Resolution Solution

v2002

Contents

Explanation of terms

- **Game size / resolution / game content / virtual size** - the size of the game that was intended by the software developer (you).
- **Window** - the game is rendered to a window. The window can be resized by the user to be larger or smaller than the intended size of the game. Some platforms use different terms, but it is the object the game is rendered to.
- **rs table** - the Resolution Solution table that is exposed by this library. Many settings and values can be accessed via **rs** functions but they can also be set directly in the **rs** table. This manual uses "**rs table**" meaning the table provided by this library.
  Example:
  ```
  rs.scaleMode = 2
  ```
- **Aspect / aspect ratio** - means the size of the game compared to the size of the window as a ratio. Example: a game of 800 x 600 that is rendered in a window that is 1600 x 1200 has an aspect ratio 2:1.

Variables

rs.scaleMode

- Type: **number**
    - Possible values:
        1. **Aspect Scaling**
        2. **Stretch Scaling**
        3. **Pixel Perfect Scaling**
- Default value: **1**

A setting that tells the library how it should scale the game to the window.

To change this setting, use the `rs.setScaleMode()` function.

For advanced users:

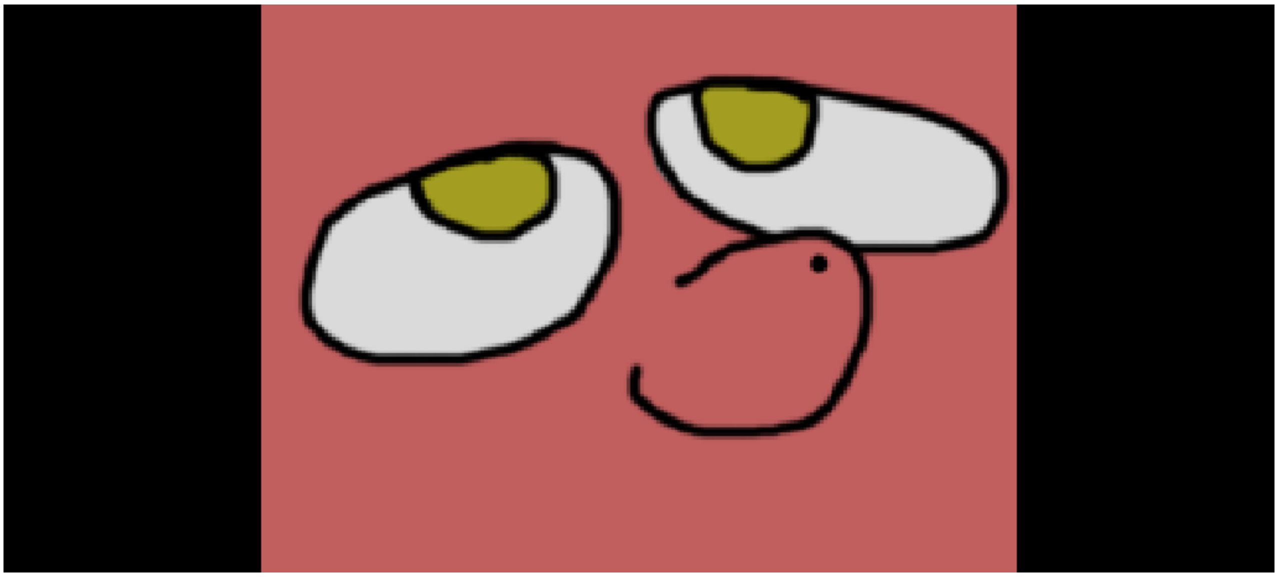
If you manually change this setting (`rs.scaleMode`) directly from the table then you need to call `rs.resize()` immediately after that to update the library.

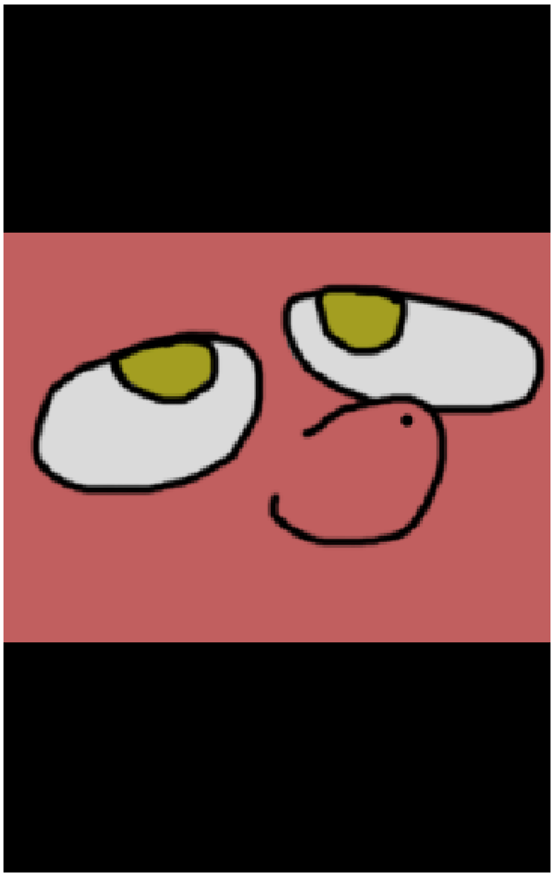
Example:

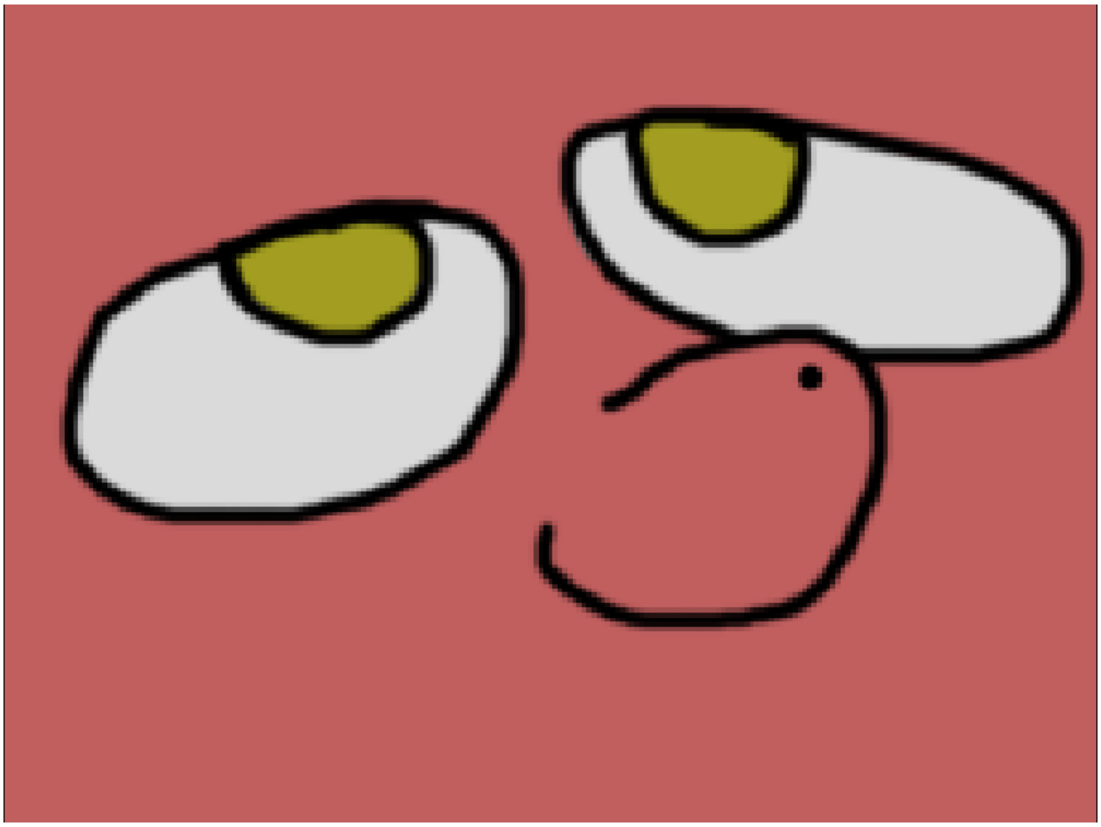
```
rs.scaleMode = 2
rs.resize()
```

1 – Aspect Scaling

Aspect scaling will ensure **rs.scaleWidth** and **rs.scaleHeight** have the same value so images look proportional and not skewed.


If the window is wider than the game width then the library will draw bars on the left and right side of the window.


If the window is taller than the game height then the black bars will be drawn on the top and bottom.

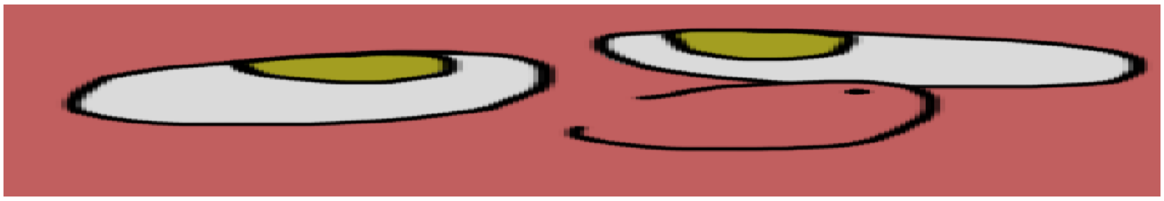


If game aspect and window aspect same, then there will be no visual black bars.

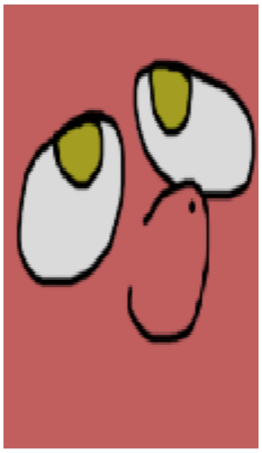
This mode might be best when graphical assets need to remain proportional. Assets that include vector, hand-drawn, 3D etc might look best with this setting. Pixel art might look best with setting **3**.

2 – Stretch Scaling

In this scaling mode, game content will be scaled to fill entire window, no matter what size it has.



When window width bigger then game width. Looks kind of funny, doesn't it?



When window height bigger then game height. Looks kind of funny, doesn't it?

This, as Aspect Scaling, is fine to use with most art-styles, but unlike Aspect scaling, it's more noticeable if game aspect is not same as window aspect. For example, game with 4:3 resolution will look much more distorted on 16:9, then on Aspect scaling.

The upside is that there will be no black bars no matter what.

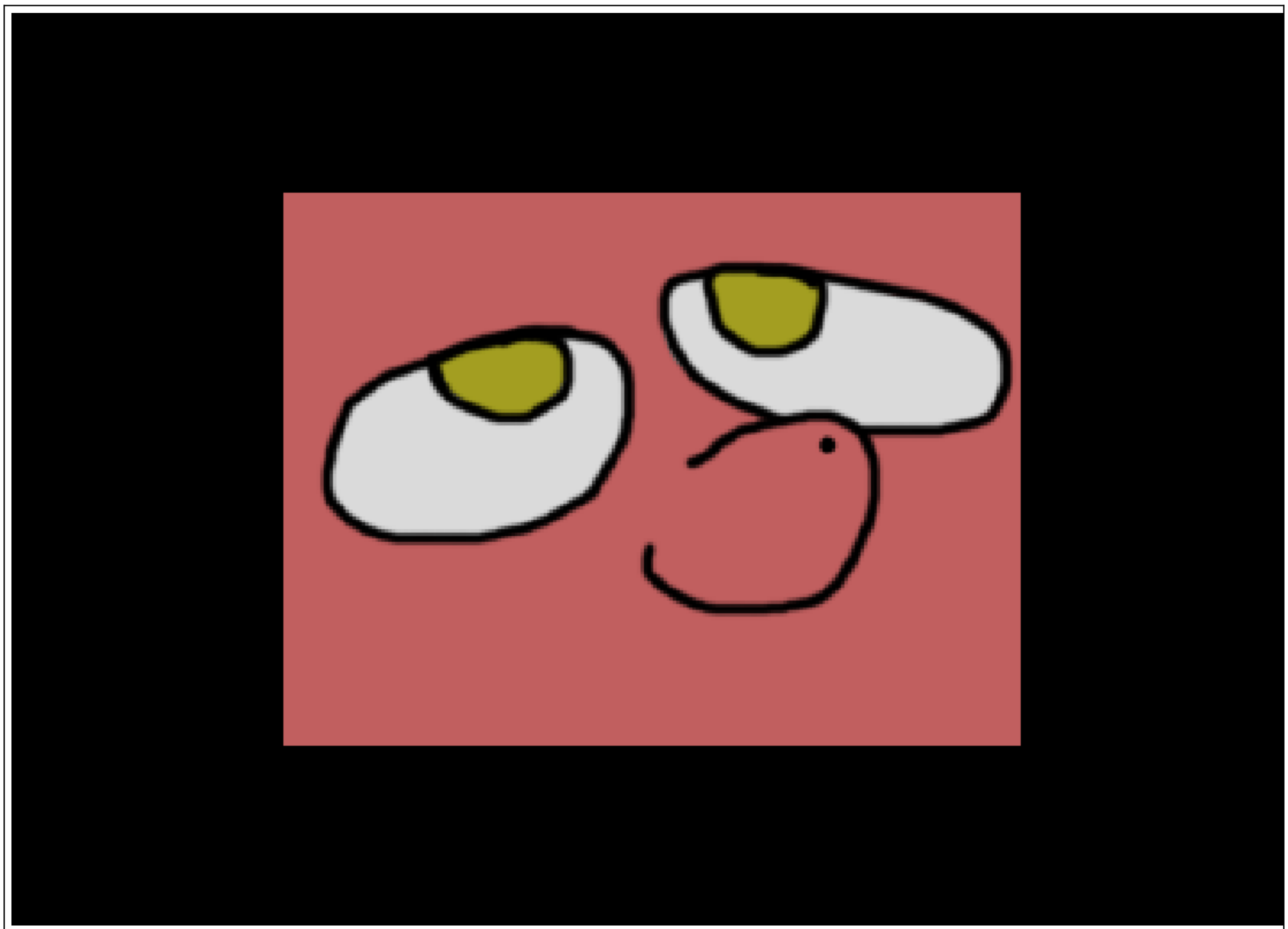
The downside is game will look distorted if game aspect is very different from window aspect, as you can see on screenshots above.

