Tópicos Especiais em Linguagens de Programação

Aula 09 – Detecção de Colisões, Orientação a Objetos, Tile-Based Scrolling, Física...

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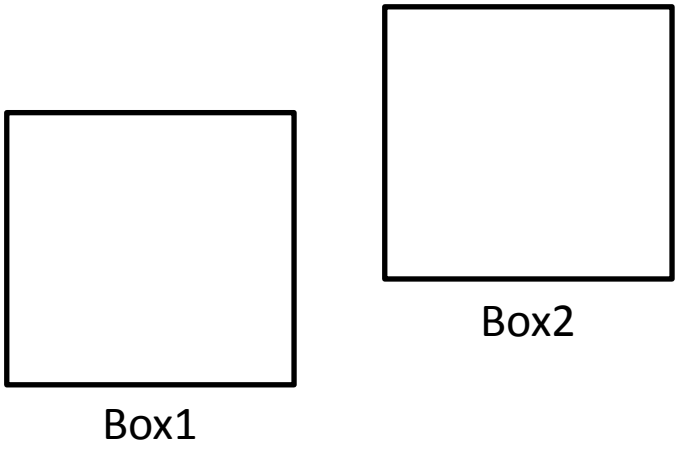
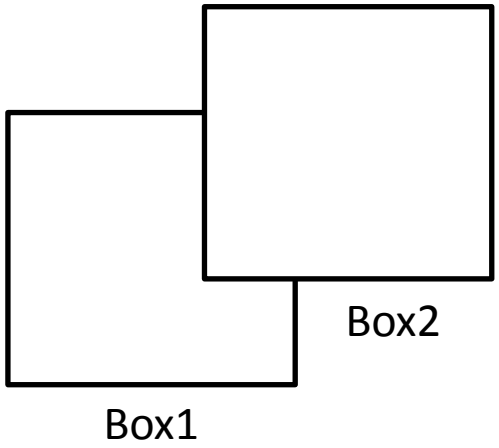
Detecção de Colisão

