# Space Invaders Game Design

**Start by loading up ‘SI – Begin’ in Scratch.** This contains various sprites you can use to get going.

## Easy

### Preparation (mostly already done)

You start with the background already set to black. Also, the graphics have been imported from the graphics folder. Note that the invader sprite has 3 costumes. Just to tidy things, move all the sprites to the right.

### Control the Ship

First move the ship sprite to the bottom left of the stage.

The ship simply moves along the bottom of the screen, left and right. So the controls for this are simple.

### Create the Bullet sprite

Choose to paint a new sprite.

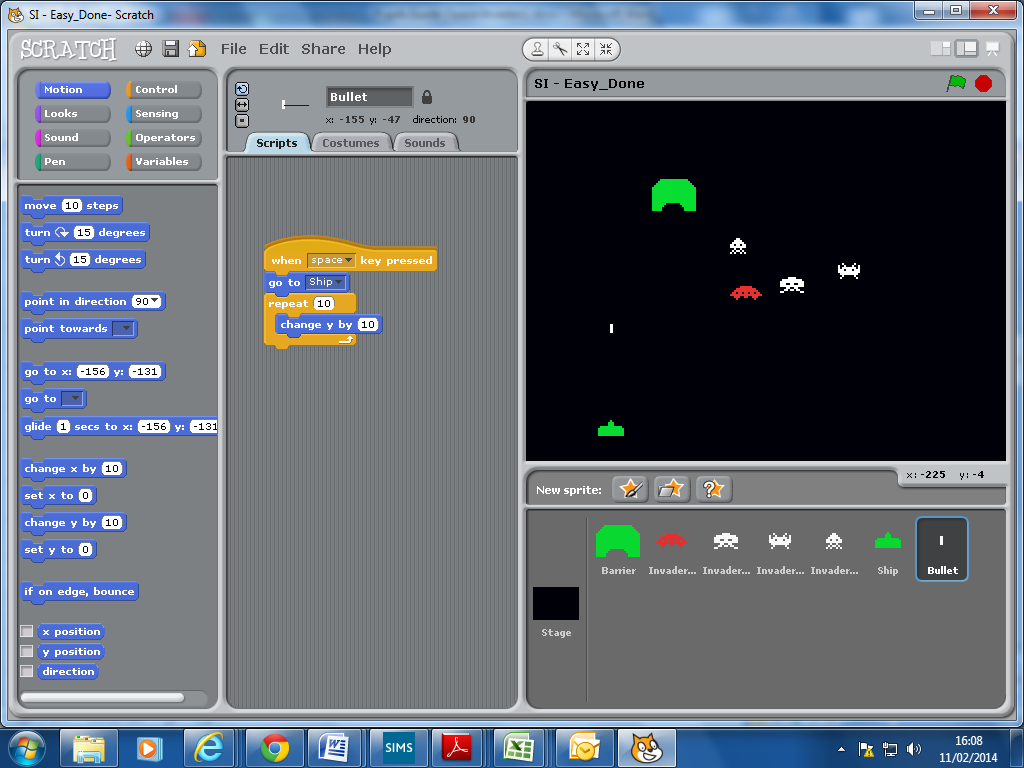
Somewhere in the centre of the canvas, use the straight line tool to draw a very short, vertical, **white** line.

Rename the sprite “bullet”.

### Firing the bullet

We want the bullet to fire from the tip of the ship when we press a button (let’s use the space bar). The bullet needs to travel upwards until it just goes off the top of the screen.

We don’t want something to repeat forever, just to the top of the screen. **Adjust this number so the bullet goes right to the top.**



This will make the bullet always start from the tip of the ship

Adjust this value to alter the speed of the bullet

### Sound for the bullet

### Next, we need to set up the sound for when the laser fires.

### Select the bullet sprite and click on the Sound tab. Select import and navigate to the electronic folder where there are some laser sounds. Import.

