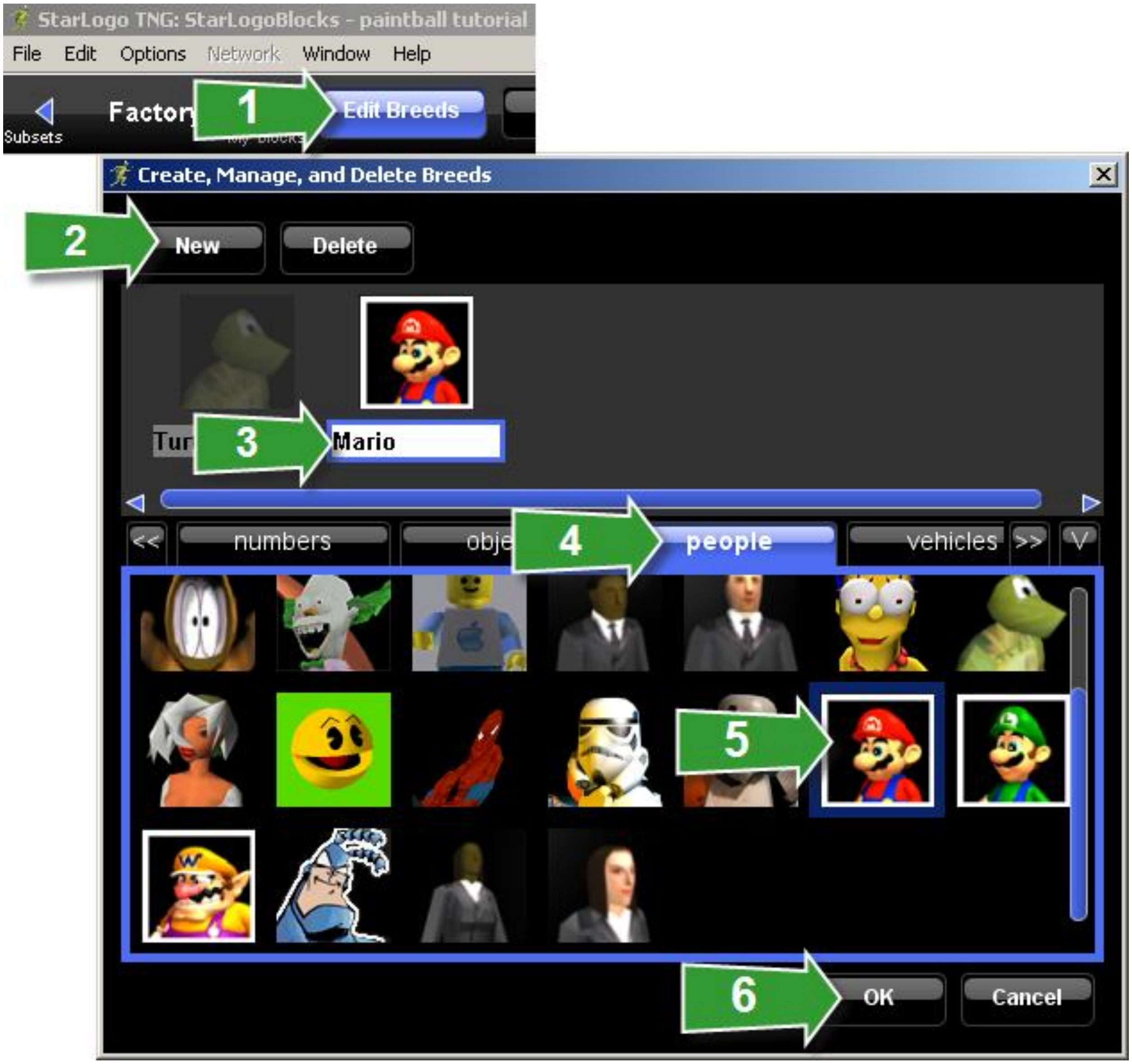
Build a Paintball Game (part 1 of 6)

The Paintball project illustrates some of the basic game-play elements that can be easily programmed with StarLogo TNG. This includes movement, collisions, terrain and "say bubbles." In this game we'll create an agent breed called "Mario" who will run around and fire spheres of paint at some turtles to give them some color.

