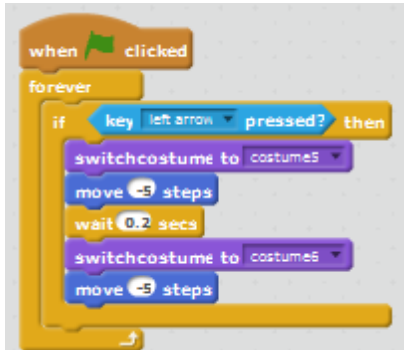
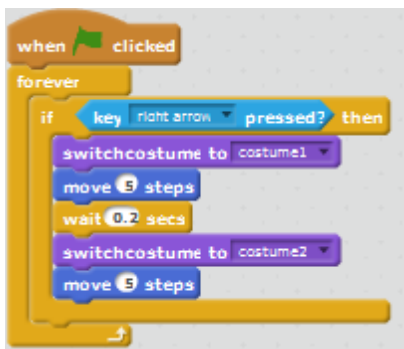


Simple Movement Techniques

Simple movement two costumes to simulate stepping, facing left



Simple movement two costumes to simulate stepping, facing right



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



How about separating the Appearance from the movement

```
when I receive game start
  forever
    if Mario Action = normal then
      if key right arrow pressed? then
        switch costume to walk1
        wait 0.25 secs
        switch costume to walk2
        wait 0.25 secs
      if key left arrow pressed? then
        switch costume to walk1
        wait 0.25 secs
        switch costume to walk2
        wait 0.25 secs
      if not key right arrow pressed? or key left arrow pressed? then
        switch costume to idle
```

Control of movement on X-axis

```
when I receive game start
  forever
    if Mario Action = normal or Mario Action = jump then
      if key right arrow pressed? then
        point in direction -90
        change x by 2
      if key left arrow pressed? then
        point in direction 90
        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 red ? then
          change y by 3
        if not touching color red ? then
          change y by -3
      if 25M Floor = 2 then
        if touching color red ? then
          change y by 3
        if not touching color red ? then
          change y by -3
    if 25M Floor = 3 then
      if touching color red ? then
        change y by 3
      if not touching color red ? then
        change y by -3
  