### Then modify the code for the bullet to this:

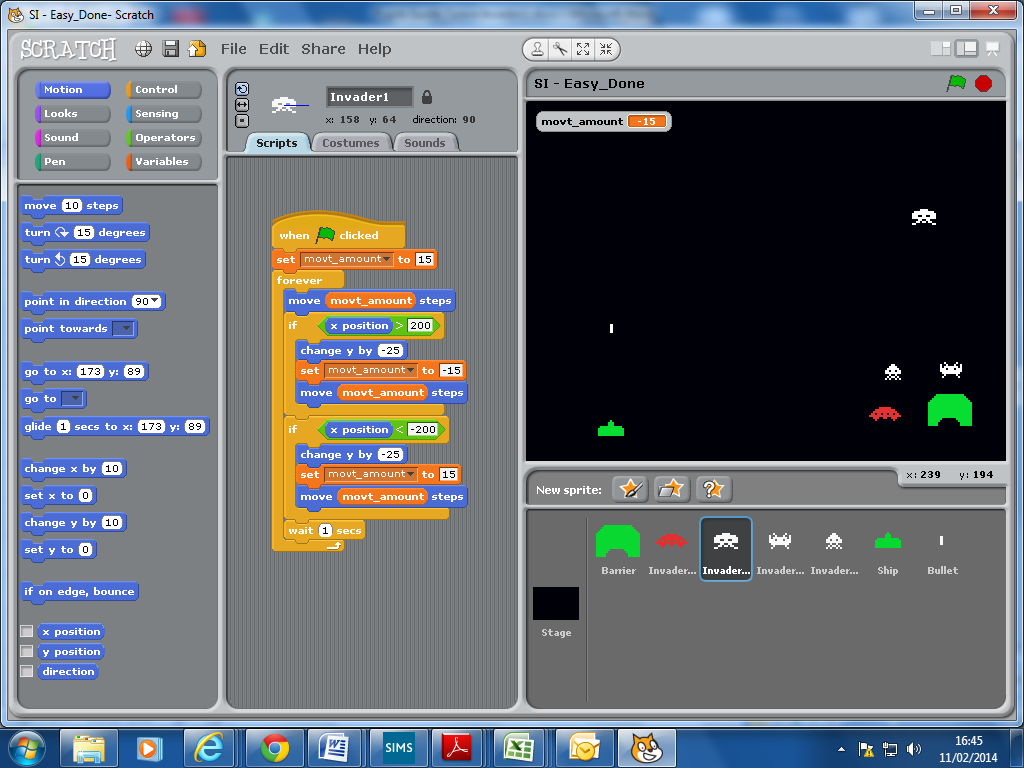
### Setting up an invader to move

First drag Invader\_1 to somewhere on the left edge (about 2cm from top and 1cm from the edge).

Next create a variable called ***movt\_amount*** and set up the following block.

The ***movt\_amount*** variable controls how far the invader moves in one go and its direction: try adjusting this to 10 and then 20 (also -10 and -20), see what effect this has.

The two ***ifs*** make sure that the invader doesn’t get right to the screen edges. When the invader goes past an x co-ordinate of 200 (or less than -200) it will switch direction. Test this out.



Each time the invader gets to one side, it should drop downwards and get ever closer to the ship. Now modify the above block to look like this:

The ***change y by -25*** makes the invader lower. The ***move*** has now been placed into the ***ifs*** to make the movement smoother. The ***wait*** has moved to the end. Try changing the wait time and see what happens.

