ArcadeJS Tutorial

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Overview

Arcade.js is a 2D game engine that drives a render loop for multiple moving objects.
Also sound, keyboard, mouse and touch events are supported.

The linear algebra math is provided by LinaJS (which comes as part of the same project), so you might want to read LinaIntro first.

API details:

https://cdn.rawgit.com/mar10/arcade-js/master/doc/jsdocs/arcade.js/jsdoc/index.html

Arcade.js is open source, released under the MIT license.

The project home is located at https://github.com/mar10/arcade-js/.

Creating a game page

To implement a game, we need

1. One HTML page that includes the required JavaScript libraries and one canvas element. The Arcade-JS game object is instantiated here.
2. The game code

```
<!DOCTYPE html>
<html>
<head>
   <script src="../../depends/jquery.js"></script>
   <script src="../../lina.js/lina.js"></script>
   <script src="../../arcade.js/arcade.js"></script>
   <script src="jsAsteroids.js"></script>

   <script type="text/javascript">
   $(function(){
     // Initialize the game
     var canvas = document.getElementById("gameCanvas");
     var game = new AsteroidsGame(canvas);
   });
   </script>
</head>
<body>
<canvas id="gameCanvas">This game requires HTML 5 support.</canvas>
</body>
</html>
```

Render loop

A game is essentially an infinite sequence of scene snaphots (or 'frames').

```
While game.isRunning:
   // Set up the new scene positions
   for obj in game.object_list:
     calculate_new_object_position(obj)
     // Let object modify this
     obj.step()

   // Draw all objects
   clear_canvas()
   for obj in game.object_list:
     set_canvas_context(obj.pos, obj.orientation)
     // Let object draw itself, using modelling coordinates
     obj.draw()
```

More detailed:

```
While game.isRunning:
  // Trigger timeout event
  if game.timeout_reached:
    game.onTimeout()

  // --- Step all objects
  game.preStep()

  for obj in game.object_list:
    // Trigger timeout event
    if obj.timeout_reached:
          obj.onTimeout()

    // Calculate new position
    obj.pos += obj.velocity
    obj.orientation += obj.rotationalSpeed
    if obj.auto_wrap:
          <calculate wrapped position>

    // Let object modify this
    obj.step()

  game.postStep()

  // --- Draw all objects
  clear_canvas()
  game.preDraw(ctx)

  for obj in game.object_list:
    save_canvas_context()
    set_canvas_context(obj.pos, obj.orientation)

    // Let object draw itself, using it's own modelling coordinates
    obj.draw(ctx)

    draw_object_debug_infos()
    restore_canvas_context()

  game.postDraw(ctx)

  draw_game_debug_infos()
```

Frames, velocities and timing

Object velocities (object.velocity and object.rotationalSpeed) are defined in World Coodinate units per second.

Time correction

If the requested frame rate drops due to expensive processing, the objects appear to move slower.

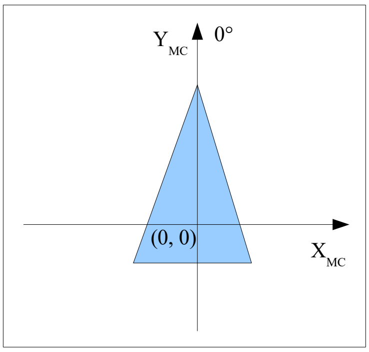
Optional time correction makes sure, that the perceived on-screen-speed of objects remains constant, by adjusting the Δt of every frame step.

Coordinate systems and transformation pipeline

Modelling Coordinates ('MC')

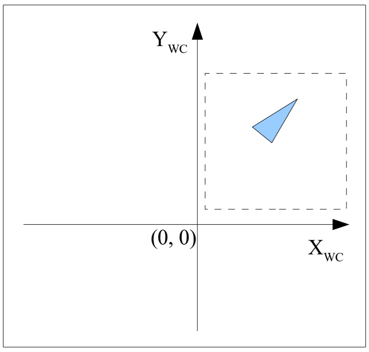
All game objects are designed in Modelling Coordinates.