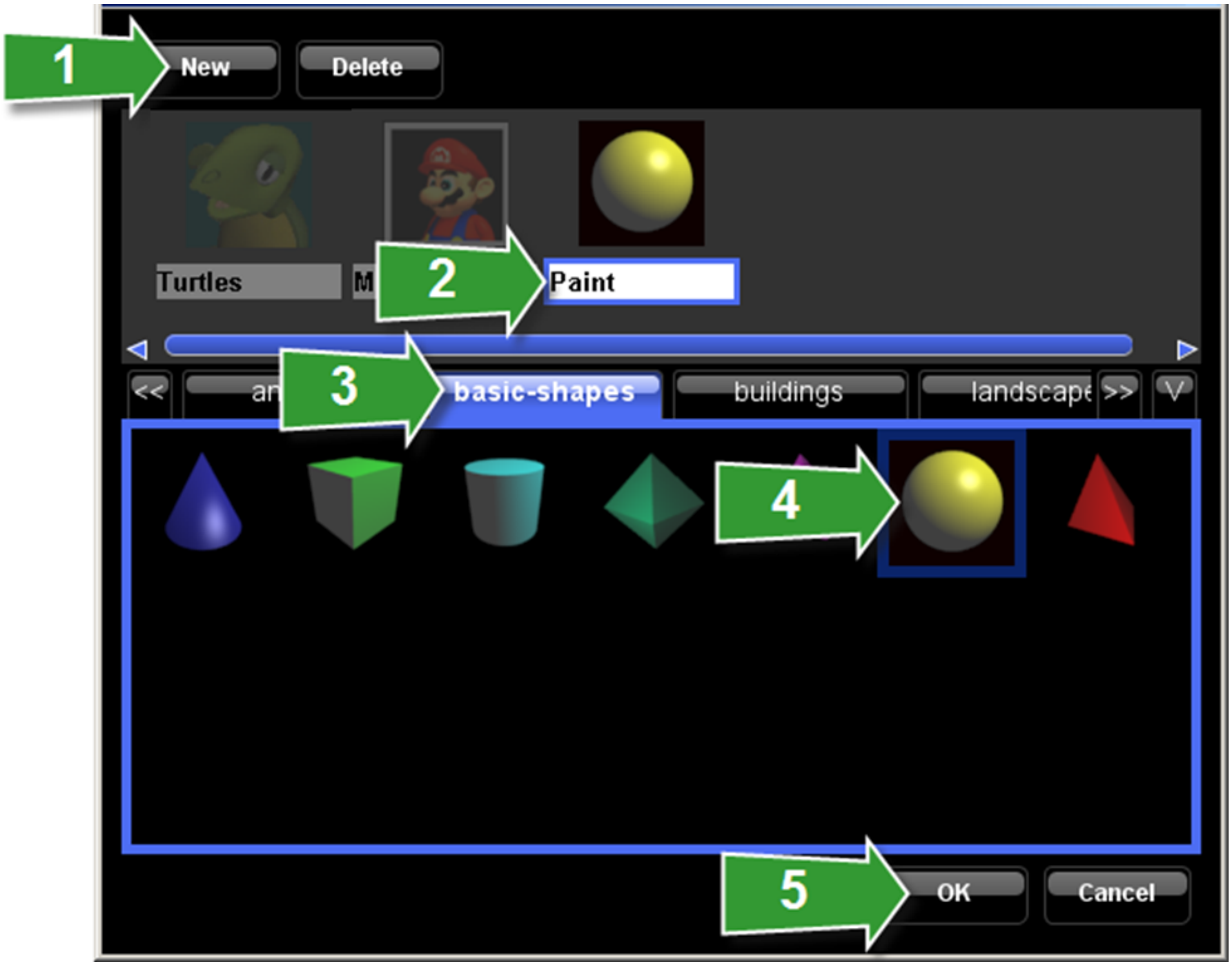
Setting up Breeds

We start this game by thinking about the breeds that we'll need. Let's leave the Turtle breed (though we'll change its shape in a minute). But let's add two new breeds. We'll add *Mario* who will look like Mario. And we'll add *Paint* that Mario can throw. Open the Breed Editor by clicking on the Edit Breeds button to the right of the My Blocks button. Click New to add a new breed, give the name Mario to the breed and select Mario as the shape.