### Scoring a hit on an invader

### Again, fairly simple. For the invader, add this code:

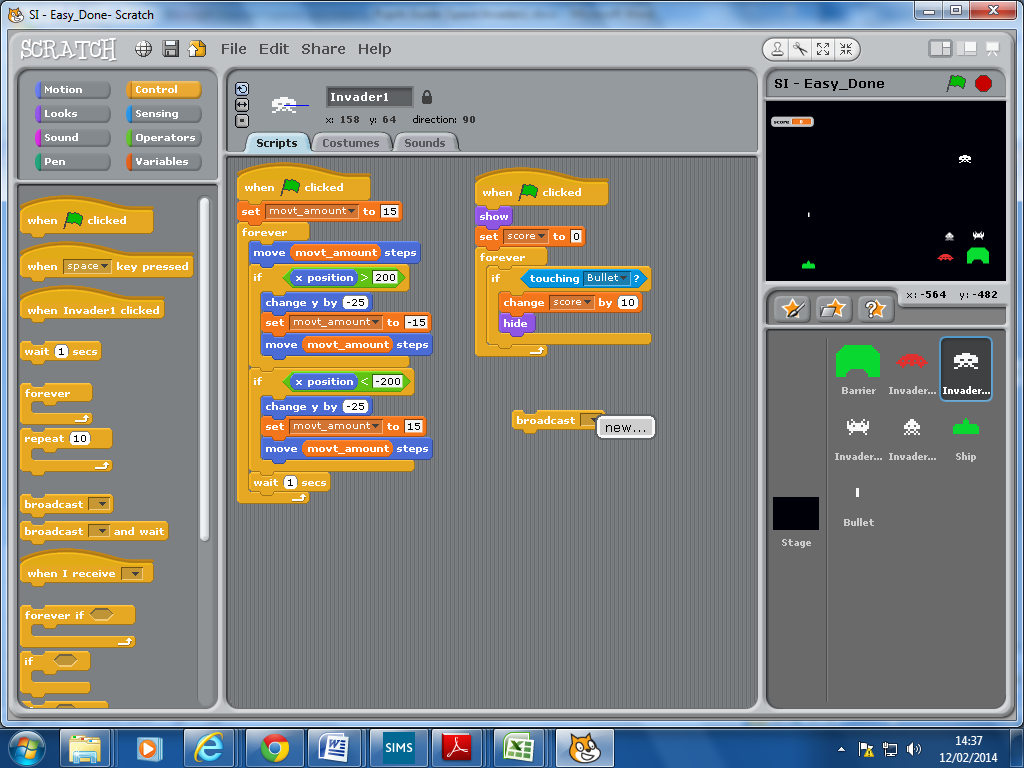
## Medium

**Using Broadcast Messages to tidy up a few problems**

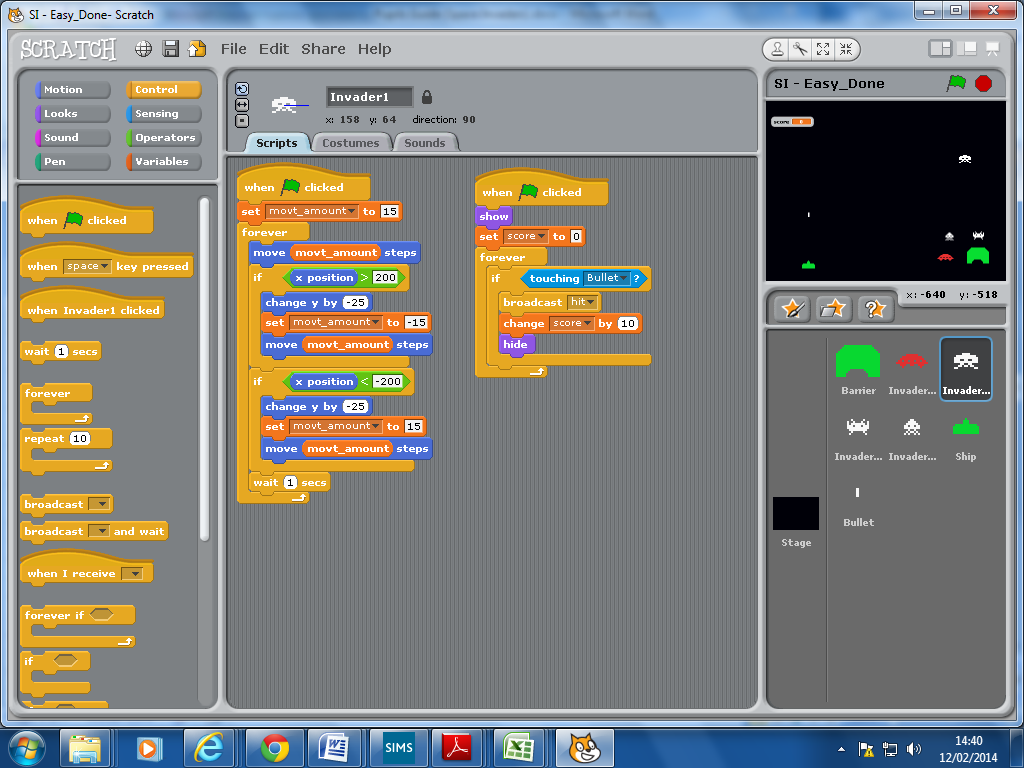
1. **Stopping the bullet after a hit.**

With the previous code block to score a hit on an invader, the invader does ***hide*** when it gets hit, but if you test this you’ll see that the bullet just keeps on going. This is a problem because in the game there are often more invaders above the one you hit first.