The object's neutral orientation is assumed to be upward (along the positive y-axis).
The rotation pivot should be at (0, 0).



World Coodinates ('WC')

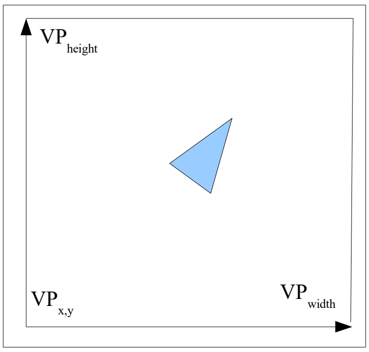
The game play takes place in World Coordinates with infinite dimension.
The dashed rectangle marks the part of the world is visible to the user ('Viewport').



Viewport

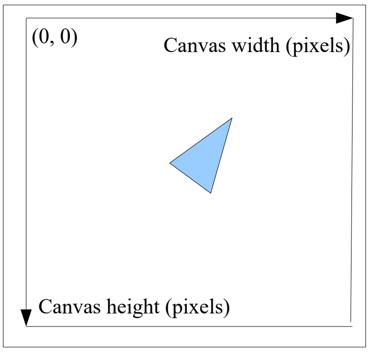
The Viewport defines the visible part of the 'world'.

It's dimensions are specified in World Cordinate units.



Canvas Coordionates ('CC')

Finally the objects are rendered to the canvas using pixel coordinates.
Note that the positve y-axis of the canvas points downward.



Viewport definition

The viewport is defined using World Coordinates

```
game.setViewport(0, 0, 640, 480, "extend");
```

If the aspect ratio of the viewport and the canvas are different, some parts outside of the original viewport may be displayed in order to prevent stretching. The mapMode controls this:

- 'stretch'
- 'fit'
- 'extend'
- 'trim'
- 'none'

Usable canvas area

Otionally the 'usable' part of the canvas can be restricted to a smaller rectangle:

```
game.setCanvasArea(10, 10, 620, 440, true);
```

In this case, the viewport is projected into this area, leaving an unused margin.

All rendering that uses World Coordinates takes place in this area.
But it is still possible to draw outside by using Canvas Coordinates.

Drawing

Augmented canvas

Details:

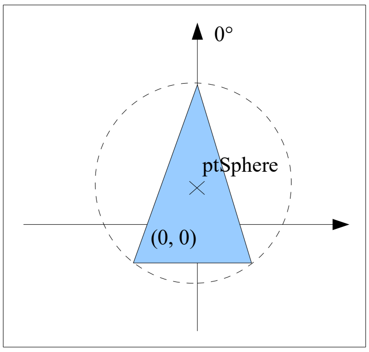
https://cdn.rawgit.com/mar10/arcade-js/master/doc/jsdocs/arcade.js/jsdoc/symbols/ArcadeCanvas.html

Game play

Set up the object list

Collision detection

The center of the bounding sphere is not necessarily identical with the rotation pivot.



Scheduled events (timeout trigger)

- game.later()
- object.later()

Activities

- onActivity(), setActivity(), isActivity()
- ==> API Doc

The object list

Sound

See

https://cdn.rawgit.com/mar10/arcade-js/master/doc/jsdocs/arcade.js/jsdoc/symbols/AudioJS.html

User input

Event handling

Keyboard input

Mouse input, Drag'n'drop

Touch events

Controls

Mobile devices and touch events

Debugging

Game.debug

Game.opts.debug.showVelocities = true

stoprequest 0 true

logToCanvas

Further information

The LinaJS API is documented at

https://cdn.rawgit.com/mar10/arcade-js/master/doc/jsdocs/lina.js/jsdoc/index.html.

A tutorial can be found here:

https://cdn.rawgit.com/mar10/arcade-js/master/doc/lina-js_tutorial.pdf