

#### I'm Learning about

Donkey Kong Game

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This project explores how to create the popular Nintendo game of Donkey Kong using Scratch. This Sushi card will help you work through the different parts of the Game building on what you have learnt about Sprites, Movement, Sensing and Game Strategy.



For the Donkey Kong game, we need a few sprites to recreate the game...

- Donkey Kong
- Princess
- Mario
- Barrels
- Ladders

- Platforms
- Scores
- Heart (when Mario reaches the Princess)

To get started go to our Scratch GitHub repository at:

https://github.com/CoderDojoDunLaoghaire/ScratchSushi

In the SRC folder of this Sushi Pack you will find this Sushi card and a starter Project **Donkey Kong Base.sb2** project with some starter Sprites to get you going. There's a few basic things that need coding, but its up to you to decide how your version of this game will be coded!:

- Move left and right
- Move up and down ladders
- Jump Over barrels

- Die when touching Barrel or Donkey Kong
- Roll the barrels
- Score Points







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#### 1 Simple Movement Techniques

Simple movement using two costumes to simulate stepping, facing left

```
when clicked

forever

if key left arrow pressed? then

switchcostume to costume5

move 5 steps

wait 0.2 secs

switchcostume to costume5

move 5 steps
```

Simple movement using two costumes to simulate stepping, facing right

```
when clicked

forever

if key nontarrow pressed? then

switchcostume to costume1

move 5 steps

wait 0.2 secs

switchcostume to costume2

move 5 steps
```

Or how about even simpler code? Does this code work as expected?

```
when nort arrow key pressed
switchcostume to costume1
move 5 steps
wait 0.2 secs
switchcostume to costume2
move 5 steps
```







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#### 2 Movement and Appearance

As you start to add code to your project you will start to mix up code that deals with Movement and code that deals with Appearance. Having this in one block means the two become dependent upon each other and can often slow the program down. To avoid this, we can use the Parallelism feature of Scratch and separate this code, making the program work better, and the program easier to debug. It would also be a good idea to name your costumes and sprites so it makes your code easier to read!

For example, this code snippet deals solely with Appearance.

```
when I receive game start 

forever

if Mario Action = normal then

if key right arrow v pressed? then

switch costume to walk1 v

wait 0.25 secs

switch costume to walk2 v

wait 0.25 secs

switch costume to walk1 v

wait 0.25 secs

switch costume to walk2 v

wait 0.25 secs
```

And this code controls the movement of Mario along the X-axis







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```
when I receive game start

forever

if Mario Action = normal or Mario Action = jump then

if key right arrow v pressed? then

point in direction -90v

change x by 2

if key left arrow v pressed? then

point in direction 90v

change x by -2
```

And then maybe some gravity to keep Mario on the platform – note that this also keeps him on the platform (Red in this case)

```
when I receive game start 

forever

if Mario Action = normal then

if 25M Floor = 1 then

if touching color ? then

change y by 3

if not touching color ? then

change y by 3

if touching color ? then

change y by 3

if not touching color ? then

change y by 3
```







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## 3 Climbing

Climbing up something Blue (eg ladder), using costumes to simulate movement

```
when clicked

forever

if key warrow pressed? and touchingcolor ? then
switch costume to costume3 change y by 3
wait 0.2 secs
switch costume to costume4
change y by 3
```

Climbing down something blue (eg Ladder) using costumes to simulate movement

```
forever

if key downarrow pressed? and touchingcolor ? then

switch costume to costume3 change y by 3
wait 0.2 secs
switch costume to costume4 change y by 2
```







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#### 4 Jumping Techniques

Take a look at the Scratch Scratch Wiki for good examples of Jumping techniques

http://wiki.scratch.mit.edu/wiki/Jumping

#### Simple jumping

The following is commonly used in animations and results in a sprite effectively teleporting upwards, and then downwards again.

```
forever

if key up arrow pressed? then

typical jumping key

change y by 50

wait 0.5 secs

change y by -50
```

#### **Falling**

The following script "teleports" the sprite upwards, and then has it fall back down at a constant rate, until it lands on a platform

```
when clicked

forever

if key up arrow v pressed? then typical jumping key

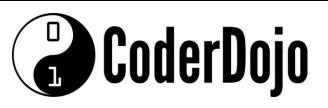
change y by 50

repeat until touching color ?

change y by -5
```







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#### Physically Accurate Jumping

#### With Ground Detection

A more realistic effect for jumping commonly used in games is the following, using a variable to control the vertical speed of a sprite (simulating gravity) is this:

```
when clicked

forever

change y by y speed

when clicked

forever

if key up arrow pressed? and y speed = 0 then

set y speed to 9.9

repeat until touching color 2 the color of the platforms

change y speed to 0

set y speed to 0
```

#### Without Ground Detection

If one does not need to sense the ground and simply want a realistic, gravitational jump, that will end at the starting point, the following script can replicate the jump:







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```
when clicked

forever

if key up arrow v pressed? then

set y vel v to 10

repeat (20)

change y by y vel

change y vel v by 1 simulates gravity
```

#### Advanced Jumping

The following script includes velocity-based jumping and advanced landing. The sprite is constantly acted upon by the force of gravity and cannot pass through sprites. The sprite may appear to "bounce: slightly when "at rest":

```
when clicked

forever

change yvel v by -0.2 simulates the force of gravity

change y by vvel

if touching platforms v? then

set yvel v to -0.34 vvel

change y by vvel

if touching platforms v? then

change y by vvel

if touching platforms v? then

change y by vvel

if touching platforms v? then

change y by vvel

if vvel > 0 and key up arrow v pressed? then

set yvel v to 4 jump magnitude (a higher number results in a higher jump)
```

Now add these techniques to your program or use these in a sample project!







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#### 5 Barrel Movement

Start Simple – drop a barrel from the top and roll along one level!

```
when I receive throwBarrel v

go to x: 153 y: 95

hide

broadcast stomp v

show

glide 0.5 secs to x: 172 y: -155

set barrelDirection v to left

repeat 41

move -10 steps

wait 0.1 / Level secs
```

This Barrel stars at the top platform, falls to the bottom and rolls to the left at a set speed. Now make the barrel roll along all levels!

```
when I receive throwBarrel2
go to x: 153 y: 95
hide
broadcast stomp -
glide 0.5 secs to x: 133 γ: 45
set barrelDirection v to left
  peat 34
  move -10 steps
  wait 0.1 / Level sec
glide 0.1 secs to x: -204 y: -52
 et barrelDirection v to right
   eat 42
  move 10 steps
  wait 0.1 / Level secs
glide 0.1 secs to x: 216 y: -155
  t barrelDirection v to left
   eat 42
  move -10 steps
  wait 0.1 / Level secs
```







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We repeat the code across gliding between the levels – does this code work reliably?

```
when I receive game start v
go to x: -100 y: 104
show
wait 0.75 secs
glide 0.25 secs to x: -88 y: 85
glide 0.8 secs to x: -148 y: -6
glide 0.4 secs to x: -133 y: -65
glide 0.75 secs to x: -183 y: -153
broadcast 25barrelsorange v
hide
```

The first barrel triggers the remaining barrels

```
n I receive 25barrelsorange 🔻
  at until Mario Action = die or Mario Action = win
   it pick random 3 to 4 secs
  ritch costume to pickup 🔻
   it 1 secs
itch costume to throw •
    dcast 25barrel1 ▼
    pick random 3 to 4 secs
   itch costume to pickup 🔻
  ritch costume to throw
   itch costume to idle 🔻
   it pick random 3 to 4 sec
   itch costume to pickup 🔻
   it 1 secs
   itch costume to throw ▼
   it 0.3 secs
  witch costume to idle 🔻
```

And then each Barrel Sprite called will have different paths through the platform







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#### 6 Using Cloning for Barrels

You may have found it easy to simply create a few barrels, with the intention to have different barrels travel different paths at different times. You may find it easy to create one, then duplicate it, then only make minor changes to it. That's easy to do, but you might find yourself improving your game and having to make the same changes to each of these sprites, making it difficult to maintenance you code. In some cases where you want lots of sprites that are really doing the same thing, it may be simply impractical to duplicate these. Cloning lets you create a copy of the sprite at runtime, and to control when the sprite is created and when its deleted. This can be useful in tower defense games, for example, for a wave of objects. Clones of a sprite will be the same as the original, or parent sprite, but as a separate instance. Clones inherit the parent's scripts, costumes, sounds, and properties, but can then be modified.

A clone can be as easy as:

```
when clicked
```

And associated specific code when the Clone Starts:

```
when I start as a clone

go to x: 153 y: 95

hide

broadcast stomp 

show

glide 0.5 secs to x: 172 y: -155

set barrelDirection 

to left

repeat 41

move -10 steps

wait 0.1 / Level secs
```

But of course you might need to make the operation of the clone dependent on variables to control the behaviour of the clone and you should have code that deletes the Clone, either on an event or when the function of the clone has been completed.







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```
when I receive newLevel delete this clone
```

Because clones can be created in code, any variables used in the sprite code can either be associated only with this clone, or with all clones. This gives us some flexibility in controlling how code will work.