Sem Colisão

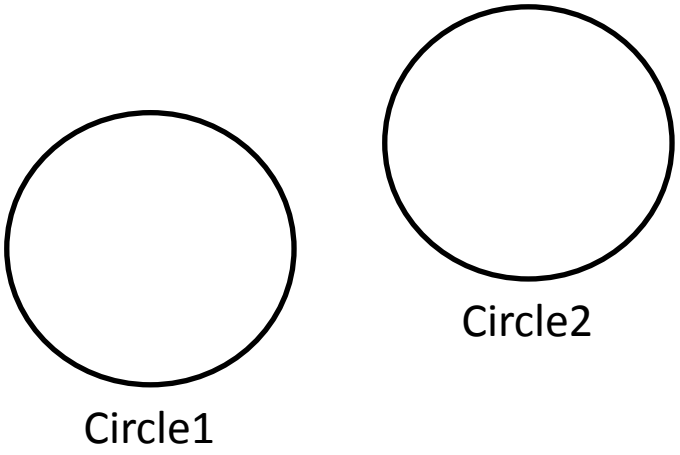


Com Colisão

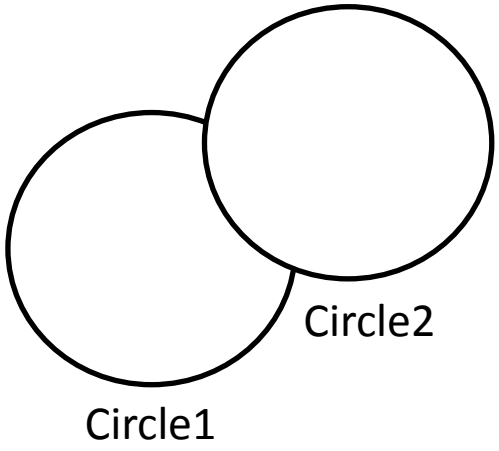


Detecção de Colisão

Sem Colisão



Com Colisão

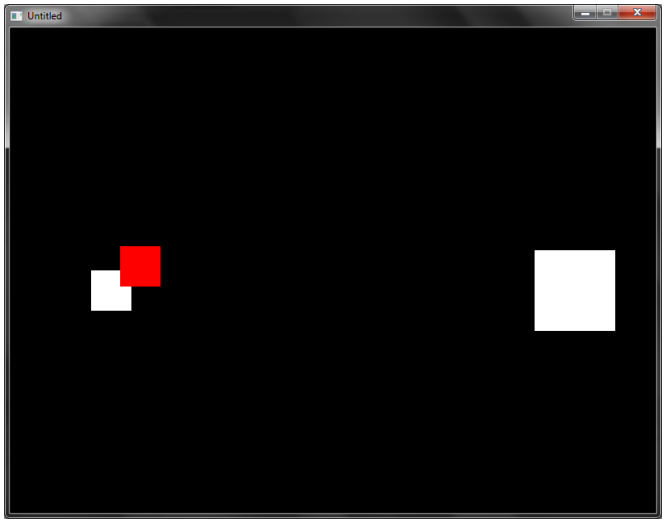


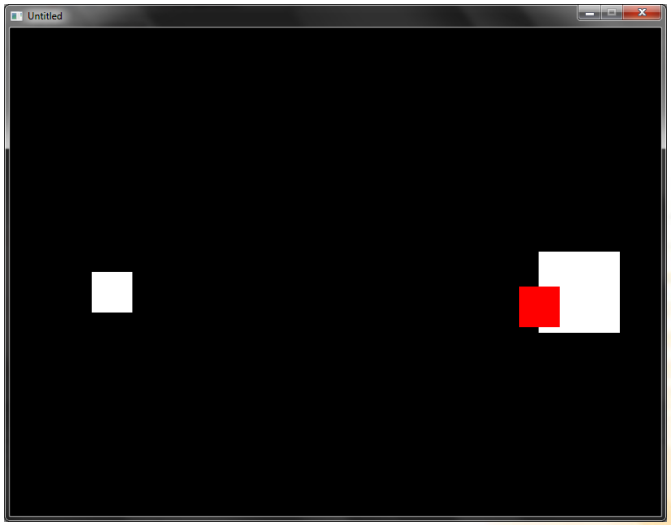
Detecção de Colisão (Box)

```
function love.load()
  player1 = {
    x = 390,
    y = 300,
    width = 50,
    height = 50,
    collided = false
  }
  box1 = {
    x = 100,
    y = 300,
    width = 50,
    height = 50
  }
  box2 = {
    x = 650,
    y = 275,
    width = 100,
    height = 100
  }
end
```

```
function CheckBoxCollision(x1,y1,w1,h1,x2,y2,w2,h2)
  return x1 < x2+w2 and x2 < x1+w1 and y1 < y2+h2 and y2 < y1+h1
end

function love.update(dt)
  if love.keyboard.isDown("left") then
    player1.x = player1.x - (120 * dt)
  end
  if love.keyboard.isDown("right") then
    player1.x = player1.x + (120 * dt)
  end
  if love.keyboard.isDown("up") then
    player1.y = player1.y - (120 * dt)
  end
  if love.keyboard.isDown("down") then
    player1.y = player1.y + (120 * dt)
  end

  if CheckBoxCollision(player1.x, player1.y, player1.width,
           player1.height, box1.x, box1.y, box1.width, box1.height) or
     CheckBoxCollision(player1.x, player1.y, player1.width,
           player1.height, box2.x, box2.y, box2.width, box2.height) then
    player1.collided = true
  else
    player1.collided = false
  end
end
```

```
function love.draw()
  love.graphics.setColor(255,255,255)
  love.graphics.rectangle("fill", box1.x, box1.y,
                                  box1.width, box1.height)
  love.graphics.rectangle("fill", box2.x, box2.y,
                                  box2.width, box2.height)

  if player1.collided == true then
    love.graphics.setColor(255,0,0)
  end

  love.graphics.rectangle("fill", player1.x, player1.y,
                                  player1.width, player1.height)
end
```