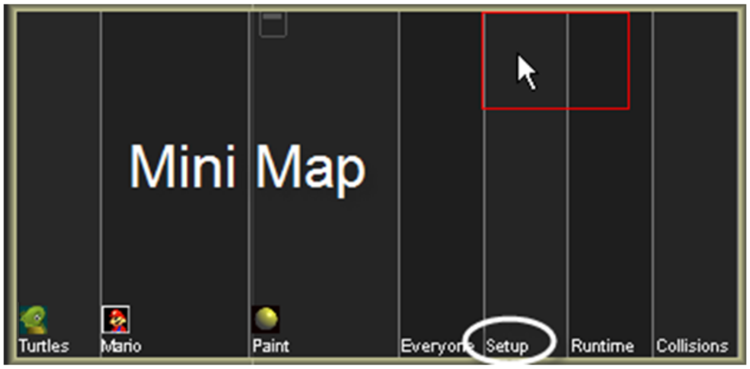
Mario

Make another breed called Paint and select the sphere shape. Finally click on the Turtles breed and select the turtle shape with a slight blue background in the Animals category - these are turtles that can be painted different colors.

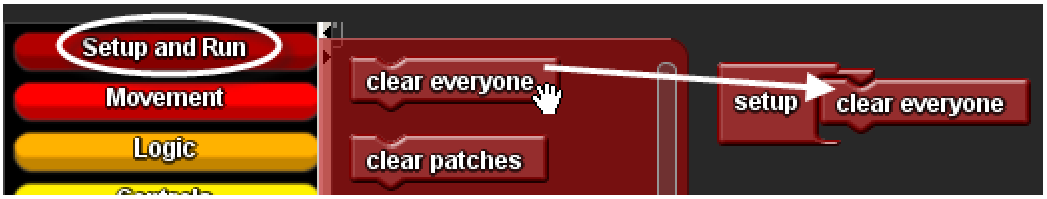


Setup Block

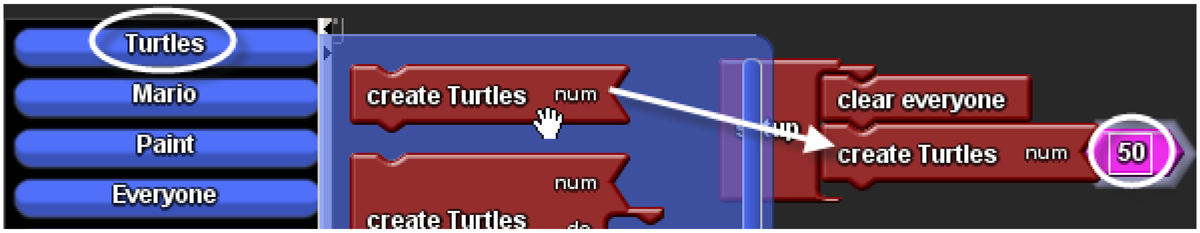
Navigate to the Setup section of the canvas. Click on the Setup and Run tab and drag out the Setup block. We will fill this with commands to clear everyone from the previous run, create one Mario agent and a bunch of Turtle agents, and set the camera angle to show Mario's perspective.