3 – Pixel Perfect Scaling

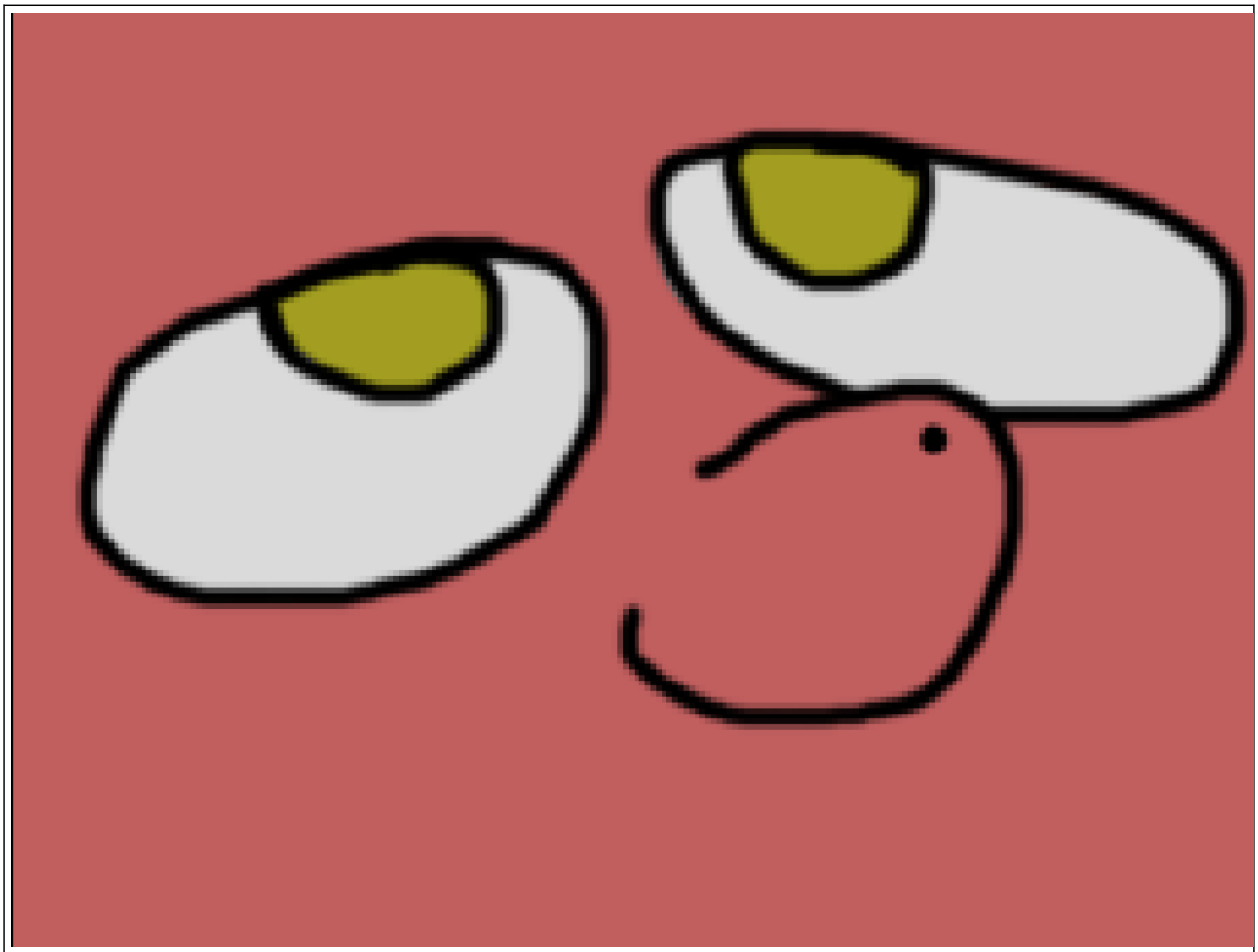
As was mentioned before, Pixel Perfect scaling is *perfectly* suited for games with pixel-art.

It will make sure, that calculations result in **number** scaling value (1, 2, 3, …) with minimal value being 1. It will floor down scale value to achieve this. So, if scale value turns out to be 1.7, it will be floored to 1, or floored to 2 if scale is 2.3. It will guaranty, that your game content will stays as crisp as possible, and there will be no pixel bleeding.

The downside is, however, that this mode will produce 4 black bars on 4 sides of window, game and window aspect doesn't result in integer value:



Game size is 640x480, while window size is 1111x792, which resulted in scale value being 1 and 4 black bars. If window was at least 1280x960, scale value would have been 2.


1280x960 window, 640x480 game produced scale 2.

rs.scaleWidth [number], rs.scaleHeight [number]

- rs.scaleWidth
  - Type: **number**.
- rs.scaleHeight
  - Type: **number**.
- Default values: *will be calculated on first rs.resize() call.*

This 2 values is result of calculations between virtual/game size and window size to fit game content on window no matter which size it has (with exception with 3rd scale mode – Pixel Perfect – where if window **smaller** then game width and height then parts of game content will be simple not visible). This values will be calculated differently, depending on scale mode that you use.

In mode 1 and 3, **rs.scaleWidth** and **rs.scaleHeight** have same value, because there scaling same for width and height. In mode 2, width and height scaling is 2 **independent** values.

Changing this value manually will break library calculations, since this value intended to be updated via **rs.resize()** or built-in functions that relies on **rs.resize()** because this is read-only value that you can use in your own calculations if they somehow relies on scaling data.

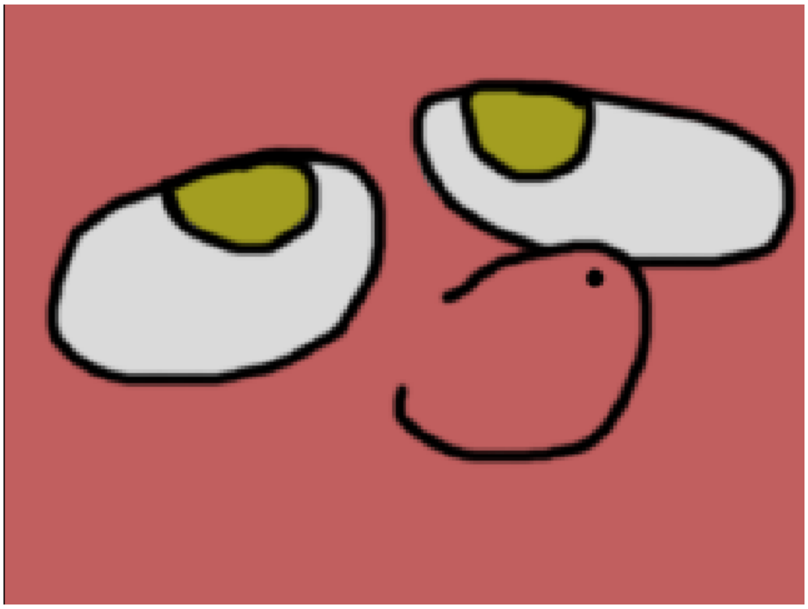
You can use **rs.getScale()** to get both **rs.scaleWidth** and **rs.scaleHeight** at same time.

rs.gameWidth [number], rs.gameHeight [number]

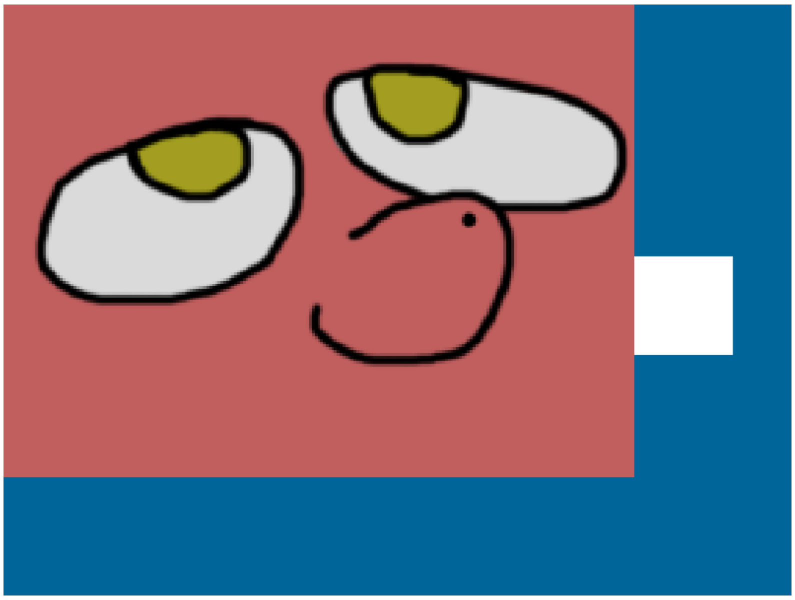
- rs.gameWidth
  - Type: **number**.
  - Default: **800**
- rs.gameHeight
  - Type: **number**.
  - Default: **600**

This is width and height values, that library will scale game to. They represent “resolution” of your game – amount of content/information that can be visible on screen in pixels.

You can get both **rs.gameWidth** and **rs.gameHeight** in single function call via **rs.getGame()**



Game with 640x480 resolution/game size. Image has same size, so it 100% fits game resolution.



Now game is 800x600, but image still 640x480. It doesn't fit game screen anymore and now you can see white rectangle that was outside of 640x480 boundaries.

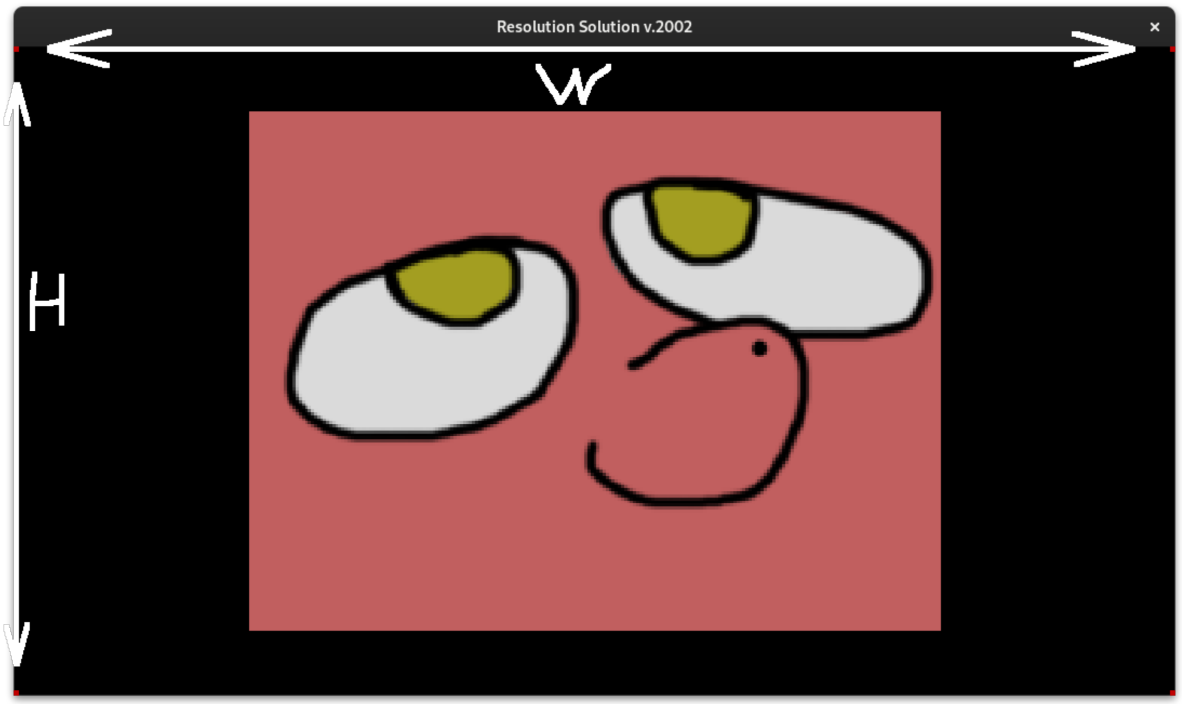
As you can see, while this library takes care about scaling your game, you still need to design and implement yourself different resolutions (If you wants/can implement this, of course). For example, that if someone would play game in 800x600 they should be able to see important parts of level (such as enemies, bosses, items, etc) same way as someone who would play with 1920x1080, or, at least, provide some ways to tell player that on that part of level that player can’t see on 640x480 resolutions is something interesting (for example, place NPC that would tell player “*hey, did you know that there something interesting lies? Go ahead and check!*”).

To change this values, use **rs.setGame()** or **rs.init()** functions instead of manually changing them.

rs.windowWidth [number], rs.windowHeight [number]

- rs.windowWidth:
  - Type: **number**.
- rs.windowHeight
  - Type: **number**.
- Default values: *will be calculated on first rs.resize() call.*

This is mostly equivalent of **love.graphics.getWidth()** and **love.graphics.getHeight()**. Library utilize this values for calculating scaling values, offsets, etc. You can use this variables instead of **love.graphics.getWidth()** and **love.graphics.getHeight()**, but it’s same things.



*W – **rs.windowWidth***
*H – **rs.windowHeight***

rs.xOff [number], rs.yOff [number]

- rs.xOff
  - Type: **number**.
- rs.yOff
  - Type: **number**.