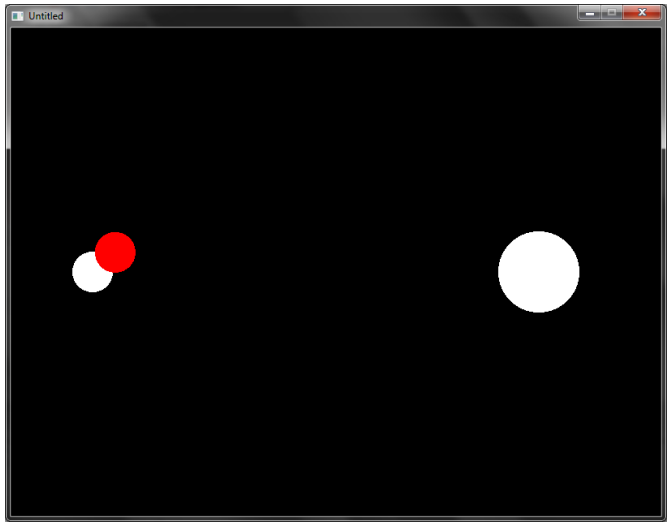


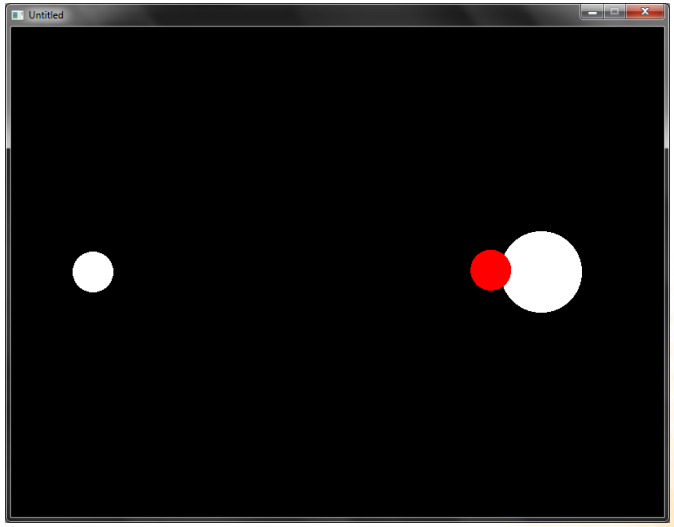
Detecção de Colisão (Circle)

```
function love.load()
  player1 = {
    x = 390,
    y = 300,
    raio = 25,
    collided = false
  }
  circle1 = {
    x = 100,
    y = 300,
    raio = 25
  }
  circle2 = {
    x = 650,
    y = 300,
    raio = 50
  }
end
```

```
function CheckCircularCollision(ax, ay, ar, bx, by, br)
    local dx = bx - ax
    local dy = by - ay
    local dist = math.sqrt(dx * dx + dy * dy)
    return dist < ar + br
end
function love.update(dt)
  if love.keyboard.isDown("left") then
    player1.x = player1.x - (120 * dt)
  end
  if love.keyboard.isDown("right") then
    player1.x = player1.x + (120 * dt)
  end
  if love.keyboard.isDown("up") then
    player1.y = player1.y - (120 * dt)
  end
  if love.keyboard.isDown("down") then
    player1.y = player1.y + (120 * dt)
  end
  if CheckCircularCollision(player1.x, player1.y, player1.raio,
                            circle1.x, circle1.y, circle1.raio) or
     CheckCircularCollision(player1.x, player1.y, player1.raio,
                            circle2.x, circle2.y, circle2.raio) then
    player1.collided = true
  else
    player1.collided = false
  end
end
```

```
function love.draw()
  love.graphics.setColor(255,255,255)
  love.graphics.circle("fill", circle1.x, circle1.y, circle1.raio, 100)
  love.graphics.circle("fill", circle2.x, circle2.y, circle2.raio, 100)

  if player1.collided == true then
    love.graphics.setColor(255,0,0)
  end

  love.graphics.circle("fill", player1.x, player1.y, player1.raio, 100)
end
```





Orientação a Objetos em Lua

GameObject.lua

```
GameObject = {}

function GameObject:new(x, y, w, h)
  local obj = {px = x,
               py = y,
               width = w,
               height = h,
               collided = false}
  setmetatable(obj, self)
  self.__index = self
  return obj
end


function GameObject:MoveX(x)
  self.px = self.px + x
end


function GameObject:MoveY(y)
  self.py = self.py + y
end
```

```
function GameObject:GetX()
  return self.px
end

function GameObject:GetY()
  return self.py
end

function GameObject:GetWidth()
  return self.width
end

function GameObject:GetHeight()
  return self.height
end

function GameObject:IsCollided()
  return self.collided
end

function GameObject:SetCollided(c)
  self.collided = c
end
```

Orientação a Objetos em Lua

main.lua

```
require "GameObject"

function love.load()
  player1 = GameObject:new(390, 300, 50, 50)
  box1 = GameObject:new(100, 300, 50, 50)
  box2 = GameObject:new(650, 275, 100, 100)
end

function CheckBoxCollision(obj1, obj2)
  return obj1:GetX() < obj2:GetX()+obj2:GetWidth() and
         obj2:GetX() < obj1:GetX()+obj1:GetWidth() and
         obj1:GetY() < obj2:GetY()+obj2:GetHeight() and
         obj2:GetY() < obj1:GetY()+obj1:GetHeight()
end
```

Orientação a Objetos em Lua

main.lua

```
function love.update(dt)
  if love.keyboard.isDown("left") then
    player1:MoveX(-120 * dt)
  end
  if love.keyboard.isDown("right") then
    player1:MoveX(120 * dt)
  end
  if love.keyboard.isDown("up") then
    player1:MoveY(-120 * dt)
  end
  if love.keyboard.isDown("down") then
    player1:MoveY(120 * dt)
  end

  if CheckBoxCollision(player1, box1) or
     CheckBoxCollision(player1, box2) then
    player1:SetCollided(true)
  else
    player1:SetCollided(false)
  end
end
```

Orientação a Objetos em Lua

main.lua

```
function love.draw()
  love.graphics.setColor(255,255,255)
  love.graphics.rectangle("fill", box1:GetX(), box1:GetY(),
                                  box1:GetWidth(), box1:GetHeight())
  love.graphics.rectangle("fill", box2:GetX(), box2:GetY(),
                                  box2:GetWidth(), box2:GetHeight())

  if player1:IsCollided() == true then
    love.graphics.setColor(255,0,0)
  end

  love.graphics.rectangle("fill", player1:GetX(), player1:GetY(),
                                  player1:GetWidth(),
                                  player1:GetHeight())

end
```

Operações em Tabelas

- Tamanho de um vetor:

```
vet = {1, 2, 1, 6}
tamanho = table.getn(vet)
```

- Adicionar elementos:

```
vet = {1, 2, 1, 6}
table.insert(vet, 8)
table.insert(vet, 1, 10)
```

- Remover elementos:

```
vet = {1, 2, 1, 6}
table.remove(vet, 4)
table.remove(vet, 1)
```

Geração de Números Aleatórios

```
number = love.math.random(min, max)
```

Exemplo 1:

```
x = love.math.random(1, 100) -- Gera um número entre 1 e 100
```

Exemplo 2:

```
vet = {}  -- Gera um vetor com 100 números aleatórios
for i=1, 100, 1 do
  vet[i] = love.math.random(1, 100)
end
```

Executando o Programa em Tela Cheia

```
success = love.window.setFullscreen(fullscreen, fstype)
```

Exemplo 1:

```
-- coloca o programa em tela cheia na resolução atual do windows
love.window.setFullscreen(true, "desktop")
```

Exemplo 2:

```
-- coloca o programa em tela cheia mudando a resolução do monitor
love.window.setFullscreen(true, "normal")
```