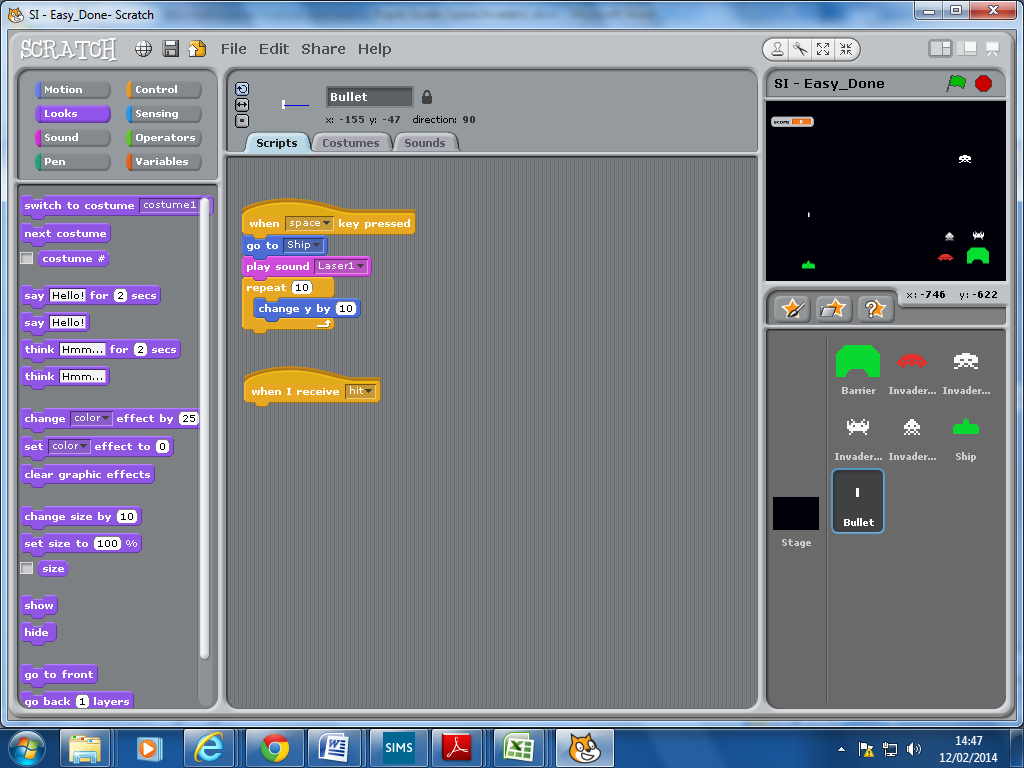
Making the bullet hide is not enough, because it will still destroy the invaders above. What we need is a way of stopping the bullet dead as well as hiding it.

To solve this, we can make the invader ***broadcast*** a message when it gets hit. Broadcast messages allow sprites to communicate what’s going on with each other. In this case we want the invader to say that it’s been hit, which is a signal for the bullet to stop.