- Default values: *will be calculated on first rs.resize() call.*

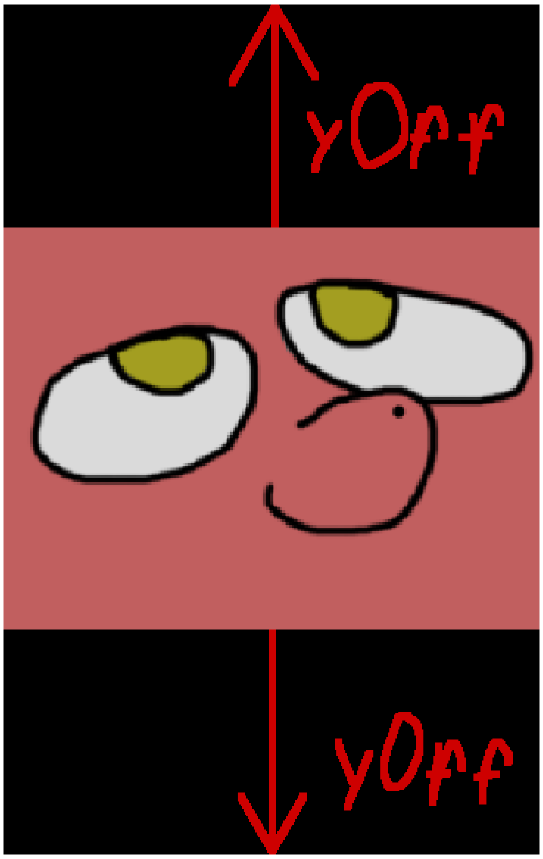
This variables represent width and height for black bars. For example, with mode 1 (Aspect Scaling) if window width **bigger** then game width, you will get 2 black bars on left and right sides. And **rs.xOff** will represent width for black bar, but keep in mind, that there will be **2** black bars, so if you *2 this value, you will get how much horizontal space on screen takes black bars. Same for **rs.yOff**.

In mode **1** (**Aspect Scaling**) there will be only 2 bars at time. If window width **bigger** then game width, then there will be bars on left and right sides. And if window height **bigger** then game height, then there will be bars on top and bottom. And unless window has same aspect as game window (when you can't see black bars at all, meaning **rs.xOff** and **rs.yOff** equal 0) then either **rs.xOff** or **rs.yOff** will be 0 and another one will be non-0.

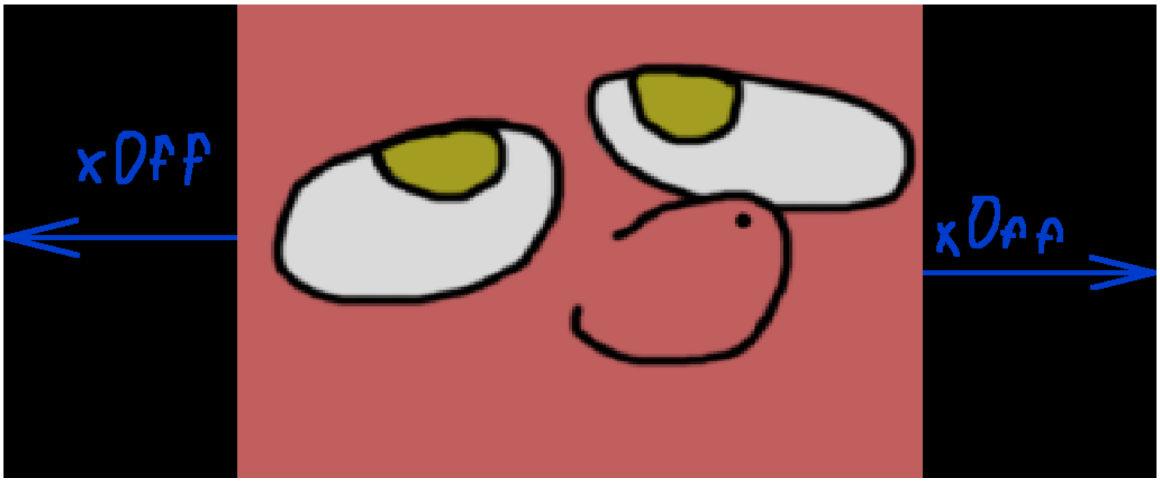
In mode **2** (**Stretch Scaling**) there no bars at all, so there **rs.xOff** and **rs.yOff** always will be **0**.

In mode **3** (**Pixel Perfect Scaling**) there will be 4 bars, so both **rs.xOff** and **rs.yOff** will be non-0 unless game window and game size (including integer scaling factor that this mode produces) same size.

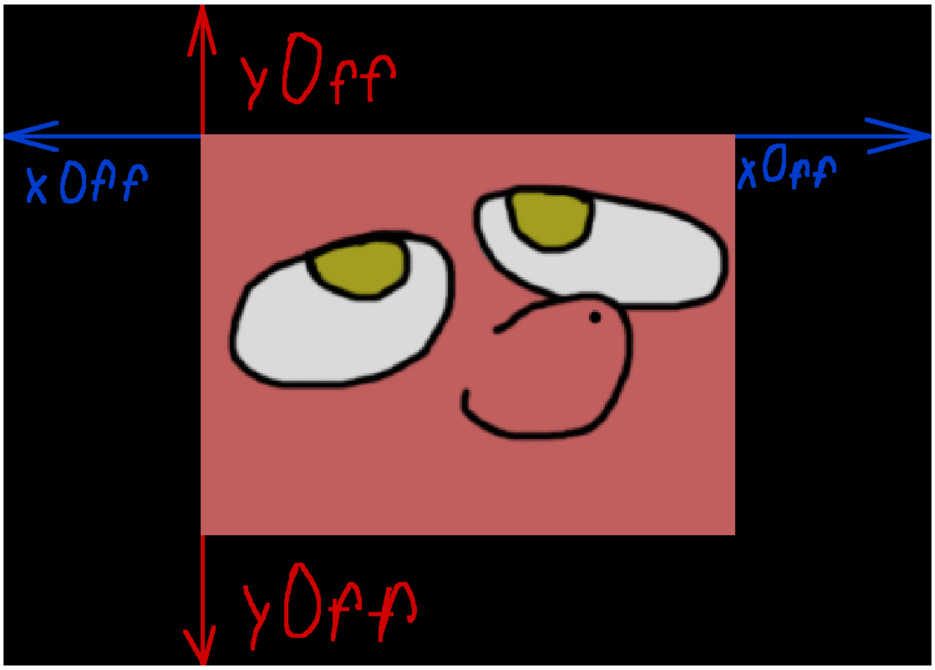
Visualization:



Aspect Scaling (1), when window height bigger then game height.
For both top and bottom bar used same rs.yOff value.



Aspect Scaling (1), when window width bigger then game width.
For both left and right bar used same rs.xOff value.



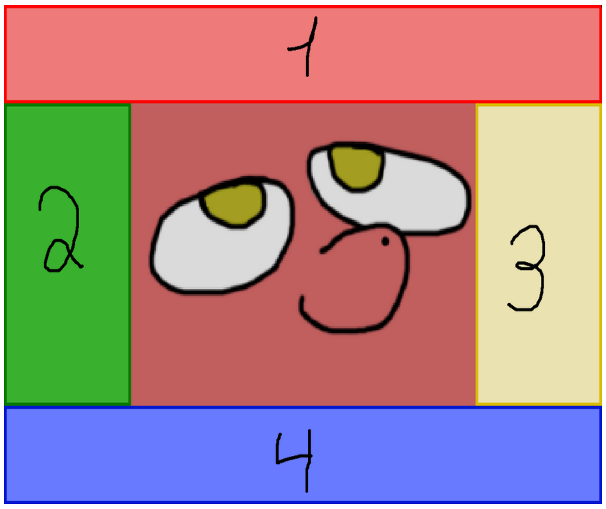
Pixel Perfect Scaling (3).
For both left and right bar used same rs.xOff value and for both top and bottom bar used same rs.yOff value.

Black Bars Coordinates [numbers]

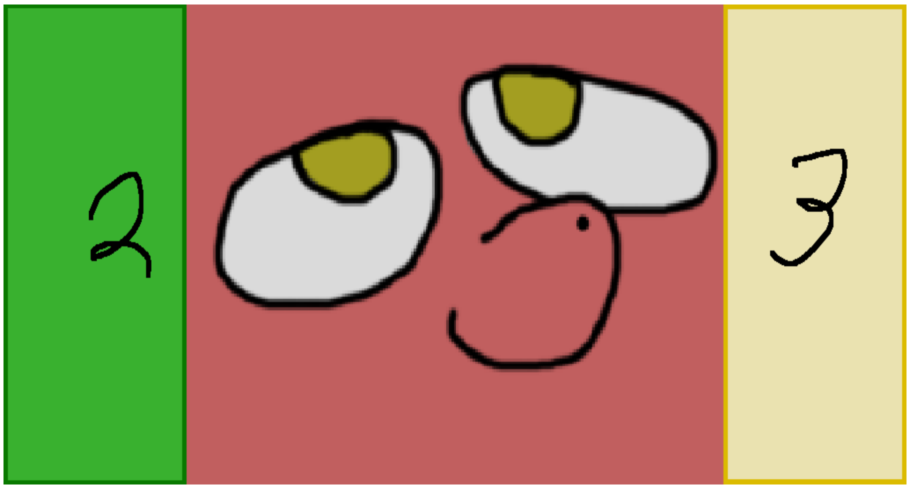
- rs.x1, rs.y1, rs.w1, rs.h1 – 1st bar
  - Types: **numbers**.
- rs.x2, rs.y2, rs.w2, rs.h2 – 2nd bar
  - Types: **numbers.**
- rs.x3, rs.y3, rs.w3, rs.h3 – 3rd bar
  - Types: **numbers.**
- rs.x4, rs.y4, rs.w4, rs.h4 – 4th bar
  - Types: **numbers.**
- Default values: *will be calculated on first rs.resize() call.*

Every black bar is simple **love.graphics.rectangle(**«fill»**)** with given coordinates, that calculated during **rs.resize()** based on current scaling mode and window size. When scale mode 2, there no bars at all.

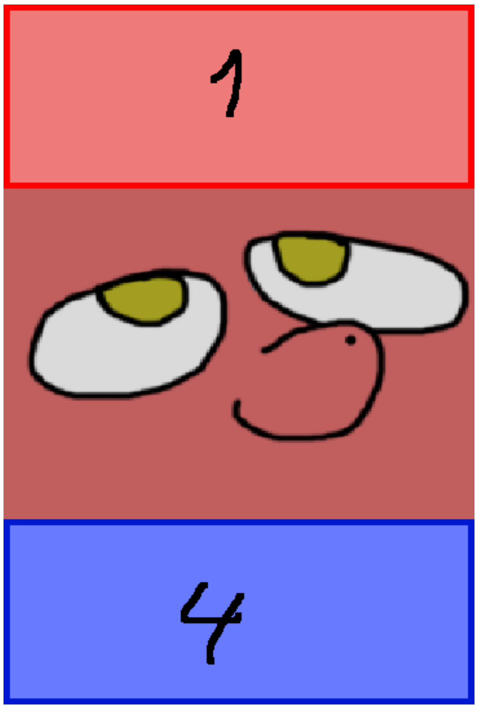
Here visualizations:



*When **rs.scaleMode** is **3***



When scale mode is 1 and window width bigger then game width.



When scale mode is 1 and window height bigger then game height.

Usually, you don’t need to use this variables, unless you doing some custom rendering for bars.

Black Bars Colors [numbers]

- **rs.r** — Red component.
    - Type: **number**.
        - from 0 to 1.
        - Default: **1**.
- **rs.g** — Green component.
    - Type: **number**.
        - From 0 to 1.
        - Default: **1**.
- **rs.b** — Blue component.
    - Type: **number**.
        - From 0 to 1.
        - Default: **1**.
- **rs.a** — Alpha channel.
    - Type: **number**.
    - From 0 to 1.
    - Default: **0**.

You can change color and alpha channel for black bars. They all use same color. To change all color variables at single call, use function **rs.setColor()** or edit each of this variable individually, like this:

```
rs.a = 1
rs.r = 0.1
rs.g = 0.4
rs.b = 0.4
```

Remember, that starting from love 11, color become 0 — 1 as number, while before they was 0 — 255.

By default, “black” bars, in fact, black and you can’t see though them.

rs.bars [boolean]

- Type: **boolean**.
- Default value: **true**.

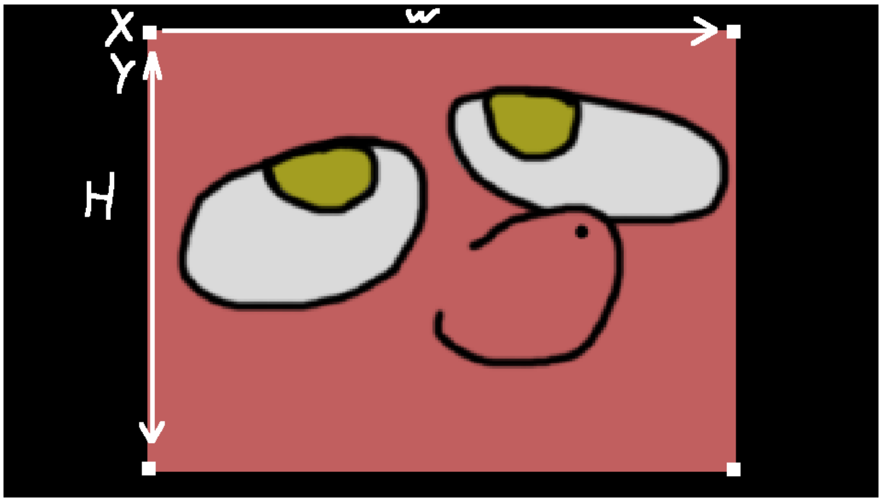
When this variable is **true**, function **rs.drawBars()** will draw bars on top, bottom, left and right sides. If **false**, bars wouldn't be draw, which might result in slight performance improvement.