Modificando o Tamanho da Janela

```
success = love.window.setMode(width, height, flags)
```

Exemplo 1:

```
-- define o tamanho da janela em 1024 x 768 resizable
love.window.setMode(1024, 768, {resizable=true})
```

Exemplo 2:

```
-- define o tamanho da janela em 1024 x 768 e em tela cheia
love.window.setMode(1024, 768, {fullscreen=true})
```

Modificando o Titulo da Janela

```
love.window.setTitle(title)
```

Exemplo:

```
love.window.setTitle("Meu Jogo!")
```

Modificando a Fonte

```
font = love.graphics.newFont(filename, size)
```

Exemplo:

```
function love.load()
  myfont = love.graphics.newFont("anyfont.ttf", 20)
  love.graphics.setFont(myfont)
end

function love.draw()
  love.graphics.print("Hello world!", 100, 200)
end
```

Texture Atlas

- Forma mais eficiente de armazenar sprites na memória;
  - Somente uma textura é armazenada
- Simplifica a importação de sprites;

Texture Atlas

Mapa

```
XXXXXXXXXXXXXXX
XXXXXXXXXXXXXXX
XXXXXXXXXXXXXXX
XXXXXXXXXXXXXXX
XXXXXXXXXXXXXXX
XXXBXXXXXXXXXXX
XXBBBXXXXXXXXXX
GGGGGGGAAGGGGG
TTTTTTTPPTTTTT
TTTTTTTPPTTTTT
```

Tileset

http://www.inf.puc-rio.br/~elima/intro-eng/plataform_map1.zip

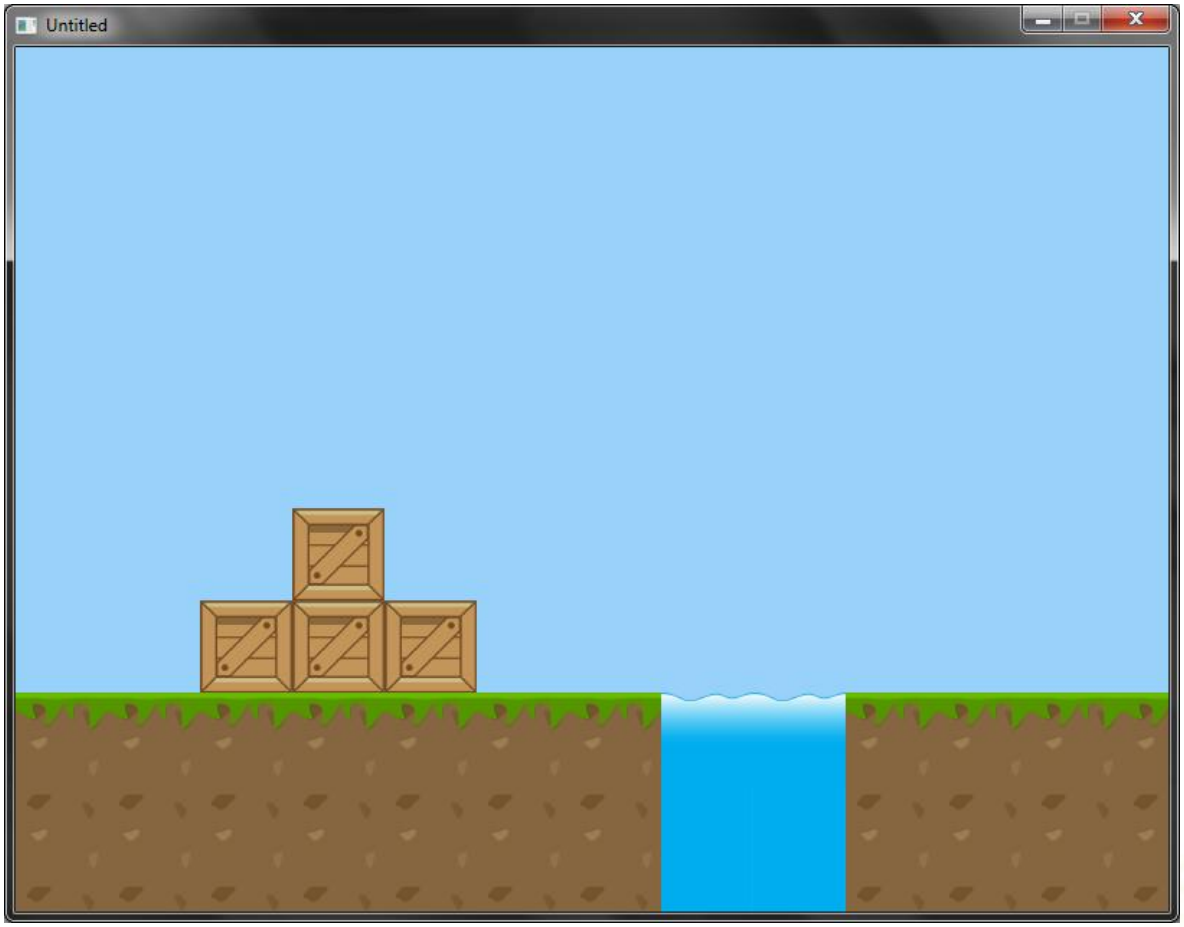
Texture Atlas

```
local mapa = {}
local tilesetImage
local tileQuads = {}
local tileSize = 64

function LoadTiles(filename, nx, ny)
  tilesetImage = love.graphics.newImage(filename)
  local count = 1
  for i = 0, nx, 1 do
    for j = 0, ny, 1 do
      tileQuads[count] = love.graphics.newQuad(i * tileSize ,
                                        j * tileSize, tileSize, tileSize,
                                        tilesetImage:getWidth(),
                                        tilesetImage:getHeight())
      count = count + 1
    end
  end
end
.
.
.
```

```
.
.
.
function LoadMap(filename)
  local file = io.open(filename)
  local i = 1
  for line in file:lines() do
    mapa[i] = {}
    for j=1, #line, 1 do
      mapa[i][j] = line:sub(j,j)
    end
    i = i + 1
  end
  file:close()
end

function love.load()
  LoadMap("plataform_map.txt")
  LoadTiles("plataform_tileset.png", 2, 2)
  love.graphics.setBackgroundColor(152,209,250)
end
.
.
.
```