```
if barrel = 1 then

go to x: 153 γ: 95

hide

broadcast stomp γ
```

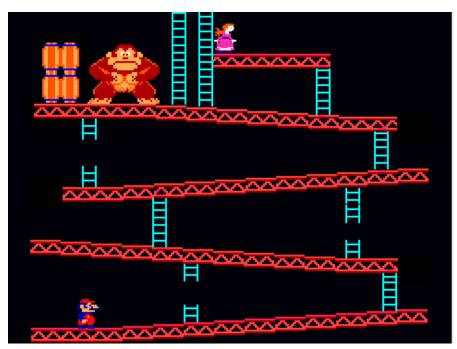




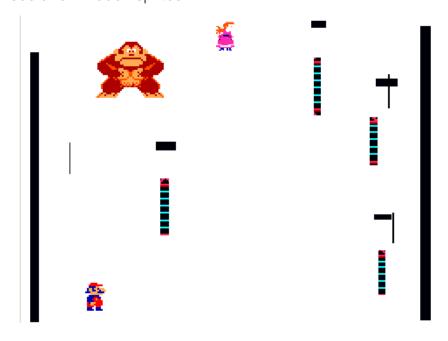


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#### 7 Sensing with Hidden Sprites



Here's what the Platform could look like, now if we change/delete the background we see a few hidden sprites:









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```
when I receive game start 🔻
       key up arrow ▼ pressed? then
          Mario Action = normal then
           touching 25m ladder sensor ? then
               25M Floor = 2 then
           set Mario Action ▼ to climb
           go to x: -77 y: -65
           switch costume to climb1
           repeat until touching Floor 3 7 ?
                 key up arrow v pressed? then
                change y by 3
                switch costume to climb
                wait 0.1 secs
                change y by 3
                switch costume to climb1 -
                wait 0.1 secs
           set Mario Action v to normal
```

Where some of these "invisible" sprites act as sensors which set the floor level we are on and control which code is being executed....

```
when I receive game start v
show
go to x: 101 y: 163
go back 51685 layers
forever

if touching Mario v? then
broadcast win v
```

Or to detect if Mario reached the Princess





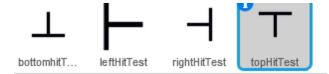


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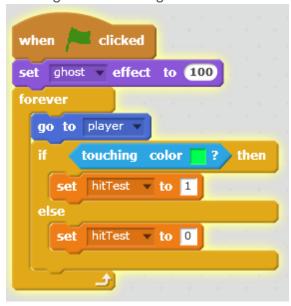
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#### 8 Sensing Block around Mario



Four sprites with a sensing function that can be set to surround Mario and act as the sensing function using a local variable called "hitTest"



Now we can check if the sprite has touched something and then effect a move of the platform by changing the X or Y co-ordinates for the Platform/Background sprites

```
if hitTest ▼ of rightHitTest ▼ = 1 then

change scrollX ▼ by 10
```







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#### 9 Improving the Game

How do you think we can improve the game? Here are some suggestions:

- Use Cloning to reduce the number of sprites
- Keep score of the games and lives
- Randomize the possible barrel paths, avoiding ladders
- Add levels of Difficulty
- Add fireballs that chase Mario

This Sushi card was based on the Original Donkey Kong material developed by Simon Lewis can be found at:

- Week 1 Overview: http://www.anseo.net/scratch-saturday-platform-games-1
- Week 2 Moving Mario: http://www.anseo.net/scratch-saturday-platform-games-2
- Week 3 Platforms and Ladders: <a href="http://www.anseo.net/scratch-saturday-platform-games-3">http://www.anseo.net/scratch-saturday-platform-games-3</a>
- Week 4 Donkey Kong: <a href="http://www.anseo.net/scratch-saturday-platform-games-6">http://www.anseo.net/scratch-saturday-platform-games-6</a>
- Week 5 Barrels: <a href="http://www.anseo.net/scratch-saturday-platform-games-7">http://www.anseo.net/scratch-saturday-platform-games-7</a>
- Week 6 Reaching the Princess: <a href="http://www.anseo.net/scratch-saturday-platform-games-4">http://www.anseo.net/scratch-saturday-platform-games-4</a>
- Week 7 Adding the Heart: <a href="http://www.anseo.net/scratch-saturday-platform-games-5">http://www.anseo.net/scratch-saturday-platform-games-5</a>
- Week 8 Improvements <a href="http://www.anseo.net/scratch-saturday-platform-games-10">http://www.anseo.net/scratch-saturday-platform-games-10</a>