It make sense to disable them if:

- You don't need them, if you use different method for hiding content outside of virtual game width and height. (For example, you draw content to canvas and then scale it with this library. In this case, you probably wouldn't need this bars at all, because content was already hidden by canvas.)
- For debug purposes. With default **rs.start()** and **rs.stop()**, content behind black bars is not removed and still there. This black bars is only mask content. So you can disable bars rendering if you need to see what happens behind this bars.

rs.gameZone [table]

- Type: **table**.
    - Table contains:
        - x — X coordinate of top-left corner of game zone.
            - Type: **number**.
        - y — Y coordinate of top-left corner of game zone.
            - Type: **number**.
        - w — width of game zone.
            - Type: **number**.
        - h — height of game zone.
            - Type: **number**.



X *and* ***Y*** *is top-left corner.*
W – width.
H – height.

This table contains coordinates for game zone – zone inside black bars, what you can see on screen.

This might be useful for some cases:

- For custom UI rendering. With **rs.gameZone** you can locate screen edges inside scaled zone.

With combination of **love.graphics.setScissor()** you can disable black bars render and rely on scissors instead (which might be result in slightly better performance).

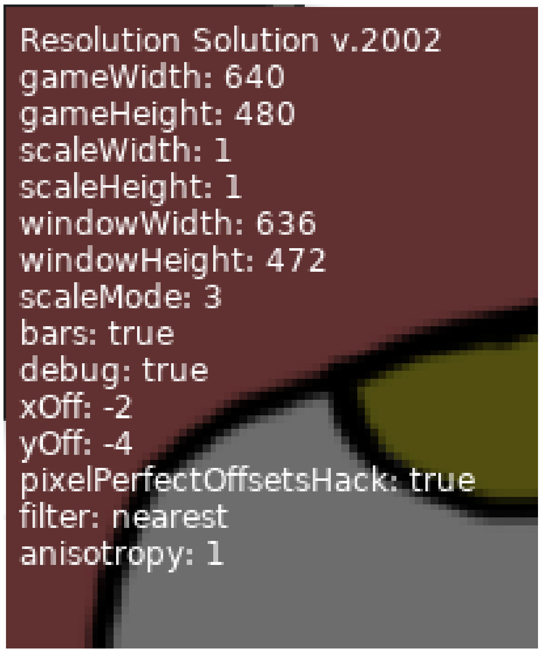
Like this:

```
love.graphics.setScissor(rs.getGameZone())
```

rs.debug [boolean]

- Type: **boolean.**
- Default value: **false**.

Related to **rs.debugFunc()**. Activates/deactivate debug window with some info about current library state, such as scale mode, offsets, library version, etc. If this value **false**, then function **rs.debugFunc()** will do nothing if you call it in **love.draw()**. If **true**, then debug window would show up.



```
Resolution Solution v.2002
gameWidth: 640
gameHeight: 480
scaleWidth: 1
scaleHeight: 1
windowWidth: 636
windowHeight: 472
scaleMode: 3
bars: true
debug: true
xOff: -2
yOff: -4
pixelPerfectOffsetsHack: true
filter: nearest
anisotropy: 1
```

This debug info includes black, transparent background so text will be more visible.

rs.pixelPerfectOffsetsHack [boolean]

- Type: **boolean**.
- Default value: **true**.

When **rs.scaleMode** == **3**, library renders game in pixel perfect way. But, sometimes, calculations might result in non-integer **xOff** and **yOff**, which is not ideal when you want pixel perfect scaling, because non-integer position would result in non-crispy sprites and sprites wouldn't be perfectly aligned. It's especially noticeable when you actively resizing game window.

When **rs.pixelPerfectOffsetsHack** == **true** and **rs.scaleMode** == **3**, during **rs.resize**, library would check if window width and height if they is even. If not, then it would add **1** to width/height to compensate. This would guaranty that **xOff** and **yOff** always will be even, but, as result, sometimes **xOff** and **yOff** will be **1** pixel off to right side.

I recommend to set **rs.pixelPerfectOffsetsHack** to **true** if pixel bleeding/misalignment is too noticeable when **rs.scaleMode** == **3** during window resizing. In any other case, set it to **false**.

Try to run demo and slowly resize game window with mouse to see if there any noticeable difference to you.

Functions

rs.init(options: table [optionally])

- Arguments:
  - options
    - Type: **table**.
    - Passing nothing, **nil** or **empty table** will update library, but no option will be changed.
- Returns: nothing.

With this function you can quickly change all library options at once. As name suggest, it’s better to use once you required library to initialize it.

Example of usage:

```
rs = require("resolution_solution")
rs.init({width = 800, height = 600, mode = 3, a = 0.5})
```

Here, we required library and initialized it with next options:

- Library will scale window content to 800x600. (width, height)
- Library will do so with pixel perfect way. (mode)
- Black bars will be draw with 50% of transparency (a).

There more options available, here complete list:

- **width**
  - Type: **number**.
  - Game width to which library will scale to. For more info look for: **rs.gameWidth**.
- **height**
  - Type: **number**.
  - Game height to which library will scale to. For more info look for: **rs.gameHeight**.
- **bars**
  - Type: **boolean**.
  - Should library draw black bars or not. For more info look for: **rs.bars**
- **debug**

    - Type: **boolean**.
    - Should game show debug info with library data or not. For more info look for: **rs.debug** and **rs.debugFunc()**.
- **mode**
    - Type: **number**.
        - Can be 1, 2 and 3.
    - How library should scale your game. For more info look for **rs.scaleMode**.
- **r**
    - Type: **number**.
        - From 0 to 1 in float.
    - Red component for black bars. For more info look for **Black Bars Colors**.
- **g**
    - Type: **number**.
        - From 0 to 1 in float.
    - Green component for black bars. For more info look for **Black Bars Colors**.
- **b**
    - Type: **number**.
        - From 0 to 1 in float.
    - Blue component for black bars. For more info look for **Black Bars Colors**.
- **a**
    - Type: **number**.
        - From 0 to 1 in float.
    - Alpha channel for black bars. For more info look for **Black Bars Colors**.
- **hack**
    - Type: **boolean**.
    - Should game use pixel perfect hack or not. For more info look for **rs.pixelPerfectOffsetsHack**.

rs.getGameZone()

- Arguments: none.
- Returns:
  1. **x**
     - Type: **number**.
     - X coordinate of top-left point of game zone.
  2. **y**
     - Type: **number**.
     - Y coordinate of top-left point of game zone.
  3. **width**
     - Type: **number**.
     - Width of game zone.
  4. **height**
     - Type**: number**.
     - Height of game zone.

Shortcut function, that would return data of game zone. If you need to get individual values, get them directly from: **rs.gameZone.x**, **rs.gameZone.y, rs.gameZone.w, rs.gameZone.h**.

For more info look for **rs.gameZone**.

Example:

```
local x, y, w, h = rs.getGameZone()
```

rs.setGame(width: number, height: number)

- Arguments:
    - width
        - Type: **number**.
    - height
        - Type: **number**.
- Returns: nothing.

Function to change rs.gameWidth and rs.gameHeight.

For more info look for **rs.gameWidth** and **rs.gameHeight**.

For advanced users:

Manually editing **rs.gameWidth** and **rs.gameHeight** not going to change game size unless you manually call **rs.resize()** afterwards.

Example:

```
rs.setGame(800, 600) -- now game would scale to 800x600
rs.setGame(1920, 1080) -- now game would be scaled to 1920x1080!
```

rs.getGame()

- Arguments: none.
- Returns:
  1. game width
     - Type: **number**.
  2. game height
     - Type: **number**.

Shortcut function, that would return both **rs.gameWidth** and **rs.gameHeight**. For more info look for **rs.gameWidth** and **rs.gameHeight**.

Example:

```
-- Basic usage.
local gameWidth, gameHeight = rs.getGame()
```

rs.setScaleMode(mode: number)

- Arguments:
  - mode: **number**.
    - Acceptable values: 1, 2, 3.
- Returns: nothing.

Look for **rs.scaleMode** for more info about scaling modes.

Reads argument that you pass to it, do sanity check, set this argument to **rs.scaleMode** and call **rs.resize()** to update library. You can pass only **1**, **2**, **3** as argument. Anything other then that will raise error.

For advanced users:

Don't manually change **rs.scaleMode** because library won't update itself once you change this variable, unless you call **rs.resize()** afterward.

Example:

```
-- Basic usage
rs = require("resolution_solution")
rs.setScaleMode(2)
```

rs.switchScaleMode(sideToSwitch: number [optional])

- Arguments:
  - sideToSwitch
    - Type: **number**.
    - Acceptable values: **1**, **-1**.
    - If argument is **nil**, then it would be same as if you passed **1**.
- Returns: nothing.

Refer to **rs.scaleMode** for more info about scaling modes.

Function to switch current **rs.scaleMode** by +1 or -1. It will also wrap around, so you can infinitely add or decrease by 1. For example, if current **rs.scaleMode** == 1, and you call **rs.switchScaleMode(**-1**)**, then **rs.scaleMode** become 3. Same if current mode is 3 and you will call **rs.switchScaleMode(**1**)** then scale mode become 1.

Examples:

```
-- Basic usage.
rs = require("resolution_solution")
rs.setScaleMode(1) -- Current scale mode is 1
rs.switchScaleMode(1) -- now mode is 2.
rs.switchScaleMode(1) -- now mode is 3.
rs.switchScaleMode(1) -- and... again 1.
rs.switchScaleMode(-1) -- back to 3.
rs.switchScaleMode(-1) -- scale mode is 2.

-------------------------------------------------------

-- Switch scale modes by pressing F4 and F5 on keyboard.
rs = require("resolution_solution")
rs.setScaleMode(1) = true -- Current scale mode is 1.

love.keypressed = function(key)
  if key == "f4" then
    rs.switchPixelHack(1) -- +1
  elseif key == "f5"
    rs.switchPixelHack(-1) -- -1
  end
end
```

rs.setMode(width: number, height: number, flags: table)

- Arguments:
  - width
    - Type: **number**.
  - height
    - Type: **number**.
  - flags
    - Type: **table**.
- Returns: nothing.

This function is wrapper for **love.window.setMode()**. Use **rs.setMode()** instead to ensure that library will update itself after calling this **love.window.setMode()**.

Wiki page for for **love.window.setMode**: https://love2d.org/wiki/love.window.setMode

For advanced users:

```
-- This wrapper function equivalent of doing this:
love.window.setMode(width, height, flags)
rs.resize()
```

Example:

```
-- Basic usage.
rs = require("resolution_solution")
rs.init({w = 800, h = 600, mode = 3}) -- We want to create game with 800x600 
resolution
-- But we also want to change window size to be same as game.
-- To achieve this, we can do...
rs.setMode(rs.gameWidth, rs.gameHeight, select(3, love.window.getMode()))
-- Done, now we initialized game with 800x600 game size and resized window to be
same as game width and height.
```

rs.switchPixelHack()

- Arguments: none.
- Returns: nothing.

Function to switch **rs.pixelPerfectOffsetsHack** state from **true** to **false** and vice versa. If you need to switch to specific state, directly change **rs.pixelPerfectOffsetsHack**. For more info look for **rs.pixelPerfectOffsetsHack.**

Examples:

```
-- Basic usage for rs.switchDebug()
rs = require("resolution_solution")
rs.pixelPerfectOffsetsHack = true -- now hack is active
rs.switchPixelHack() -- rs.pixelPerfectOffsetsHack == false
rs.switchPixelHack() -- rs.pixelPerfectOffsetsHack == true

-- Switch debug on/off by pressing F2 on keyboard.
rs = require("resolution_solution")
rs.pixelPerfectOffsetsHack = true -- now hack is active

love.keypressed = function(key)
  if key == "f2" then
    rs.switchPixelHack()
  end
end
```

rs.switchBars()

- Arguments: none.
- Returns: nothing.

Function to switch **rs.bars** state from **true** to **false** and vice versa. If you need to switch to specific state, directly change **rs.bars**. For more info look for **rs.bars**.

Examples:

```
-- Basic usage.
rs = require("resolution_solution")
rs.bars = true -- now bars will be rendered
rs.switchBars() -- rs.bars == false
rs.switchBars() -- rs.bars == true

-- Show/hide bars by pressing F3 on keyboard.
rs = require("resolution_solution")
rs. bars = true -- now bars will be rendered

love.keypressed = function(key)
  if key == "f3" then
    rs.switchBars()
  end
end
```

rs.drawBars()

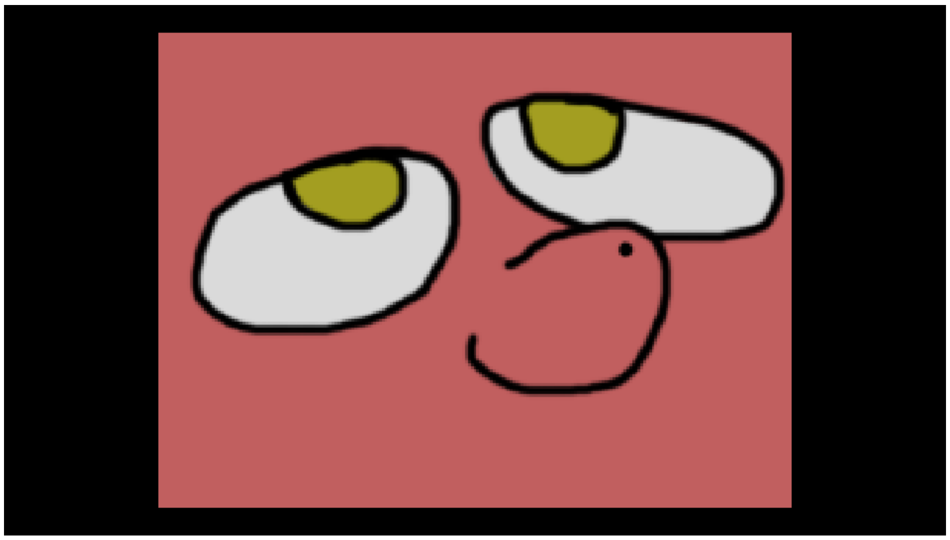
- Arguments: none.
- Returns: nothing.