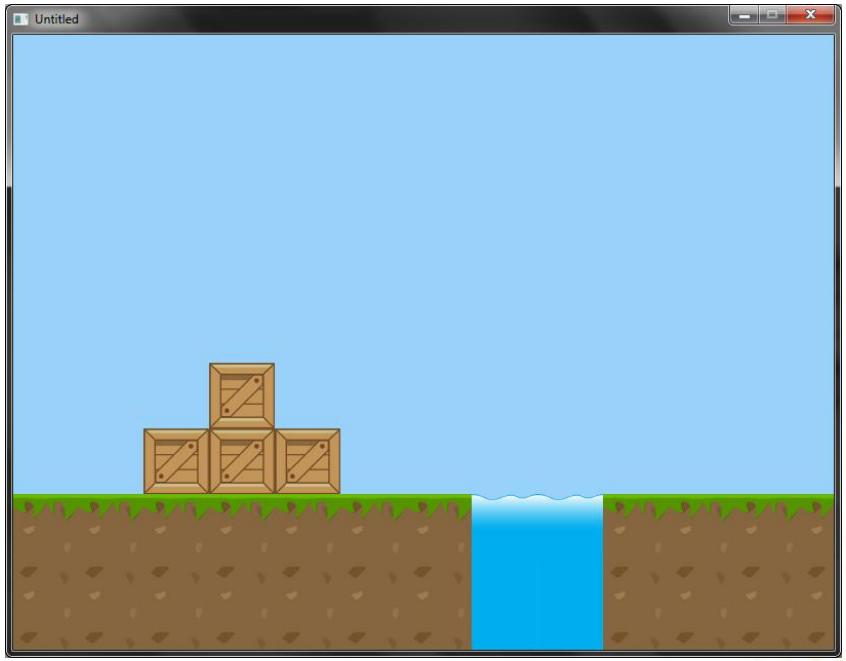
```
.
.
.
function love.draw()
  for i=1, 10, 1 do     --Percorre a matriz e desenha quadrados imagens
    for j=1, 14, 1 do
      if (mapa[i][j] == "G") then
        love.graphics.draw(tilesetImage, tileQuads[1],
                    (j * tileSize) - tileSize, (i * tileSize) - tileSize)
      elseif (mapa[i][j] == "T") then
        love.graphics.draw(tilesetImage, tileQuads[4],
                    (j * tileSize) - tileSize, (i * tileSize) - tileSize)
      elseif (mapa[i][j] == "A") then
        love.graphics.draw(tilesetImage, tileQuads[7],
                    (j * tileSize) - tileSize, (i * tileSize) - tileSize)
      elseif (mapa[i][j] == "P") then
        love.graphics.draw(tilesetImage, tileQuads[8],
                    (j * tileSize) - tileSize, (i * tileSize) - tileSize)
      elseif (mapa[i][j] == "B") then
        love.graphics.draw(tilesetImage, tileQuads[6],
                    (j * tileSize) - tileSize, (i * tileSize) - tileSize)
      end
    end
  end
end
```