For the invader, first create a new ***broadcast*** message

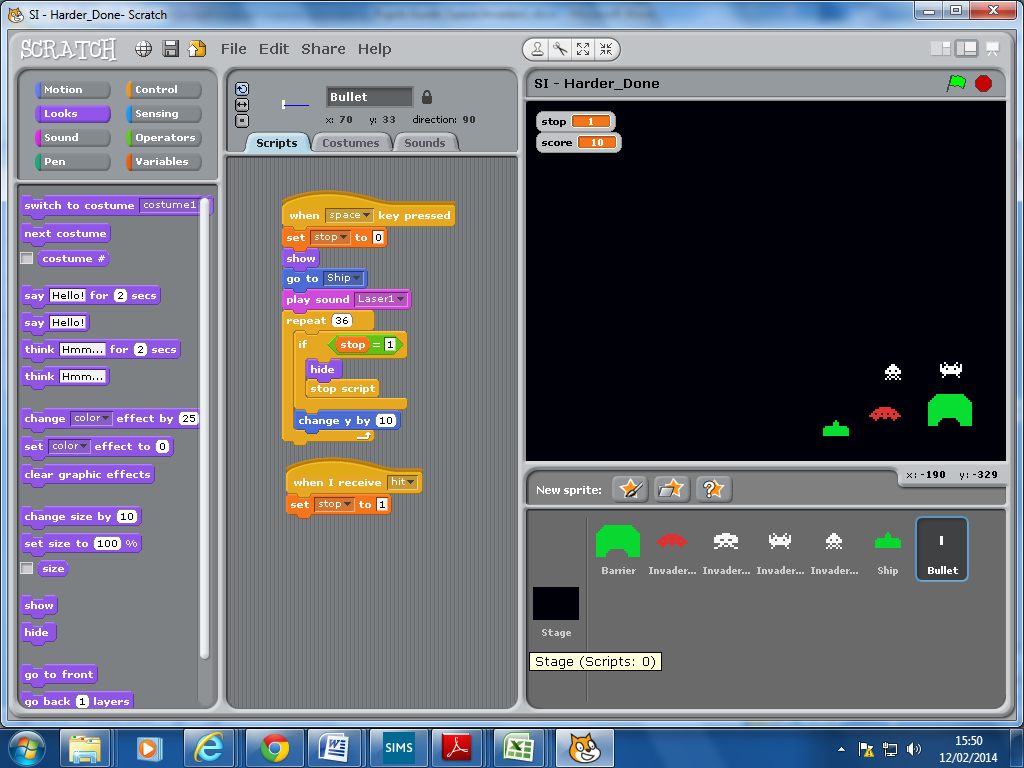


Name it “hit” and insert it into the existing block, like this:



Then for the bullet sprite, begin this block:

We now need a new variable called “stop”. We will use it to tell us if the bullet needs to stop, true or false. The easiest way is to do this is to give it a value of either zero or one, 0 – means False, 1 – means True.



Means set “stop” to False, each time you fire.

So …

Note that we are also hiding and

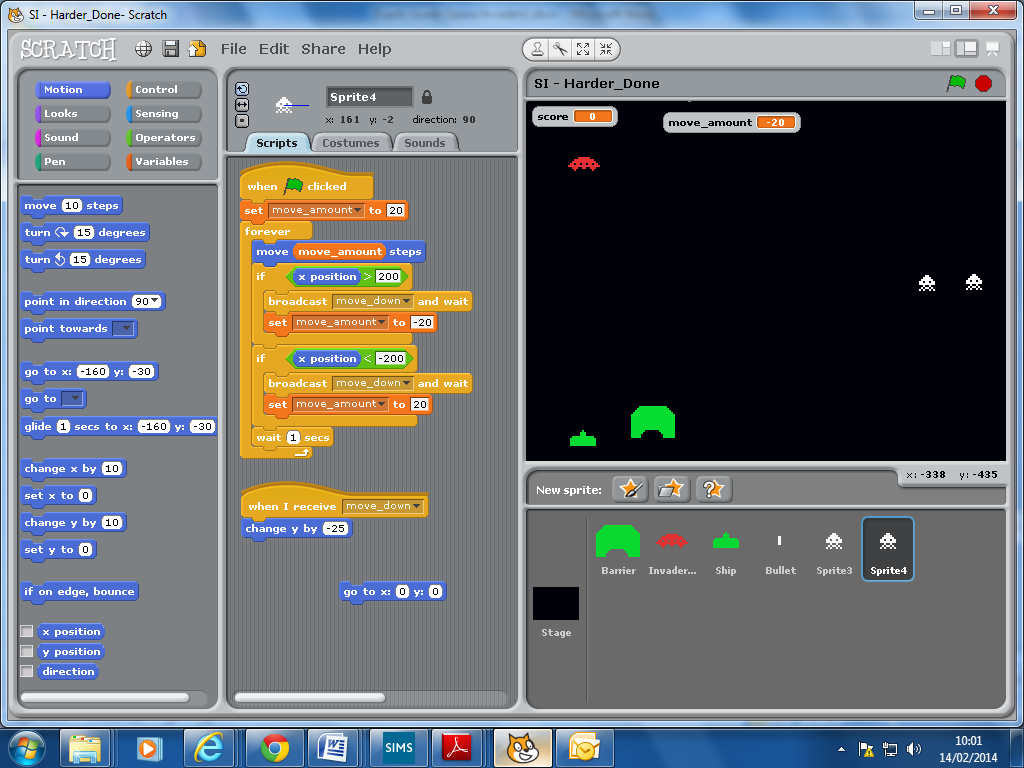
Whilst the bullet is moving, if you’ve scored a hit, stop the bullet (and hide it).