This function draw black bars. Library internally uses this function during **rs.stop()** to draw black bars. You can call this function during **love.draw()** to draw black bars. This might be useful, if you use custom scaling functionality and you need to draw bars independently from **rs.start()** and **rs.stop()**.

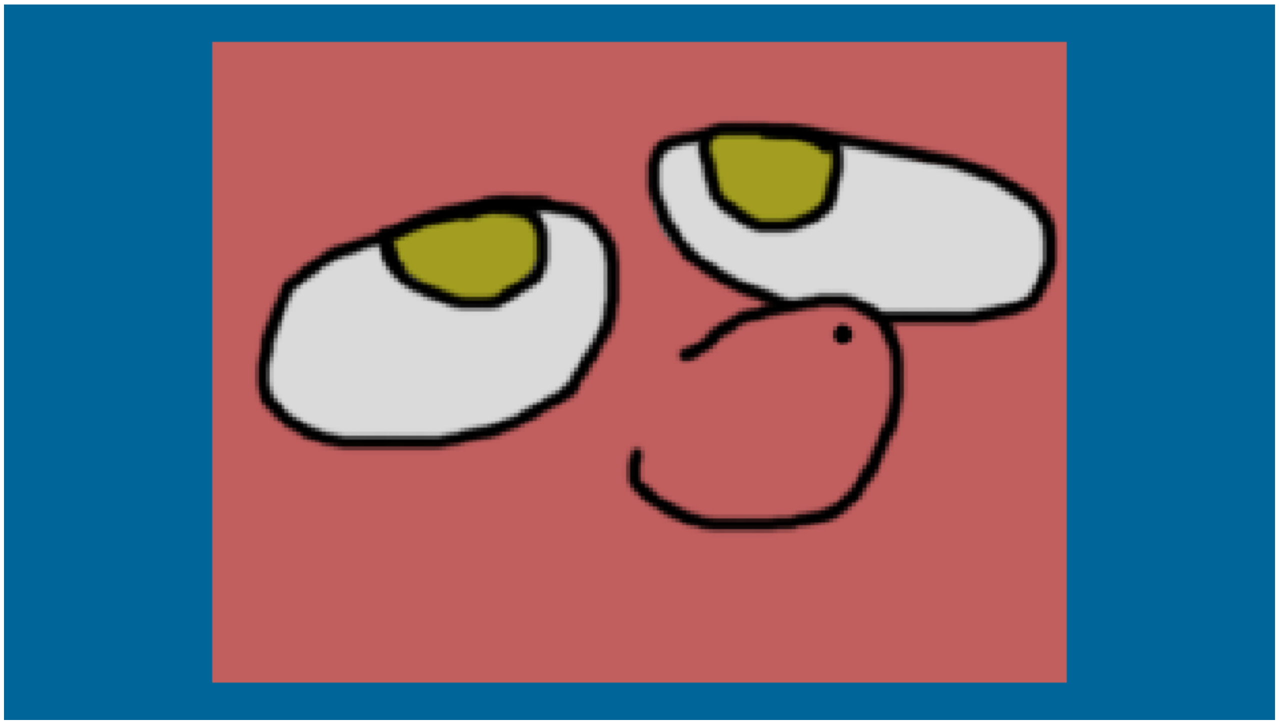
If **rs.bars == false**, then bars wouldn't be rendered at all, and if **true** then they will be rendered. To change this, you can manually change **rs.bars**, via **rs.init()**, via **rs.switchBars()** which would switch from **true** to **false** and vice versa (think about this function as shortcut for `rs.bars = not rs.bars`).

Example:

```
rs = require("resolution_solution")
rs.defaultColor() -- And set *black* bars to be black.
rs.bars = true -- And activate rendering of black bars (which is true by 
default, but this is example)

love.graphics.setBackgroundColor(0, 0.4, 0.6, 1) -- Lets set blue background

love.resize = function(w, h)
  rs.resize(w, h)
end

love.draw = function()
  rs.start()
    -- Draw something
  rs.stop()
end
```


You would see blue background and black bars. (Here we have red pony instead, but imagine that this is blue background.)

`rs.bars = false` – Now lets disable rendering for black bars.


And since we disabled rendering for black bars, we can see that background, in fact, blue!

rs.setColor(r: number, g: number, b: number, a: number)

- Arguments:
  1. **r**
     - type: **number**.
     - Can be in-between 0 – 1. Passing more then 1 and less then 0 will result in error raising.
  2. **g**
     - type: **number**.
     - Can be in-between 0 – 1. Passing more then 1 and less then 0 will result in error raising.
  3. **b**
     - type: **number**.
     - Can be in-between 0 – 1. Passing more then 1 and less then 0 will result in error raising.
  4. **a**
     - type: **number**.
     - Can be in-between 0 – 1. Passing more then 1 and less then 0 will result in error raising.
- Returns: nothing.

This function allow you quickly change all colors of *black* bars via 1 function call. If you need to change individual color component, the just change it via table fields: **rs.r, rs.g, rs.b, rs.a**. Remember, that in that case there wouldn't be any checks so you can input something more then 1 and less then 0.

Example:

```
-- Basic usage.
rs.setColor(0.4, 0.9, 1, 0.5)
```

rs.getColor()

- Arguments: none.
- Returns:
  1. **r** – Red component.
     - Type: **number**.
  2. **g** – Green component.
     - Type: **number**.
  3. **b** – Blue component.
     - Type: **number**.
  4. **a** – Alpha channel.
     - Type**: number**.

Shortcut function, that would return all colors for *black* bars. If you need to get individual color, get them directly from table fields: **rs.r**, **rs.g**, **rs.b**, **rs.a**.

Example:

```
-- Basic usage.
local r, g, b, a = rs.getColor()
```

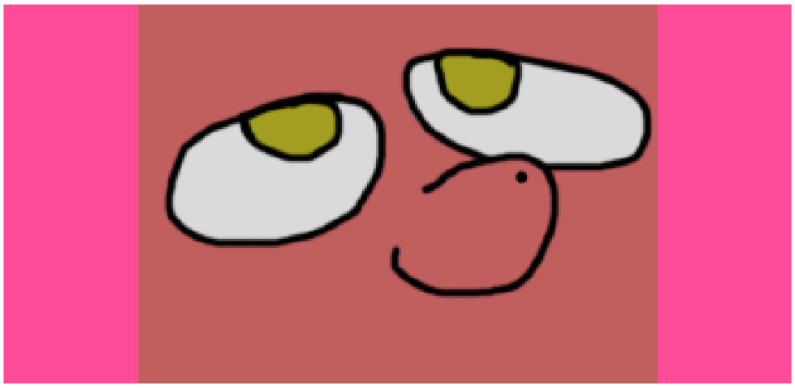
rs.defaultColor()

- Arguments: none.
- Returns: nothing.

Changes **rs.r**, **rs.g**, **rs.b**, **rs.a** to default black color. If you changed colors of *black* bars via manually editing **rs.r**, **rs.g**, **rs.b**, **rs.a** or **rs.setColor()** or **rs.init()**, and need to return back, then just call **rs.defaultColor()** and *black* bars become black.

Example:

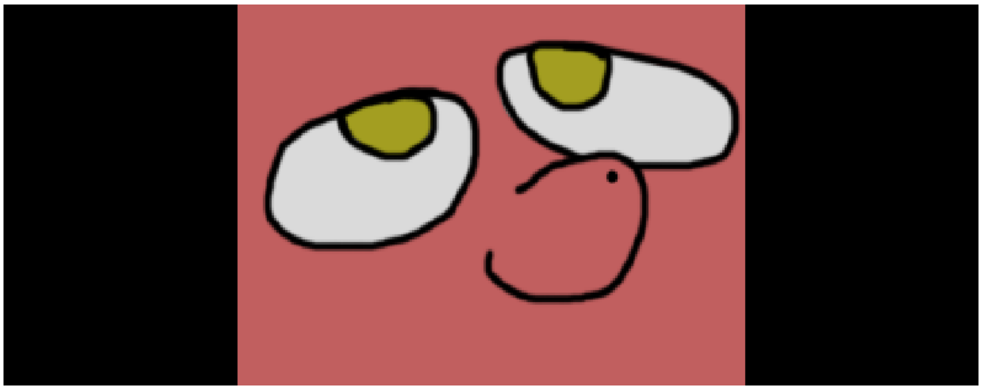
```
-- Basic usage.
rs.setColor(1, 0.3, 0.6, 1) -- we changed *black* bars to be pink bars.
```



We made pink bars!

We don't like them, so let's revert back.

```
rs.defaultColor()
```



Back to black!

rs.debugFunc(x: number [optional], y: number[optional])

- Arguments:
  1. **x**
     - type: **number**.
     - If you pass nothing or **nil**, then it will same as if you pass **0**.
  2. **y**
     - type: **number**.
     - If you pass nothing or **nil**, then it will same as if you pass **0**.
- Returns: nothing.

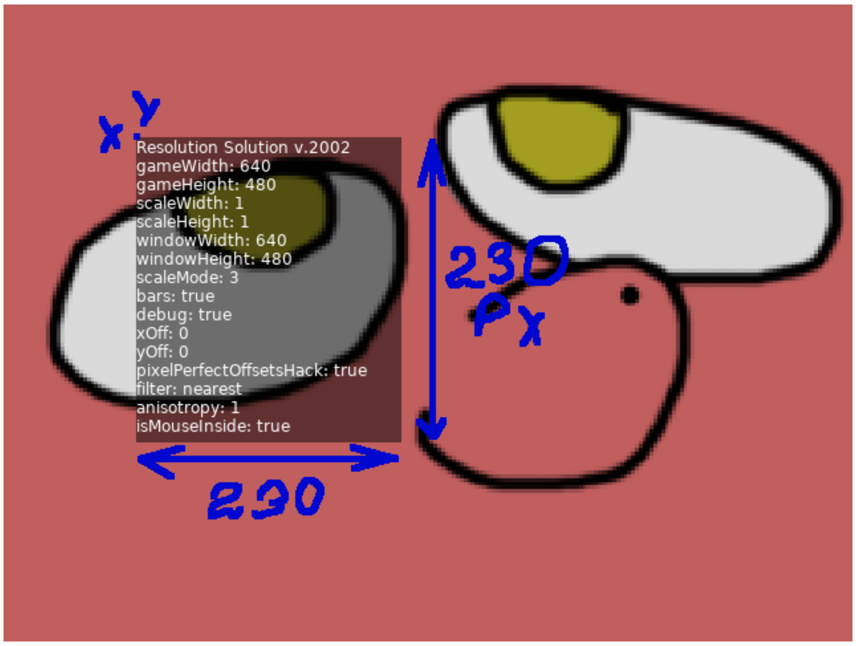
Basis debug function, that would show some info about some states of library. Can be placed somewhere on screen. Calling **rs.debugFunc()** without arguments is equivalent of calling **rs.debugFunc(**0, 0**)**, which would place debug window in top-left corner of window.

If you need more advanced debugging, you better to write own solution or use another debugging library / tool.

List of information that function shows:

- Library name
- Library version
- rs.gameWidth
- rs.gameHeight
- rs.scaleWidth
- rs.scaleHeight
- rs.windowWidth
- rs.windowHeight
- rs.scaleMode
- rs.bars
- rs.debug

- rs.pixelPerfectOffsetHack
- filtering (from love.graphics.getDefaultFilter) for both **min** and **mag**
- anisotropy (from love.graphics.getDefaultFilter)
- rs.isMouseInside



```
Resolution Solution v.2002
gameWidth: 640
gameHeight: 480
scaleWidth: 1
scaleHeight: 1
windowWidth: 640
windowHeight: 480
scaleMode: 3
bars: true
debug: true
xOff: 0
yOff: 0
pixelPerfectOffsetsHack: true
filter: nearest
anisotropy: 1
isMouseInside: true
```

Currently, size of debug window is: width 230, height 230.

Examples:

```
-- Example drawing this debug window on top-right corner in-between rs.start()
and rs.stop()
rs = require("resolution_solution")
love.graphics.setBackgroundColor(1, 0.3, 0.6, 1)
rs.init({w = 200, h = 200})
rs.setMode(640, 480, {resizable = true})

love.resize = function(w, h)
  rs.resize(w, h)
end

love.draw = function()
  rs.start()
    rs.debugFunc(rs.gameWidth - 230)
  rs.stop()
end
```

```lua
-- Example drawing this debug window on bottom-right corner outside rs.start() 
and rs.stop()
rs = require("resolution_solution")
love.graphics.setBackgroundColor(1, 0.3, 0.6, 1)
rs.init({w = 200, h = 200})
rs.setMode(640, 480, {resizable = true})

love.resize = function(w, h)
  rs.resize(w, h)
end

love.draw = function()
  rs.start()
  rs.stop()
  
  rs.debugFunc(rs.windowWidth - 230, rs.windowHeight - 230)
end
```

rs.switchDebug()

- Arguments: none.
- Returns: nothing.

Function to switch **rs.debug** state from **true** to **false** and vice versa. If you need to switch to specific state, directly change **rs.debug**. For more info look for **rs.debug** and **rs.debugFunc()**.