Texture Atlas



Tile-Based Scrolling

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXBXXXXXXXXXXXXBXXXXXXXXXX
XXBBBXXXXXXXXXXXBBBXXXXXXXX
GGGGGGGAAGGGGGGGGGGGAAGGGGG
TTTTTTTPPTTTTTTTTTTTPPTTTTT
TTTTTTTPPTTTTTTTTTTTPPTTTTT
```



http://www.inf.puc-rio.br/~elima/intro-eng/plataform_map2.zip

Tile-Based Scrolling

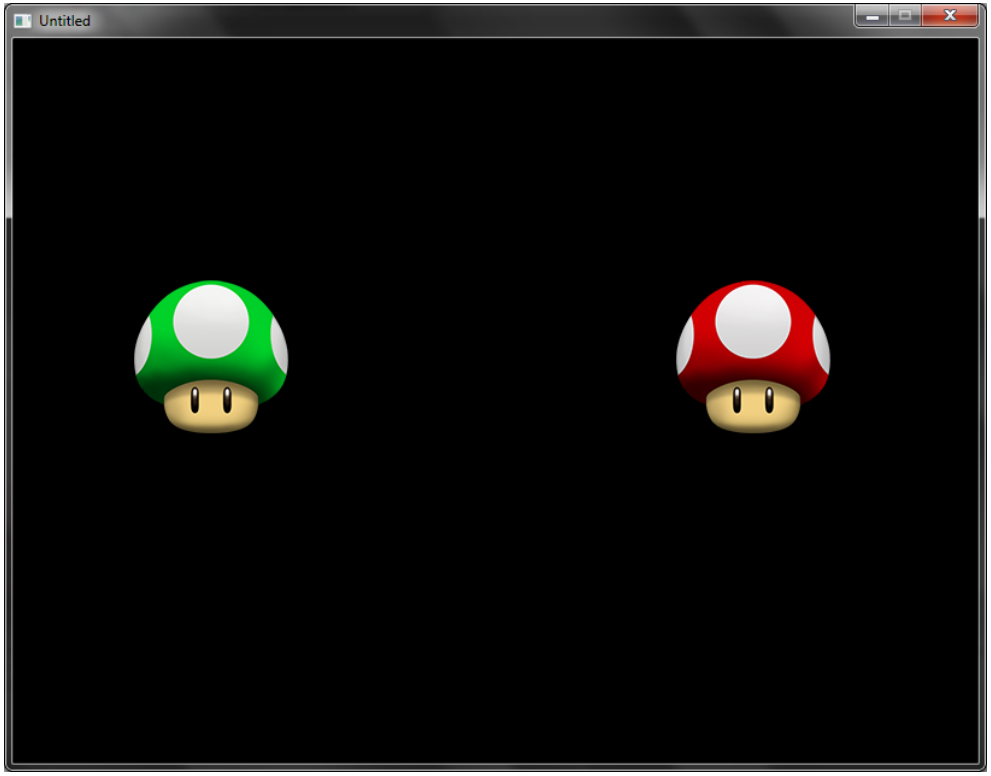
```
local mapa = {}
local tilesetImage
local tileQuads = {}
local tileSize = 64

local mapa_config = {
  mapaSize_x = 28,
  mapaSize_y = 10,
  mapaDisplay_x = 14,
  mapaDisplay_y = 10
}

local camera = {
  pos_x = 1,
  pos_y = 1,
  speed = 120
}
```

```
function LoadTiles(filename, nx, ny)
  tilesetImage = love.graphics.newImage(filename)
  local count = 1
  for i = 0, nx, 1 do
    for j = 0, ny, 1 do
      tileQuads[count] = love.graphics.newQuad(i * tileSize, j *
                                        tileSize, tileSize, tileSize,
                                        tilesetImage:getWidth(),
                                        tilesetImage:getHeight())
      count = count + 1
    end
  end
end

function LoadMap(filename)
  local file = io.open(filename)
  local i = 1
  for line in file:lines() do
    mapa[i] = {}
    for j=1, #line, 1 do
      mapa[i][j] = line:sub(j,j)
    end
    i = i + 1
  end
  file:close()
end
```

```
function love.load()
  LoadMap("plataform_map.txt")
  LoadTiles("plataform_tileset.png", 2, 2)
  love.graphics.setBackgroundColor(152,209,250)
end

function love.update(dt)
  if love.keyboard.isDown("right") then
    camera.pos_x = camera.pos_x + (camera.speed * dt)
  elseif love.keyboard.isDown("left") then
    camera.pos_x = camera.pos_x - (camera.speed * dt)
  end

  if camera.pos_x < 0 then
    camera.pos_x = 0
  elseif camera.pos_x > mapa_config.mapaSize_x * tileSize -
                        mapa_config.mapaDisplay_x * tileSize - 1 then
    camera.pos_x = mapa_config.mapaSize_x * tileSize -
                        mapa_config.mapaDisplay_x * tileSize - 1
  end
end
```