```

CLIMBING

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

```

when clicked
  forever
    if key up arrow pressed? and touchingcolor blue ? 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

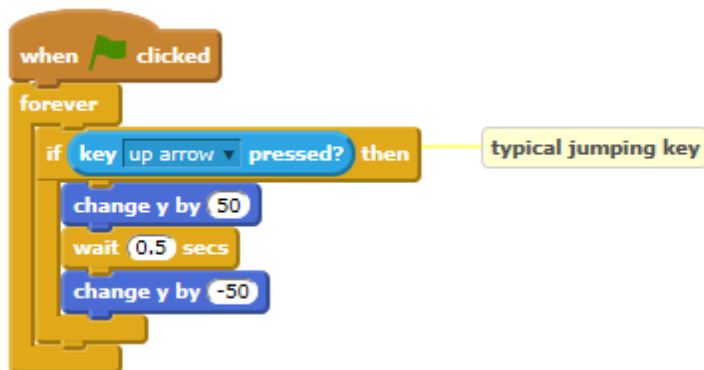
```
when clicked
  forever
    if key down arrow pressed? and touchingcolor ? then
      switch costume to costume3
      change y by -3
      wait 0.2 secs
      switch costume to costume4
      change y by -3
```

Jumping Techniques

Jumping - Scratch Wiki
<http://wiki.scratch.mit.edu/wiki/Jumping>

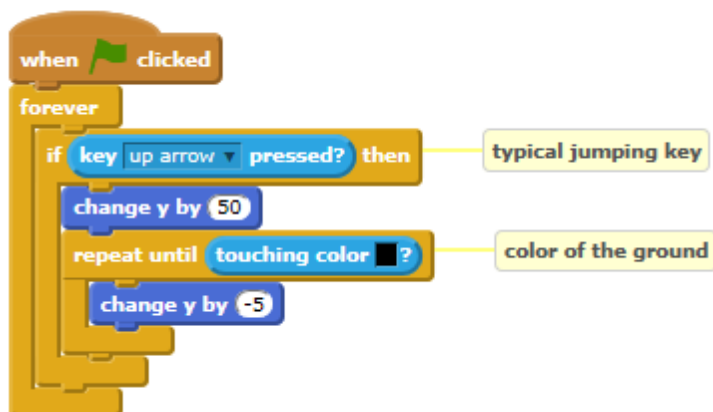
Simple jumping

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



Falling

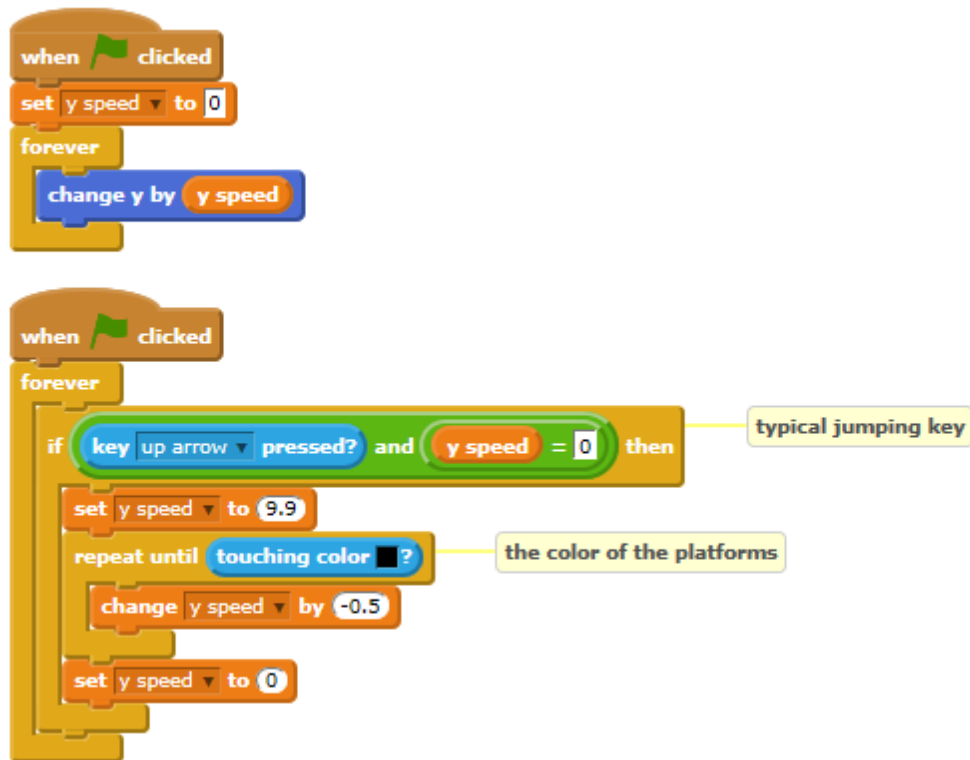
The following script "teleports" the sprite upwards, and then has it fall back down at a constant rate, until it lands on a platform



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:



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:

```

when green flag clicked
  forever loop
    if key up arrow pressed? then
      set y vel to 10
      repeat (20)
        change y by y vel
        change y vel 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 green flag clicked
  forever loop
    change y vel by -0.2
    change y by y vel
    if touching platforms? then
      set y vel to -0.34 * y vel
      change y by y vel
    if touching platforms? then
      change y by y vel
    if touching platforms? then
      change y by y vel
    if y vel > 0 and key up arrow pressed? then
      set y vel to 4
  
```

simulates the force of gravity

if the sprite hits an object

bounce off of it

jumping script

jump magnitude (a higher number results in a higher jump)

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

Barrel Movement

Jumping - Scratch Wiki

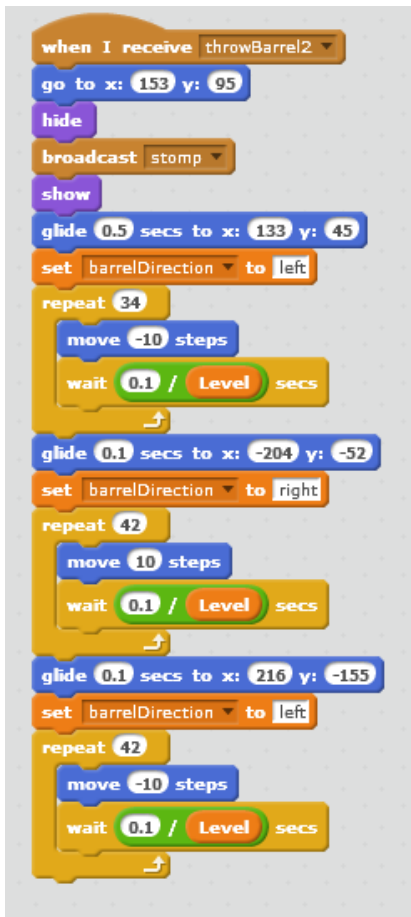
<http://wiki.scratch.mit.edu/wiki/Jumping>

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



This Barrel starts 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
  show
  glide 0.5 secs to x: 133 y: 45
  set barrelDirection to left
  repeat 34
    move -10 steps
    wait 0.1 / Level secs
  glide 0.1 secs to x: -204 y: -52
  set barrelDirection to right
  repeat 42
    move 10 steps
    wait 0.1 / Level secs
  glide 0.1 secs to x: 216 y: -155
  set barrelDirection to left
  repeat 42
    move -10 steps
    wait 0.1 / Level secs
```

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

And finally add some variation to Barrels



```
when I receive game start
  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 25barrelorange
  hide
```

The first barrel triggers the remaining barrels



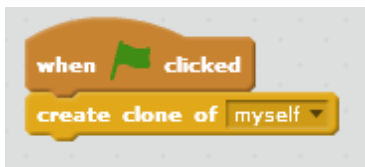
```
when I receive 25barrelorange
  forever
    repeat until Mario Action = die or Mario Action = win
      wait pick random 3 to 4 secs
      switch costume to pickup
      wait 1 secs
      switch costume to throw
      broadcast 25barrel1
      wait 0.3 secs
      switch costume to idle
      wait pick random 3 to 4 secs
      switch costume to pickup
      wait 1 secs
      switch costume to throw
      broadcast 25barrel2
      wait 0.3 secs
      switch costume to idle
      wait pick random 3 to 4 secs
      switch costume to pickup
      wait 1 secs
      switch costume to throw
      broadcast 25barrel3
      wait 0.3 secs
      switch costume to idle
```

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

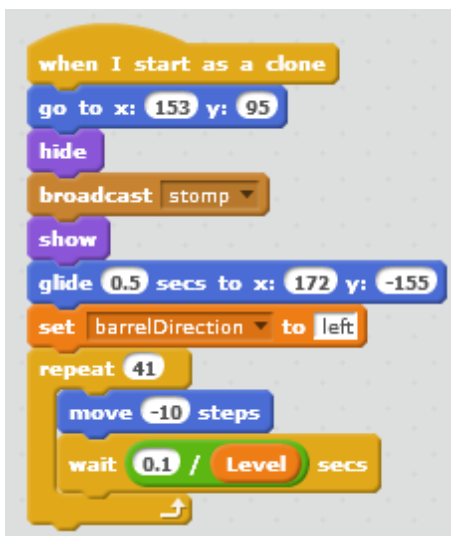
Using Cloning for Barrels

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 maintain your 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:



And associated specific code when the Clone Starts:



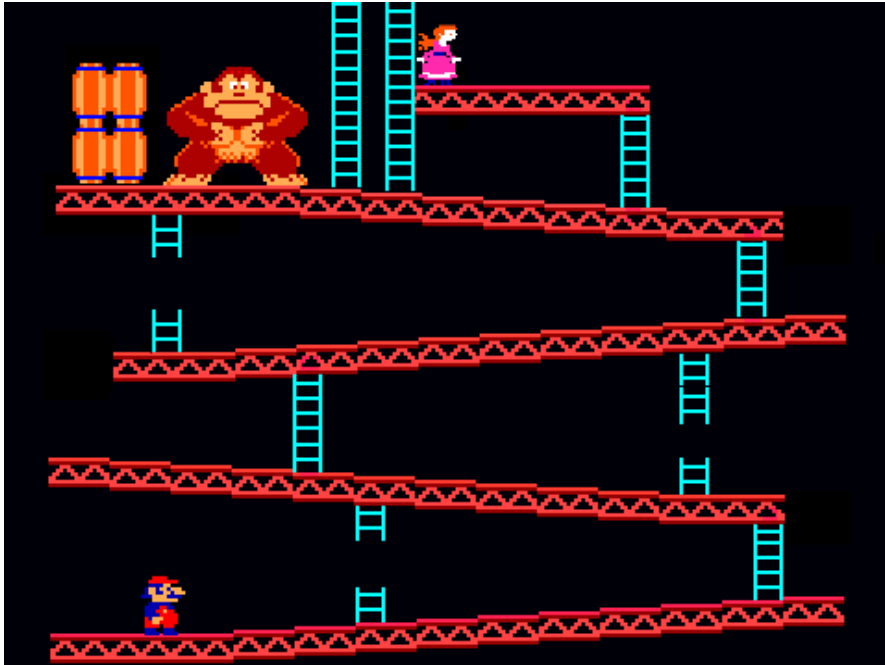
But of course you might need to make the operation of the clone dependent on variables to control the behaviour of the clone and you should have code that deletes the Clone, either on an event or when the function of the clone has been completed.



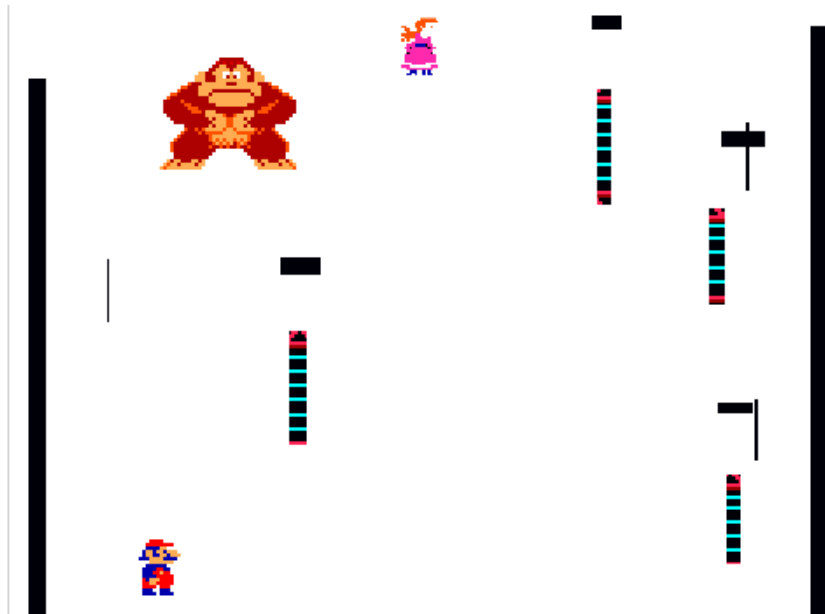
Because clones can be create in code, any variables used in the sprite code can either be associated only with this clone, or with all clones. This gives us some flexibility in controlling how code will work.



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:



```

when I receive game start
  forever
    if key up arrow pressed? then
      if Mario Action = normal then
        if touching 25m ladder sensor ? then
          if 25M Floor = 2 then
            set Mario Action to climb
            go to x: -77 y: -65
            switch costume to climb1
            repeat until touching Floor 3 ?
              if key up arrow 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 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
  show
  go to x: 101 y: 163
  go back 51685 layers
  forever
    if touching Mario ? then
      broadcast win
  
```

Or to detect if Mario reached the Princess

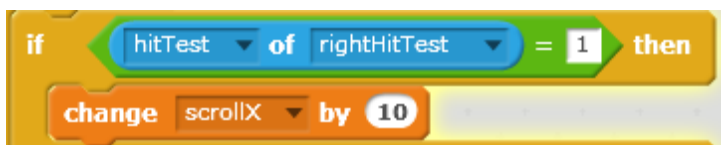
Sensing Block around Mario



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



Improvements to the Game

- Randomizing the possible barrel paths, including avoiding ladders?
- Can we use Cloning to reduce the number of sprites?
- Add Scoring
- Add Lives
- Add Level's of Difficulty
- Add fireball's to chase Mario

To Be Added

Code for Princess