Examples:

```
-- Basic usage for rs.switchDebug()
rs = require("resolution_solution")
rs.debug = true -- now debug will be shown
rs.switchDebug() -- rs.debug == false
rs.switchDebug() -- rs.debug == true
```

```
-- Switch debug on/off by pressing F1 on keyboard.
rs = require("resolution_solution")
rs.debug = true -- now debug will be shown

love.keypressed = function(key)
  if key == "f1" then
    rs.switchDebug()
  end
end
```

rs.nearestFilter(filter: boolean [optional], anisotropy: number [optional])

- Arguments:
  - filter
    - Type: **boolean**.
      - **true**, filtering would be set to “**nearest**” (for both **min** and **max** values).
      - **false**, filtering would be set to “**linear**” (for both **min** and **max** values).
    - Note: you can pass nothing or **nil** which would result in same result as passing **true**.
  - anisotropy
    - Type: **number**.
      - Set this number (if you need to) according to this: https://love2d.org/wiki/love.graphics.setDefaultFilter
    - Note: you can pass nothing or **nil** (which is same thing), which means library will take anisotropy value from **love.graphics.getDefaultFilter()** and pass it.
- Returns: nothing.

This function used to quickly set default filtering to **“nearest”**, which is go-to for Pixel Art. Simple call **rs.nearestFilter()** after you initialized library to set default filtering to **“nearest”**.

This library is mostly wrapper for https://love2d.org/wiki/love.graphics.setDefaultFilter, so learn about it before touching this function. This library exists simple because I (author of this library) associates filtering method with scaling (because this filtering all about scaling, duh!) so I prefer to set it in same place as this library in games code.

Example:

```
-- Basic example.
rs = require("resolution_solution")
rs.nearestFilter() -- Now game will look crispy!
rs.init({w = 800, h = 600})
```

rs.resize(w: int [optional], h: int [optinal])

- Arguments:
  1. **w**
     - Type: **number**.
     - If argument will be nothing or **nil**, then library will itself get window width via **love.graphics.getWidth()**
  2. **h**
     - Type: **number**.
     - If argument will be nothing or **nil**, then library will itself get window **height** via **love.graphics.getHeight()**.
- Returns: nothing

Function that update library. In normal circumstances, you need to place it inside **love.resize(**w, h**)** function, pass it’s arguments and never touch again.

Example:

```
-- Basic usage.
rs = require("resolution_solution")

love.resize = function(w, h)
  rs.resize(w, h)
end
```

For advanced users:

In fact, you can call this function inside **love.update()** which would be almost same result, but with some differences:

1. After manual editing some variables, such as **rs.scaleMode**, you don’t required to call **rs.resize()** after that, because library will update itself on next **love.update()** call.
2. **rs.resizeCallback()** become pretty much useless, because you can do your things related to library, inside **love.update()** immediately after **rs.resize()**.
3. This method will be more CPU consuming and would generate more garbage per frame that lua will be required to collect at some point, because it will be updated 60 times per second (or more, if you set so) instead of updating only when need to.

4. You can pretty much ditch all “helper” and “wrapper” functions, such as **rs.setScaleMode()** or **rs.setGame()**, because reasons explained in 1st point.

Backstage fact: this library, before update v2000, actually was designed like that. Instead of placing **rs.resize()** inside **love.resize()**, there was **rs.update()** function, that you was supposed to place inside, well, you guessed it, **love.update()**. It was also partially possible to place **rs.update()** inside **love.resize()**, but since library wasn’t designed in that way, most of library function become malfunctioned. And because library was updating every frame, there was almost no helper/wrapper functions, since you was supposed to directly change variables. In modern version, there still leftovers of this behavior, for example, colors for “black” bars. You can use **rs.setColor()** or just directly change colors like **rs.r** = 0.6 without calling **rs.resize()** afterward.

Reason to change design of library was simple: it was consuming far more CPU and memory resources, then it really needs to.

rs.resizeCallback()

- Arguments: none.
- Returns: nothing.

Simple function, that will be called every time, when **rs.resize()** is called. Note, that **rs.resizeCallback()** will be called ***after*** **rs.resize()** would finish updating library.

This function can be useful, if you need to hook into library and, for example, update UI. To do so, you need to replace **rs.resizeCallback()** and fill it with something that you need.

Note: once you setup this function, you might want to immediately call itself to calculate data that depended on it.

Example:

```
-- Basic usage.
rs = require("resolution_solution")
love.resize = function(w, h)
  rs.resize(w, h)
end

rs.resizeCallback = function()
  print("Resolution Solution was updated!")
  -- Update some data.
end
rs.resizeCallback() -- to process data.
```

rs.start()

- Arguments: none.
- Returns: nothing.

Function that would actually start scaling your game. Don’t forget to check **rs.stop()**.

Example:

```
-- Basic usage.
rs = require("resolution_solution")

love.resize = function(w, h)
  rs.resize(w, h)
end

love.draw = function()
  rs.start()
    -- draw here something that you want to be affected by scaling
  rs.stop()
end
```

*Important note: **rs.start()** and **rs.stop()** relies on love.graphics.push() and love.graphics.pop(). This might cause conflict with other libraries, that also relies on **push** and **pop** functions, due to fact, that they will cancel each other. Most notable example is camera libraries. Lets dive deep:*

```
rs = require("resolution_solution")
camera_library = ("generic_camera_library")

-- most camera libraries initializes like this:
local camera = camera_library.new(0, 0, 2000, 2000) – usually, here you specify 
boundaries that camera cannot pass through 

love.update = function(dt)
  camera:update() -- usually cameras updated like that.
end

love.resize = function(w, h)
  rs.resize(w, h)
end

-- And here important point
love.draw = function()
  rs.start()
    camera:start()
      -- draw something that supposed to be subject of camera
    camera:stop()
  rs.stop()
end
```

And… this will fail. What **rs.start()** do is:

```
love.graphics.pop()
love.graphics.origin()
-- other translations that irrelevant to example.
```

And camera libraries to pretty much same thing with **camera:start()**:

```
love.graphics.pop()
love.graphics.origin()
-- other transformations that irrelevant here.
```

If you remember what **love.graphics.push()-pop()** combo do...
https://love2d.org/wiki/love.graphics.pop and https://love2d.org/wiki/love.graphics.push

...They will restore transformations to default inside push-pop combo. So all scale and offset transformations done by **rs.start()** will be gone once **camera:start()** will be called.

There exist way to workaround this. Canvas! (https://love2d.org/wiki/Canvas)

Idea here is to draw everything that camera wants to canvas and then scale this canvas in **rs.start()** and **stop()**. There tons ways to achieve this, but let's make simple example:

```
rs = require("resolution_solution")
camera_library = ("generic_camera_library")

local camera = camera_library.new(0, 0, 2000, 2000)

love.update = function(dt)
  camera:update() -- usually cameras updated like that.
end

love.resize = function(w, h)
  rs.resize(w, h)
end

local test_canvas = love.graphics.newCanvas(rs.gameWidth, rs.gameHeight)

love.draw = function()
  camera:start()
  -- Select our canvas that will be affected by camera.
    love.graphics.setCanvas(test_canvas)
  -- Clear canvas from what was there in last frame
    love.graphics.clear(0, 0, 0, 0)
  -- Draw something that we want to be affected by camera.

  -- Once we done, deselect canvas.
  love.graphics.setCanvas()
  -- And detach camera, since we don’t need it anymore.
  cam:detach()
  -- Start scaling
  rs.start()
 -- And then simple draw that canvas!
  love.graphics.draw(test_canvas)

  -- Draw everything else that should be affected by scaling library, but not by
camera!
  rs.stop()
end
```

rs.stop()

- Arguments: none.
- Returns: nothing.

Function that closes **rs.start()**. For more info look for **rs.start()**.

Example:

```
-- Basic usage.
rs = require("resolution_solution")

love.resize = function(w, h)
  rs.resize(w, h)
end

love.draw = function()
  rs.start()
    -- draw here something that you want to be affected by scaling
  rs.stop()
end
```

rs.unscaleStart()

- Arguments: none.
- Returns: nothing.

Function to draw something that shouldn’t be scaled by library, like UI.

Note: this function is pretty much wrapper for **love.graphics.push()** and literally consistent from 2 functions:

```
  -- Start unscaling.
  love.graphics.push()

  -- Reset transformation and scaling.
  love.graphics.origin()
```

Example:

```
-- Basic usage:
local rs = require("resolution_solution")
rs.init({width = 640, height = 480, mode = 1})
rs.setMode(rs.gameWidth, rs.gameHeight, {resizable = true})
love.graphics.setBackgroundColor(0, 0.4, 0.6, 1)

love.resize = function(w, h)
  rs.resize(w, h)
end

love.draw = function()
  rs.start()
        rs.unscaleStart()
          love.graphics.print("Hello! I'm unscaled!")
        rs.unscaleStop()
  rs.stop()
end


-- Advanced usage.
-- Example how you can implement custom scaling for UI, that will ensure that UI
elements will stay crispy with any window and game size.
local rs = require("resolution_solution")
rs.init({width = 640, height = 480, mode = 1})
rs.setMode(rs.gameWidth, rs.gameHeight, {resizable = true})
rs.nearestFilter(true)
love.graphics.setBackgroundColor(0, 0.4, 0.6, 1)

-- Change scale mode via f1 key.
love.keypressed = function(key, scancode, isrepeat)
```

```lua
  if key == "f1" then
    rs.switchScaleMode()
  end
end

local font
local rectangle = {}

love.resize = function(w, h)
  rs.resize(w, h)
end

rs.resizeCallback = function()
  font = love.graphics.newFont(math.min(rs.gameZone.w * 0.04, rs.gameZone.h * 
0.04))
  rectangle[1] = rs.gameZone.x + rs.gameZone.w / 2
  rectangle[2] = rs.gameZone.y + rs.gameZone.h / 2
  rectangle[3] = math.min(rs.gameZone.w * 0.15, rs.gameZone.h * 0.15)
  rectangle[4] = math.min(rs.gameZone.w * 0.05, rs.gameZone.h * 0.05)
end
rs.resizeCallback()

love.draw = function()
  rs.start()
        rs.unscaleStart()
          love.graphics.setFont(font)
          love.graphics.print("Hello!", rs.gameZone.x + rs.gameZone.w / 2, 
rs.gameZone.y + rs.gameZone.h / 2)
          love.graphics.rectangle("line", unpack(rectangle))
        rs.unscaleStop()
  rs.stop()
end
```

rs.unscaleStop()

- Arguments: none.
- Returns: nothing.

Function to close **rs.unscaleStart()**. For more info look for **rs.unscaleStart()**.

Note: this function is pretty much wrapper for **love.graphics.pop()** and literally consistent from 1 function:

```
-- Stop unscaling.
love.graphics.pop()
```

rs.getScale()

- Arguments: none.
- Returns:
  1. **x scale**
     - Type: **number**.
  2. **y scale**
     - Type: **number**.

Shortcut function, that would return both **rs.scaleWidth** and **rs.scaleHeight**.

Example:

```
-- Basic usage.
local xScale, yScale = rs.getScale()
```

rs.getWindow()

- Arguments: none.
- Returns:
  1. window width
     - Type: **number**.
  2. window height
     - Type: **number**.

Shortcut function, that would return both **rs.windowWidth** and **rs.windowHeight**. For more info look for **rs.windowWidth** and **rs.windowHeight**.

You can also use **love.graphics.getDimensions()** instead or **love.graphics.getWidth()** and **love.graphics.getHeight()**.

Example:

```
local windowWidth, windowHeight = rs.getWindow()
```

rs.isMouseInside()

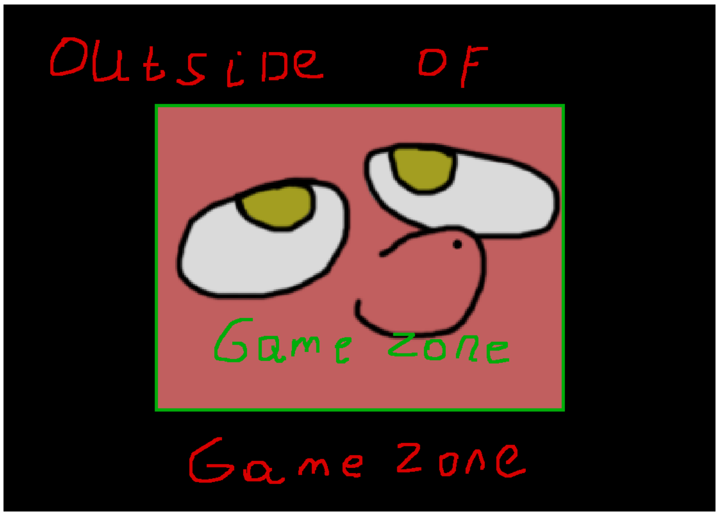
- Arguments: none.
- Returns:

  1. is mouse inside game zone

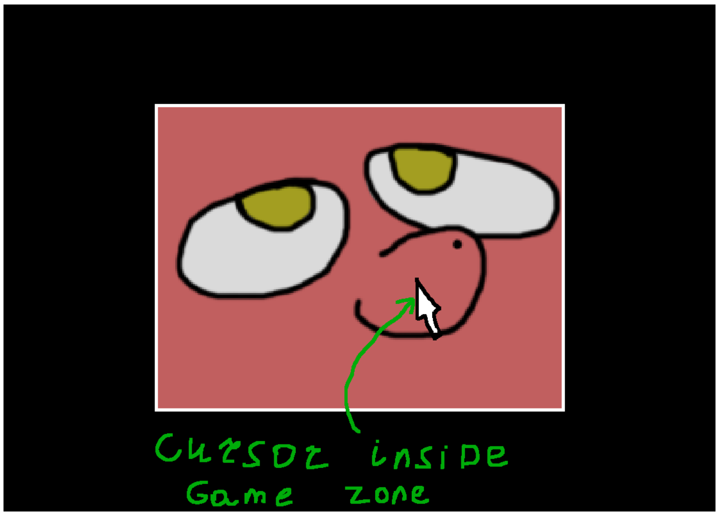
     - Type: **boolean**.
     - Returns **true** if cursor **inside** game zone.
     - Returns **false** if cursor **outside** of game zone.