```
function love.draw()
    offset_x = math.floor(camera.pos_x % tileSize)
    first_tile_x = math.floor(camera.pos_x / tileSize)
    for y=1, mapa_config.mapaDisplay_y, 1 do
        for x=1, mapa_config.mapaDisplay_x, 1 do
          if (mapa[y][first_tile_x + x] == "G") then
            love.graphics.draw(tilesetImage, tileQuads[1],
                        ((x -1)*tileSize) - offset_x ,((y-1)*tileSize))
          elseif (mapa[y][first_tile_x + x] == "T") then
            love.graphics.draw(tilesetImage, tileQuads[4],
                        ((x-1)*tileSize) - offset_x ,((y-1)*tileSize))
          elseif (mapa[y][first_tile_x + x] == "A") then
            love.graphics.draw(tilesetImage, tileQuads[7],
                        ((x-1)*tileSize) - offset_x ,((y-1)*tileSize))
          elseif (mapa[y][first_tile_x + x] == "P") then
            love.graphics.draw(tilesetImage, tileQuads[8],
                        ((x-1)*tileSize) - offset_x ,((y-1)*tileSize))
          elseif (mapa[y][first_tile_x + x] == "B") then
            love.graphics.draw(tilesetImage, tileQuads[6],
                        ((x-1)*tileSize) - offset_x ,((y-1)*tileSize))
          end
        end
    end
end
```

Áudio



www.inf.puc-rio.br/~elima/intro-eng/exemplo_audio.zip

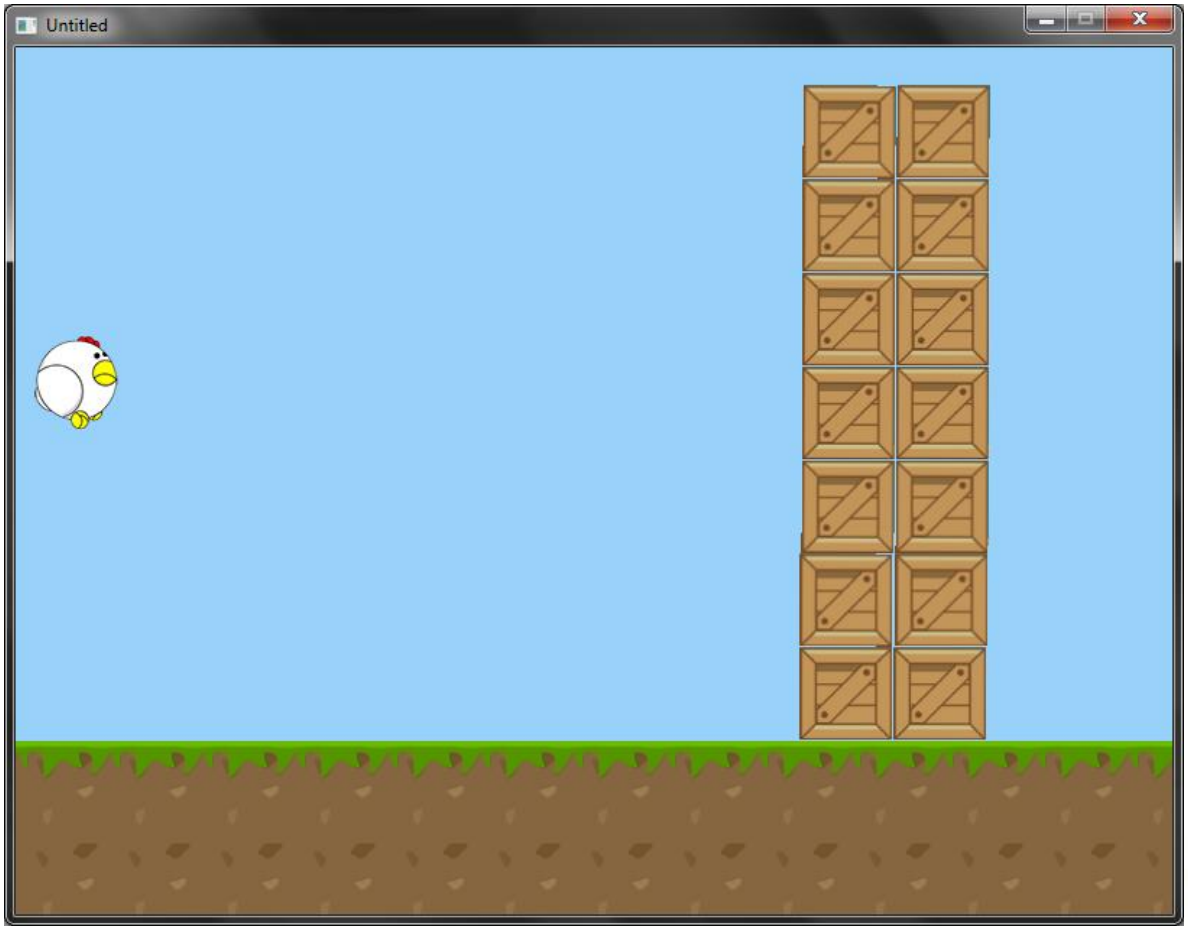
Áudio

```
local icon_1up
local icon_super
local audio_1up
local audio_super

function love.load()
  icon_1up = love.graphics.newImage("1up.png")
  icon_super = love.graphics.newImage("super.png")
  audio_1up = love.audio.newSource("1up.mp3", "static")
  audio_super = love.audio.newSource("super.mp3")
end

function CheckClick(x1,y1,w1,h1,x2,y2)
  return x1 < x2+1 and x2 < x1+w1 and y1 < y2+1 and y2 < y1+h1
end