showing the bullet as needed.

Means set “stop” to True, each time you score a hit.

1. **Making sure all invaders move together**

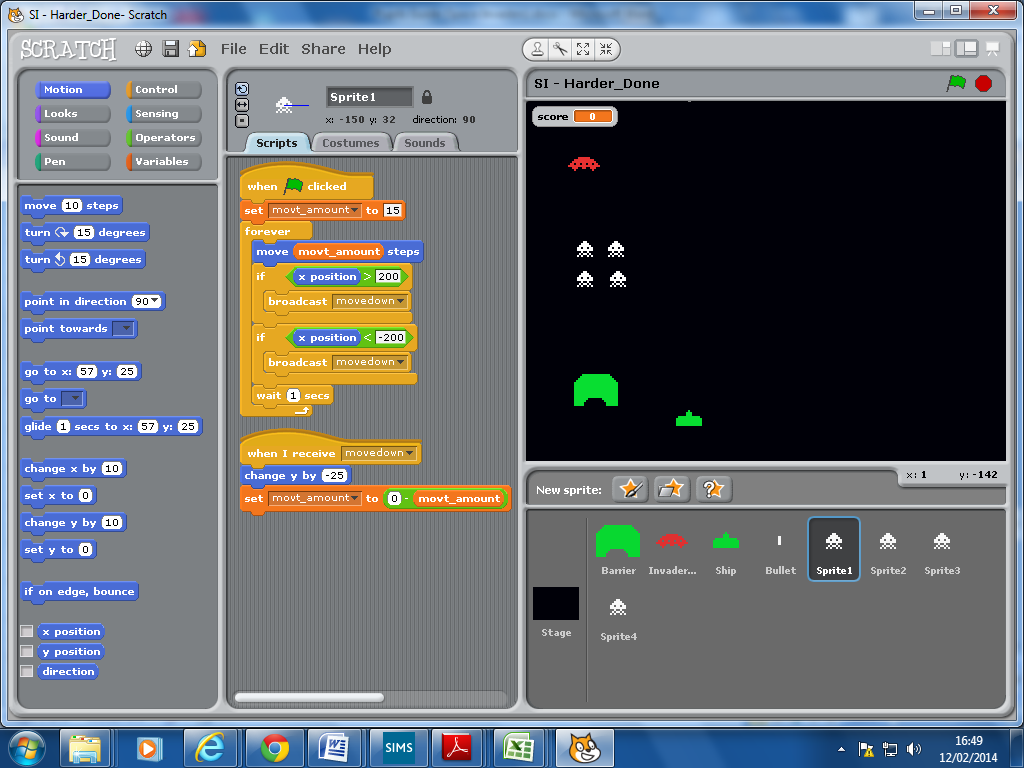
In the game, all the invaders should move as a block. When an invader at the edge of the block gets to the edge, this should be the signal for all invaders to move lower.

The only way to accomplish this is to make each invader capable of broadcasting a message if it has reached the edge. All invaders should be set to receive this message and move downwards.

So we need another broadcast ***movedown***

This means we can modify (and simplify) the invaders movement code to this:

***Movedown*** lowers all invaders

Now test this out by duplicating several invaders, positioning them in a block, and then running the programme. Do they move as they should? Try shooting some invaders.