Function to determine if cursor inside game zone (for more info about look for **rs.gameZone**). You might need it, if you develop game with support of mouse/touchscreen, because you, usually, don’t want to trigger buttons (or any other similar element that you can interact with via cursor) if they behind black bars.

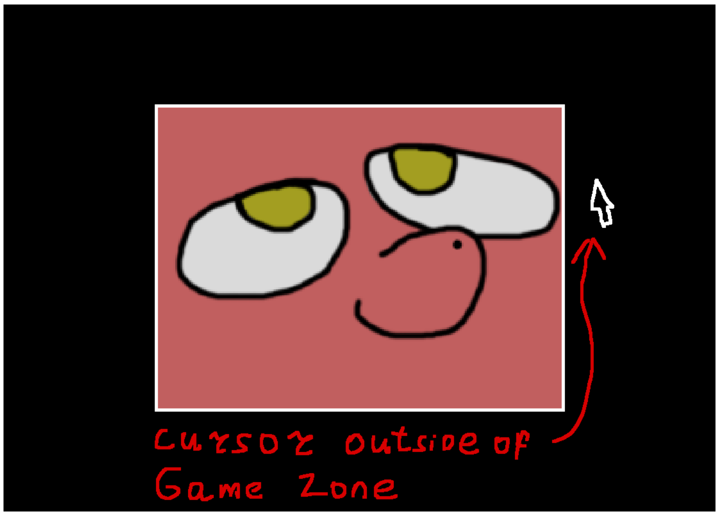
Here quick visualization:



Quick reminder what considered “game zone” and what “outside of game zone”.



Cursor inside game zone, so ***rs.isMouseInside()*** *will return* ***true****.*



Cursor outside of game zone, so ***rs.isMouseInside()*** *will return* ***false****.*

This especially useful, if you develop game with scrolling/camera, like Real-Time Strategies, because you might move camera in that way, that hit-box of units will be behind where black bars and you don't want game to pick this unit, since user cannot see them!

When scale mode == 2 (Stretch Scaling), then this function will always return **true**, because there no black bars at all.

This function relies **on love.mouse.getPosition()** (https://love2d.org/wiki/love.mouse.getPosition) to work. It might not be very suitable for touchscreen, so you can re-implement this function using **rs.loveGameZone**:

```
-- If we in Stretch Scaling mode (2), then there is no bars, so mouse always 
"inside".
  if rs.scaleMode == 2 then
    -- because there no bars in stretch scaling!
    return true
  end

  -- Get 1 touch.
  local touchX, touchY = love.touch.getPosition(love.touch.getTouches()[1])
  local x, y, w, h = rs.getGameZone()

  -- Check if cursor inside game zone.
  if touchX    >= x                 and -- left
     touchY    >= y                 and -- top
     touchX    <= x + w             and -- right
     touchY    <= y + h            then -- bottom
      -- Cursor inside game zone.
     return true
  end

  -- Cursor outside game zone.
  return false
```

It should be possible to implement several touches with this, but this is out of my (as author) or library scope. **rs.isMouseInside()** was designed for desktop platforms with mouse/cursor in mind, so it might not be fully suitable for touchscreen (at least, for complex scenarios with several touches that do several things or gestures) without additional changes from your side. Feel free to send pull request on library’s github page, if you feel such feature should exist and you can implement this.

Example:

```
-- Example if implementing rs.isMouseInside() for touchscreen.
rs = require("resolution_solution")
rs.init({w = 640, h = 480})
rs.setMode(640, 480, {resizable = true})

love.graphics.setBackgroundColor(0.7, 0.7, 0.7)

love.resize = function(w, h)
  rs.resize(w, h)
end

love.draw = function()
  rs.start()
    if rs.isMouseInside() then
      love.graphics.setColor(0, 1, 0, 1)
      love.graphics.print("Mouse inside of game zone!", rs.gameWidth / 2, 
rs.gameHeight / 2)
    elseif not rs.isMouseInside() then
      love.graphics.setColor(1, 0, 0, 1)
      love.graphics.print("Mouse outside of game zone!", rs.gameWidth / 2, 
rs.gameHeight / 2)
    end
  rs.stop()
end
```

rs.getWindow()

- Arguments: none.
- Returns:
  1. Window Width
     - Type: **number**.
  2. Window Height
     - Type: **number**.

Shortcut function, that would return both **rs.windowWidth** and **rs.windowHeight**. For more info look for **rs.windowWidth** and **rs.windowHeight**.

You can also use **love.graphics.getDimensions()** instead or **love.graphics.getWidth()** and **love.graphics.getHeight()**.

Example:

```
-- Basic usage.
local windowWidth, windowHeight = rs.getWindow()
```

rs.toGame(x: number, y: number)

Arguments:

1. **x**
   - Type: **number**.
2. **y**
   - Type: **number**.

Returns:

1. scaled to game **X**
   - Type: **number**.
2. Scaled to game **Y**
   - Type: **number**.

Function to translate coordinates from window to game game zone. This can be used to translate cursor coordinates so you can check collision of object inside game zone.

If you gonna implement cursor support in your game, then you also might want to look for **rs.isMouseInside()** to check if mouse even inside game zone.

Example:

```
-- Basic example.
-- Change size of window and try to touch red rectangle with your cursor!
-- It will become green if it detects you touching it.
local rs = require("resolution_solution")
rs.init({width = 640, height = 480, mode = 1})
rs.setMode(rs.gameWidth, rs.gameHeight, {resizable = true})
love.graphics.setBackgroundColor(0, 0.4, 0.6, 1)

local isTouching = false
local rectangle = {x = 200, y = 200, w = 100, h = 100}

love.resize = function(w, h)
  rs.resize(w, h)
end

love.update = function(dt)
  -- Get cursor position.
  local mx, my = love.mouse.getPosition()

  -- Translate it to game.
  mx, my = rs.toGame(mx, my)

  -- Check if cursor inside game zone and touches rectangle.
    if rs.isMouseInside() then
      if mx    >= rectangle.x                   and -- left
         my    >= rectangle.y                   and -- top
         mx    <= rectangle.x         +    rectangle.w  and -- right
         my    <= rectangle.y         +    rectangle.h  then -- bottom
        isTouching = true
      else
        isTouching = false
      end
    end

end

love.draw = function()
  rs.start()
    if isTouching then
      -- Green color, means that we touch rectangle.
      love.graphics.setColor(0, 1, 0, 1)
    else
      -- Red color, means that we don't touch rectangle.
      love.graphics.setColor(1, 0, 0, 1)
    end

    love.graphics.rectangle("line", rectangle.x, rectangle.y, rectangle.w, 
rectangle.h)
  rs.stop()
end
```

rs.toGameX(x: number)

Arguments:

1. **x**
   - Type: **number**.

Returns:

1. scaled to game X
   - Type: **number**.

Same as **rs.toGame()**, but accepts only **X** and return only **X**.

Example:

```
-- Basic usage.
gameX = rs.toGameX(screenX)
```

rs.toGameY(y: number)

Arguments:

2. **y**
   - Type: **number**.

Returns:

1. scaled to game Y
   - Type: **number**.

Same as **rs.toGame()**, but accepts only **Y** and return only **Y**.

Example:

```
-- Basic usage.
gameY = rs.toGameY(screenY)
```

rs.toScreen(x: number, y: number)

Arguments:

1. **x**
   - Type: **number**.
2. **y**
   - Type: **number**.

Returns:

1. scaled from game **X**
   - Type: **number**.
2. Scaled from game **Y**
   - Type: **number**.

Function similar to **rs.toGame()** but reversed: it translated coordinates **from** game zone **to** window. For example, if you want to teleport cursor on object that inside game zone.

If you gonna implement cursor support in your game, then you also might want to look for **rs.isMouseInside()** to check if mouse even inside game zone.

Example:

```lua
-- Basic example.
-- Press left button of mouse to teleport cursor to center or rectangle
-- that you can see on window.
-- Note: might not work if you use Linux with Wayland.
local rs = require("resolution_solution")
rs.init({width = 640, height = 480, mode = 1})
rs.setMode(rs.gameWidth, rs.gameHeight, {resizable = true})
love.graphics.setBackgroundColor(0, 0.4, 0.6, 1)

love.resize = function(w, h)
  rs.resize(w, h)
end

love.mousepressed = function(x, y, button)
   if button == 1 then
      love.mouse.setPosition(
        rs.toScreen(
          (rs.gameWidth / 2), -- Translate X.
          (rs.gameHeight / 2) -- Translate y.
          )
        )
   end
end


love.draw = function()
  rs.start()
    -- Place 100x100 rectangle in center of game zone.
    love.graphics.rectangle("line", (rs.gameWidth / 2) - 50, (rs.gameHeight / 2)
- 50, 100, 100)
    love.graphics.rectangle("line", (rs.gameWidth / 2) - 4, (rs.gameHeight / 2)
- 4, 4, 4)
  rs.stop()
end
```

rs.toScreenX(x: number)

Arguments:

1. **x**
   - Type: **number**.

Returns:

1. scaled from game X
   - Type: **number**.

Same as **rs.toScreen()**, but accepts only **X** and return only **X**.

Example:

```
-- Basic usage.
screenX = rs.toScreenX(gameX)
```

rs.toScreenY(y: number)

Arguments:

1. **y**
    - Type: **number**.

Returns:

1. scaled from game Y
    - Type: **number**.

Same as **rs.toScreen()**, but accepts only **Y** and return only **Y**.

Example:

```
-- Basic usage.
screenY = rs.toScreenY(gameY)
```

Tips and Tricks

How to scissor game content to hide something outside?

love.graphics.setScissor(rs.getGameZone())

How to get resolution of screen on which window is placed currently?

```
width, height = love.window.getDesktopDimensions(
select(3, love.window.getMode()).display)
```

Good example of formulas for scaling UI in custom way!

```
-- Example of scaling rectangles.
rectangle = {
               x = rs.gameZone.x,
               y = rs.gameZone.y,
               w = math.min(rs.gameZone.w * 0.04, rs.gameZone.h * 0.04),
               h = math.min(rs.gameZone.w * 0.05, rs.gameZone.h * 0.05)
             }
-- Rectangle that placed on top-left and will take 4% of game zone by width and
5% by height

-- Font
font = love.graphics.newFont(math.min(rs.gameZone.w * 0.04, rs.gameZone.h *
0.04))
-- But be careful with fonts scaling. Very big size for fonts might be very
-- resource consuming (memory usage, CPU usage for resizing fonts, GPU resources
to render font on screen, etc).
--
--
--
```

Demo

```lua
rs = require("resolution_solution")
-- Refer ro source code of library, for rs.init() to get full list of avaliable options or their explanation.
-- but in most cases you only need to specify game width/height and default scale mode.
rs.init({width = 640, height = 480, mode = 3})
-- This function allow you to change color of bars that you will appear in aspect and pixel perfect modes.
-- By default, they will have black color, but you can change it and even make transparent.
-- To change individual color, use rs.r, rs.g, rs.b, rs.a for red, green, blue and alpha.
-- Also rs.getColor() will return 4 arguments with currect colors and rs.defaultColor() will return default black color.
rs.setColor(0.1, 0.5, 0.2, 0.5)

-- Filter, works best for pixeleted raphics.
-- can be use without arguments, which same as "true".
-- It's simple wrapper for love.graphics.setDefaultFilter().
-- Refer source code for more info.
rs.nearestFilter(true)

-- Make window resizeable. I strongly suggest you to always make window resiable, via this love function or conf.lua
-- After all, this library was designed for this.
rs.setMode(800, 600, {resizable = true})
-- Show library name and version in title.
love.window.setTitle(tostring(rs._NAME .. " v." .. rs._VERSION))

-- Example rectangle, that demonstrate how you can implement, for example, mouse collision detection,
-- and other translate functions.
local rectangle1 = {
  x = 100,
  y = 100,
  w = 100,
  h = 100,
  click = 0
}

-- Show/hide rectangle around scaled area.
local showGameZone = true

-- library was designed to update at love.resize() (it possible to update at love.update(), but it's not something that you want to do),
-- so place it there. Also, side not: never forget to use rs.init() (even if you don't need to change any settings) at least 1 at start of game/scene.
-- This is required since until 1st window resize, library will be not updated, so no scale, no offset, nothing will be calculated.
love.resize = function(w, h)
  rs.resize(w, h)
end

-- Change options with keyborad
love.keypressed = function(key, scancode, isrepeat)
  if key == "f1" then
    rs.switchScaleMode()
  elseif key == "f2" then
      rs.switchBars()
  elseif key == "f3" then
```

```lua
      rs.switchDebug()
  elseif key == "f4" then
      showGameZone = not showGameZone
  elseif key == "f5" then
      rs.switchPixelHack()
  end
end

-- Example of how you can implement mouse collision detection function.
local mouseFunc = function(x, y, w, h)

  -- Translate mouse to ingame coordinates
  local mx, my = rs.toGame(love.mouse.getPosition())
  if mx  >= x                 and -- left
     my    >= y                 and -- top
     mx    <= x         +    w  and -- right
     my    <= y         +    h  then -- bottom
     return true
    end

    return false
end

love.mousepressed = function(x, y, button, istouch, presses)

    -- Example of usage for mouse collision.
    -- Add 1 to counter if clicked.
    if rs.isMouseInside() and mouseFunc(rectangle1.x, rectangle1.y, rectangle1.w, rectangle1.h) and button == 1
then
      rectangle1.click = rectangle1.click + 1
    end

    -- Example of how to use and transka scaled coordinates to screen coordinates.
    -- Set mouse cursor to rectangle.
    if button == 2 then
      love.mouse.setPosition(rs.toScreenX(rectangle1.x), rs.toScreenY(rectangle1.y))
    end

    -- Another translation example.
    -- Move rectangle to cursor.
    if button == 3 then
      rectangle1.x, rectangle1.y = rs.toGame(love.mouse.getPosition())
    end
end

love.draw = function()
  -- Start scaling
  rs.start()
  -- Background color.
    love.graphics.setBackgroundColor(0, 0.4, 0.6, 1)

    -- Change rectangle color if we touch it.
    if rs.isMouseInside() and mouseFunc(rectangle1.x, rectangle1.y, rectangle1.w, rectangle1.h) then
      love.graphics.setColor(1, 0.5, 0.5, 1)
    else
        love.graphics.setColor(0.5, 0.5, 0.5, 1)
    end
    -- Draw rectangle.
    love.graphics.rectangle("fill", rectangle1.x, rectangle1.y, rectangle1.w, rectangle1.h)

    -- Show counter and explanation.
    love.graphics.setColor(0, 0, 0, 1)
    love.graphics.print("Click on me!" .. tostring(rectangle1.click) ..  "\nYou can't click on me, if i behind\
nbars, because library\ncan take care of it!", rectangle1.x, rectangle1.y)

    -- Scaled text.
    love.graphics.print("I'm scaled text!", 200, 50)

    -- Example of how you can implement UI that should be scaled separately/differently from game.
    rs.unscaleStart()
      love.graphics.setColor(1, 1, 1, 1)
      love.graphics.print("I'm unscaled, despite being in-between rs.start() and rs.stop()!\nAlso bars draws ontop
of me!", 180, 50)
    rs.unscaleStop()

  -- Stop scaling.
  rs.stop()

  -- Bars text.
  love.graphics.setColor(1, 1, 1, 1)
  love.graphics.print("Bars can be any color you want! Not only black!", rs.windowWidth - 200, 0)

  love.graphics.setColor(0, 0, 0, 1)
    -- Example of how you can use rs.gameZone.
    -- Draw rectangle.
  if showGameZone then
    -- love.graphics.rectangle("line", rs.gameZone.x, rs.gameZone.y, rs.gameZone.w, rs.gameZone.h)
  end

  -- Call debug function.
  rs.debugFunc()

  -- Instructions.
  love.graphics.setColor(1, 1, 1, 1)
  love.graphics.print("Press F1 to change scaleMode. F2 to enable/disable bars. F3 to enable/disable debug info.
Press f4 to show/hide game zone borders.\nPress F5 to activate/deactivate pixel perfect hack (make sure to be in
scaling mode 3). When active, try resize window and see if you notice difference. \nTry to change window size and
click on rectangle. Press right mouse button to move cursor to rectangle. Press middle mouse to move rectangle
under cursor.", 0, rs.windowHeight - 100)
end
```

