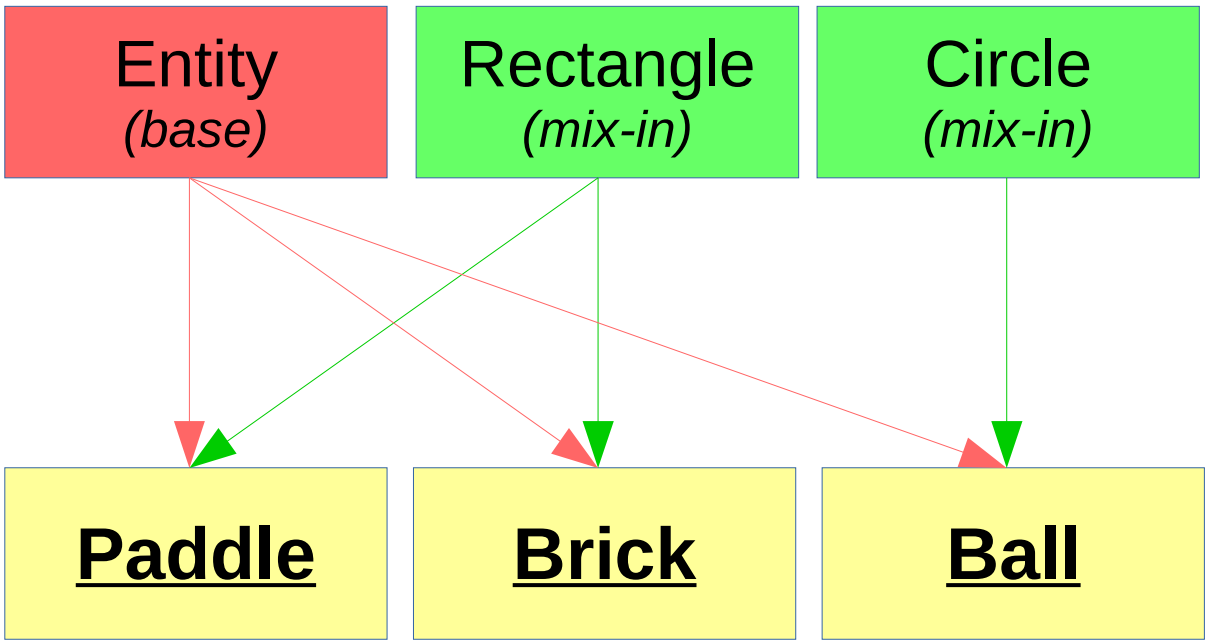
# Info: **class hierarchy**

- This is the final **class hierarchy** of our game objects.



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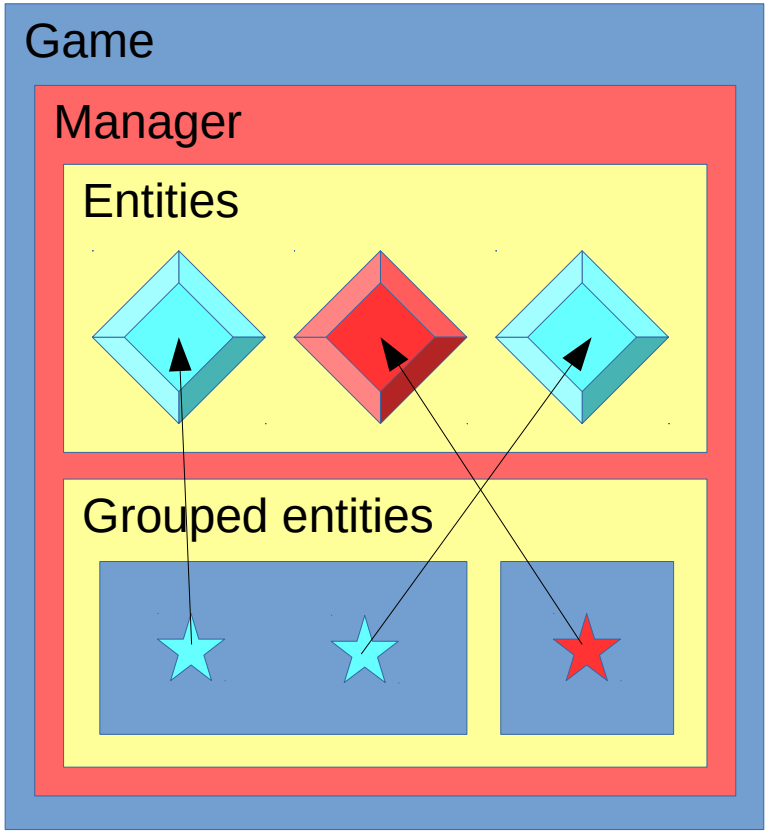
# Info: **game architecture**

- This is the final **code architecture** of our game classes.



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# Thanks!

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