function love.draw()
  love.graphics.draw(icon_1up, 100, 200)
  love.graphics.draw(icon_super, 550, 200)
end
```

Áudio

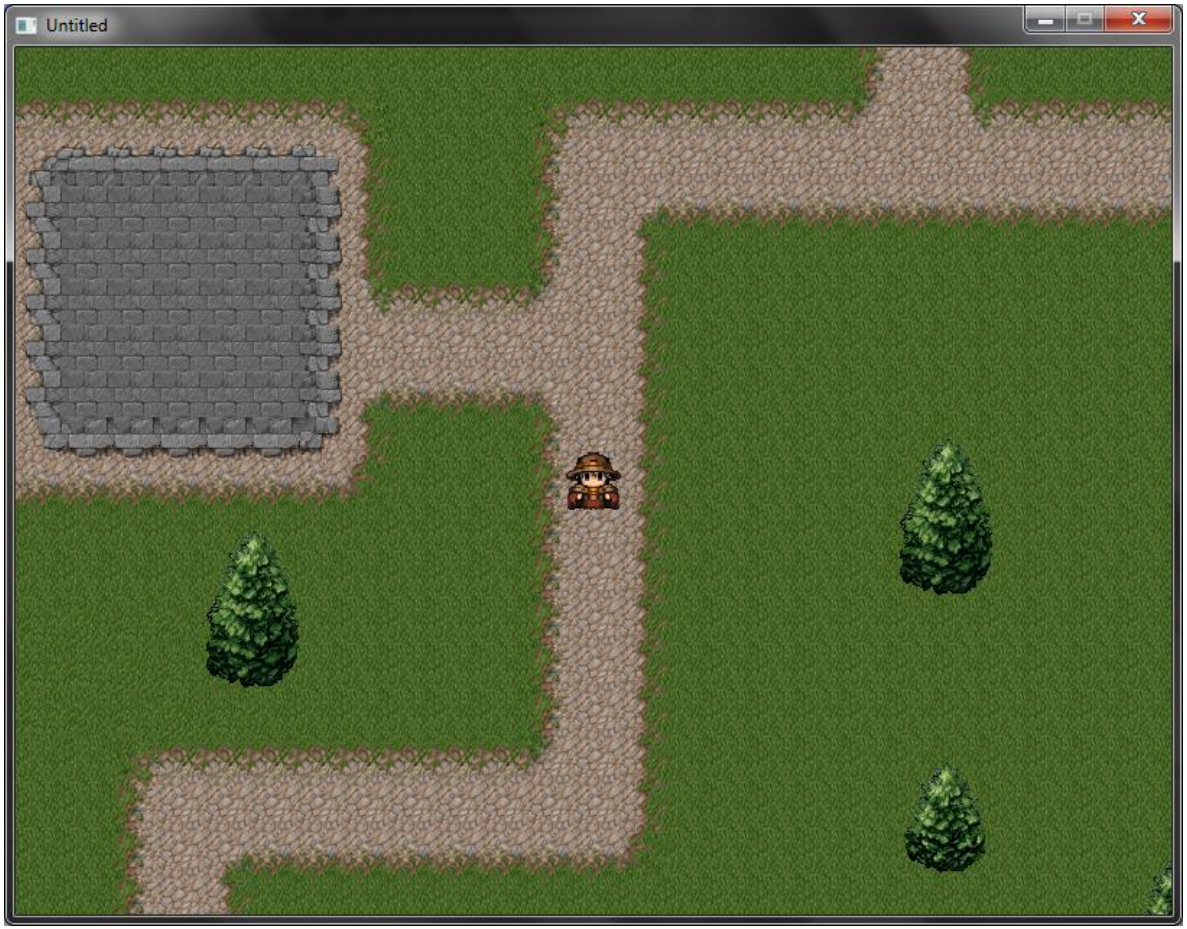
```
function love.mousepressed(x, y, button)
  if button == 1 then
    if CheckClick(550,200,128,128,x,y) then
      love.audio.play(audio_super)
    end
    if CheckClick(100,200,128,128,x,y) then
      love.audio.play(audio_1up)
    end
  elseif button == 2 then
    if CheckClick(550,200,128,128,x,y) then
      love.audio.stop(audio_super)
    end
    if CheckClick(100,200,128,128,x,y) then
      love.audio.stop(audio_1up)
    end
  end
end
```

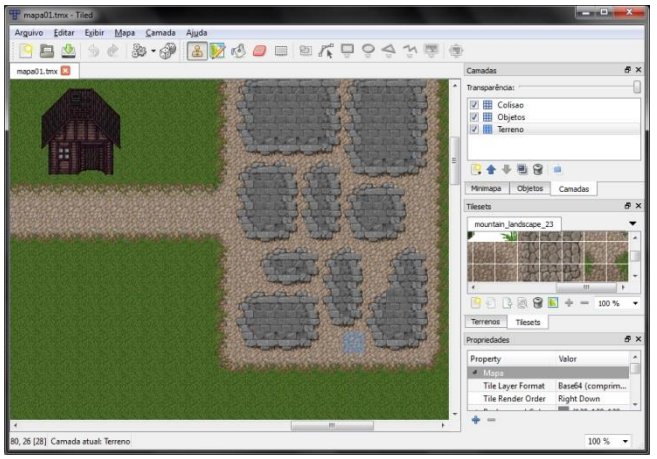
Física Simples

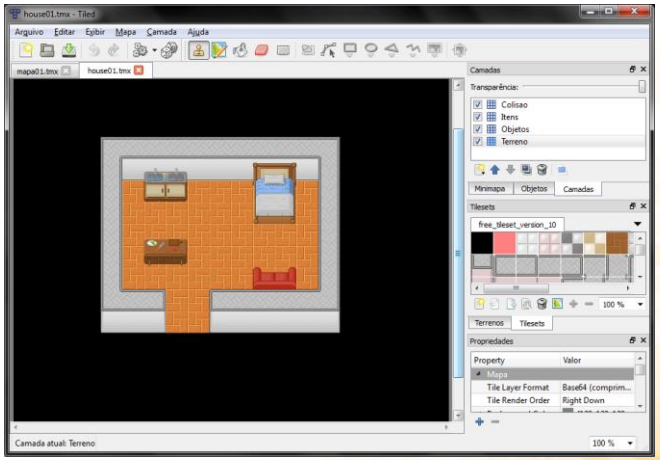


http://www.inf.puc-rio.br/~elima/intro-eng/exemplo_fisica.zip

Exemplo RPG + Tiled Map Editor







http://www.inf.puc-rio.br/~elima/intro-eng/exemplo_rpg.zip

http://www.mapeditor.org/