Changelog

v1000, 7 January 2021

Initial release! Yay!

v1001, 6 February 2022

New:

- Added comments for "Simple demo".
- Added more comments for functions and variables in library.

Changed / Fixed:

- Now, **scaling.stop()** will remember color that was set before it and return it back after.
- Fixed typos in "Simple demo".

v1002, 8 February 2022

Changed / Fixed:

- Fixed (probably) edge cases in isMouseInside() function, so now it should correctly deal with non integer offsets provided by **scaling.xOff** and **scaling.yOff**.
- Now **rs.isMouseInside()** return always true if scale mode is == 2, since there is no black bars in that scaling method so no need to wast CPU time on that.
- Updated **rs.isMouseInside()** comments.
- Rewritten "Simple demo", now it uses modified demo from github page.
- Fixed typos, rewritten/rephrased comments.
- Added note in **rs.toGame/rs.toScreen** about rounding/mismatching.
- Added note about **rs.isMouseInside()**.

v1003, 12 February 2022

New:

- Added library license text in **rs._LICENSE_TEXT**.
- Added auto-completion API for Zerobrane Studio!

Changed / Fixed:

- Updated comments.

v1004, 19 May 2022

Renamed:

- **rs.widthScale** -> **rs.scaleWidth**.
- **rs.heightScale** -> **rs.scaleHeight**.

v1005, 19 May 2022

New:

- **rs.gameZone table**, which contains x, y, w, h coordinates of scaled area.

  You might need it when you want to draw UI, which shouldn't be scaled by library regardless of current scaling mode (stretching or with black bars), because to draw UI you need to know where starts/ends scaled area on window. And it might help for camera libraries, which uses **love.graphics.setScissors()**.

v1006, 20 May 2022

New:

- **rs.drawBlackBars()** added.
  So now you can call it to draw black bar outside of **rs.start()** and **rs.stop()**. Some libraries, especially that use love's scissors functionality might broke black bars rendering;

  Or camera (or any other library that relies graphics trnsformations) libraries might mess with coordinate translating. Which might end up in broken graphics and frustration.

  Also, this function uses same rules as **rs.stop()**, meaning **rs.drawBars** = false will result in **rs.drawBlackBars()** will be not rendered.
- Now **rs.stop()** will draw black bars via **rs.drawBlackBars()** function.

v2000, 27 December 2022

Big rewrite! Check source file for all detailed changes. Some functionality in this version is not compatible with old versions.

Source file, at almost top, now include some tips and "tricks", check them out.

New:

- Pixel Perfect scaling - **rs.setScaleMode(3)** to check it out!
- **rs.init(options)** - before, to change some options in library, you could update value directly from rs.* table or use provided built-in functions. Now, considering new "insides" of library, changing options directly as **rs.scaleMode** == 1 will do nothing, because library will be updated only on **rs.resize()** or via newly (and old one) provided functions, including **rs.init()**.

  You should call **rs.init()** at least once, even if you don't need to update anything in options, otherwise until first **rs.resize()**, you will see black screen.

  You can pass argument as table with options, or pass nothing to just update.
- **rs.setScaleMode()** - allow you to change scale mode via number. Pass 1, 2, 3 to change.
- **rs.debug** - boolean, which controls if **rs.debugFunc()** will be rendered or not.
- **rs.debugFunc()** - function that will show some data that useful for debug. Call it somewhere in love.draw() as **rs.debugFunc()**.
- **rs.switchDebug()** - switch **rs.debug**, from true to false and vice-versa.

Removed:

- **rs.windowChanged()** - because now there no need in this callback.
- **rs.gameChanged()** - also not really useful anymore.
- **rs.gameAspect** - it was not really useful anyway.
- **rs.windowAspect** - also not useful.
- **rs.update()** - explained below.

Changed / Fixed:

- Before, there was only 2 bars: left/right or top/bottom and they was available only at **rs.scaleMode** == 1. With introduced 3rd scale method, Pixel Perfect, that has bars at top/bottom/left/right at same time, their functionality changed. You can still access them as: rs.x1, rs.y1, rs.w1, rs.h1 (from 1 to 4, rs.x1, rs.x2, rs.x3...), but order changed:
    1. top bar
    2. left bar
    3. for right bar
    4. for bottom bar
- Apparently, rs.gameZone table was never updated, because I forgot to do so in rs.update... Whops!
- Now all functions, that expects arguments, have error messages to point out if you passed something wrong. Yay!
- **rs.resize** - now library update loop was designed around love.resize() function, instead of love.update(), like other scaling libs do. So less wasted frame time, yay! Don't forget to pass w and h from love.resize(w, h) to library as rs.resize(w, h). For comparability sake, it should be possible to put rs.resize at love.update and just pass rs.resize(love.graphics.getWidth(), love.graphics.getHeight()). It was not tested properly, but i believe there shouldn't be any problem with it, except maybe performance.
- **rs.switchScaleMode()** - before until 3rd scaling method, there was only 2 methods and this function acted more like "boolean". Now, you can pass 1 or -1 to choose how you want to switch methods: 1 -> 2 -> 3 -> 1... or 3 -> 2 -> 1 -> 1. If you pass nothing, function will act as you passed 1.
- Demo was rewritten.
- From now on, i will include minified version of library, with removed comments and minified code, that will make filesize lesser. https://mothereff.in/lua-minifier.

Renamed:

- **rs.drawBars** -> **rs.bars**.
- **rs.drawBlackBars** -> **rs.drawBars**.
- **rs.switchDrawBars** -> **rs.switchBars**.

v2001, 31 December 2022

Small update, that add some QoL features, and hack for Pixel Perfect Scaling. Check source code (specifically **rs.pixelPerfectOffsetsHack** and **rs.resize()**) and this update log for more info.

Happy new year!

New:

- **rs.nearestFilter(filter, anisotropy)** - this function is easier to use wrapper for **love.graphics.setDefaultFilter()**. It expects 2 optional arguments:
    1. true/false or nil. true/nil results in nearest filtering, while false is linear.
    2. Anisotropy. It can be number or nil. If number, function will simply use it to slap into **love.graphics.setDefaultFilter()**, but if nil, then library will simply get anisotropy value from **love.graphics.getDefaultFilter()** and will use it instead. Current love uses 1 as default.

       If this function was never run, library will never touch or edit **love.graphics.setDefaultFilter()**.
- **rs.pixelPerfectOffsetsHack** = false/true - very experimental feature, that aim to fix pixel bleeding in perfect scaling mode when window size is not even. It result in always "clean" pixels, but comes with side effects such as:
    1. **rs.windowWidth** and **rs.windowHeight** will be wrong by 1 if window is non even. The workaround is to use **love.graphics.getWidth()** and **love.graphics.getheight()** instead.
    2. On non even window size, offset from left and top will place game content on 1 pixel left/upper. But if you never ever draw anything inside **rs.unscaleStart()** and **rs.unscaleStop()** and outside of **rs.start()** and **rs.stop()**, then you should probably fine using this hack.
- **rs.switchPixelHack()** - turn on/off mentioned hack.
- **rs.setMode()** - wrapper around love.window.setMode(). You should use this functions instead, since using love.window.setMode() might don't trigger love.resize() and therefore **rs.resize()** and as result scaling calculations will be wrong.

Changed / Fixed:

- Updated demo to include all new functions and values.

- Updated **rs.debugFunc()** to include all new values and functions.

v2002, 27 August 2023

In this update, I finally provided somewhat «decent» documentation using in form of PDF file, fixed some functions, cleaned some parts of codebase. “Resolution Solution” finally become user-friendlier!

New:

- Documentation as PDF file (+ source file (.odt) for PDF. Made using LibreOffice Writer) with images and examples.
- **rs.resizeCallback()** - callback that will be called every time when **rs.resize()** was triggered.
    - Might be useful, if you need update something related to resize function. For example, UI.

Changed / Fixed:

- **rs.pixelPerfectOffsetsHack –** now will be **true** be default.
    - After some testing, I come up to decision, that it doesn’t produce any problems. It will retain same name for compatibility.
- **rs.isMouseInside()** - now relies on **rs.getGameZone()** for cursor detection.
- **rs.nearestFilter()**
    - Slightly optimized and cleared some code.
    - Added check for input arguments.
- **rs.getGameZone()** - changed behavior. Now returns 4 values with **x**, **y**, **w**, **h** of game zone.

  Before, it was returning table like this:

  ```
  return {x, y, w, h}
  ```
  and to get values you would need do something like this:

  ```
  local gameZone = rs.getGameZone()
  love.graphics.rectangle(“line”, gameZone.x, gameZone.y, gameZone.w, gameZone.h)
  But now, it is simple as:
  love.graphics.rectangle(“line”, rs.getGameZone())
  love.graphics.setScissor(rs.getGameZone())
  Of course, if you need to access only specific value, you still can do:
  local x = rs.gameZone.x
  ```
- **rs.debugFunc()**
    - Added 2 arguments that you can pass to it to place on-screen.

        1. argument is x
        2. argument is y
    - Now internally uses **love.graphics.printf()** which might result in slightly better performance (not that it important here much).
    - Now should return font back that was used before calling this function.
    - Now shows info for **rs.isMouseInside()**.
    - Now shows filtering for both **min** and **mag**, according to **love.graphics.getDefaultFilter()**.
- **rs.init()** - added additional sanity checks for **r, g, b, a** values that you can pass to change color of black bars. Starting from love 11, colors values become 0 – 1, before was 0 – 255. So passing something more then 1 and less then 0 result in error raising.
- **rs.setColor()** - added additional sanity checks for **r, g, b, a** values that you can pass to change color of black bars. Starting from love 11, colors values become 0 – 1, before was 0 – 255. So passing something more then 1 and less then 0 result in error raising.
- New description for library: "Yet another scaling library." (Because this description reflects library better.)
- **rs.resize()**
    - library internally uses this function to re-calculate data, and also you, as developer, should place it in **love.resize()** and pass w and h to it. Now, if you don't pass arguments to it, library will take it manually using **love.graphics.getWidth()** and **love.graphics.getHeight()**. That means, that now you can call this function without any arguments and it will still works just fine, but it's still good idea to pass **w** and **h** arguments from **love.resize(w, h)** to **rs.resize()**.
    - I accidentally placed 2 times:
        - `rs.windowWidth, rs.windowHeight = windowWidth, windowHeight`
        - Which resulted in library saving window width and height sizes twice, instead of once. Now this was fixed.
- **rs.setMode()** - added input sanity check.
- All functions that do some sanity check now should report properly where error happened instead of "*error happened somewhere in resolution_solution.lua*".

Removed:

- I will no longer provide minified version of library. (I’m not sure why I did provided minified version on 1st place anyway.)
- ZeroBrane API was removed from repository. (Since this API doesn’t work very good and I don’t use ZeroBrane much.)
- Removed history for demo from repository. (It was not that useful anyway.)
- Removed “releases” from repository. (Because I don’t want to maintain it.)
- Removed “documentation” from codebase. (Since now all documentation moved to newly added PDF documentation).