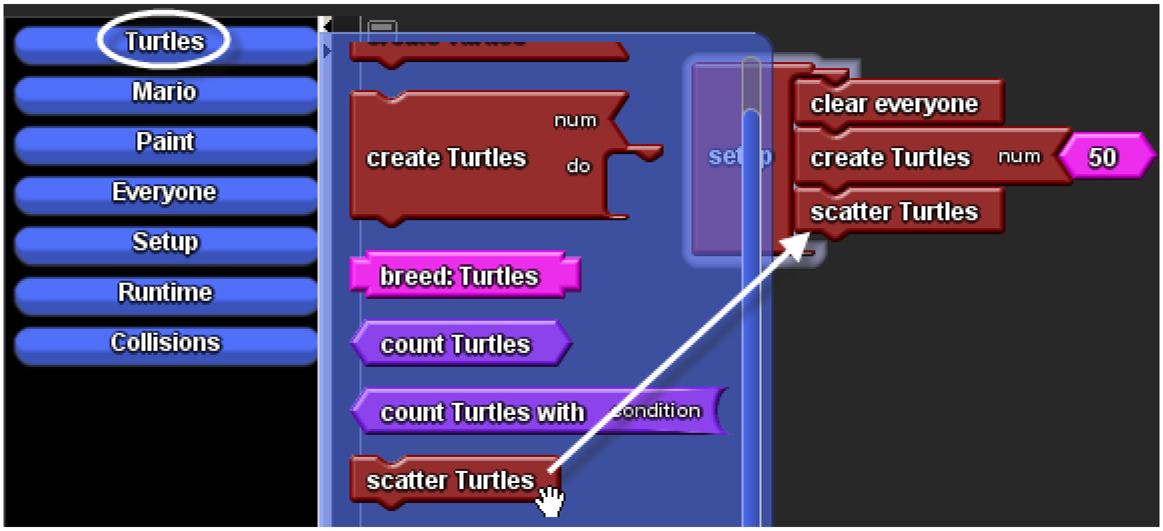
Click on the Setup and Run tab, drag out the Clear Everyone block and attach it to the Setup block.



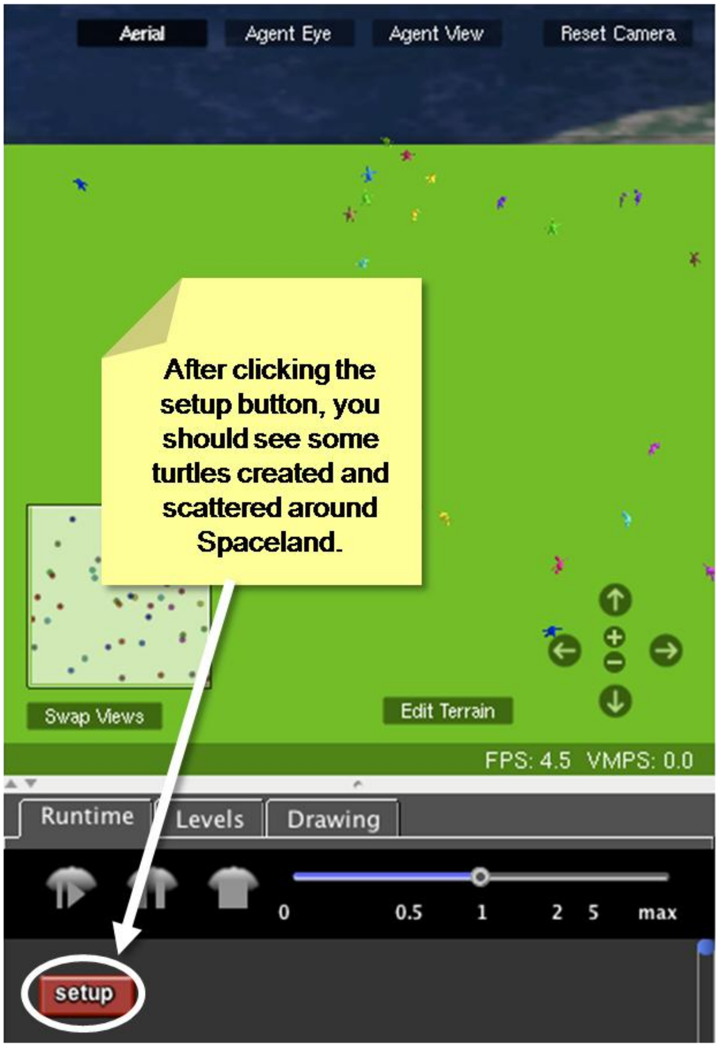
Click on the My Blocks button, open the Turtles drawer, drag out the Create Turtles block, and attach it below the Clear Everyone block. Change the number to 50.



Click on the Turtles tab again, drag out the Scatter Turtles block and attach it to stack in the Setup block. This block will scatter the turtles randomly around Spaceland.

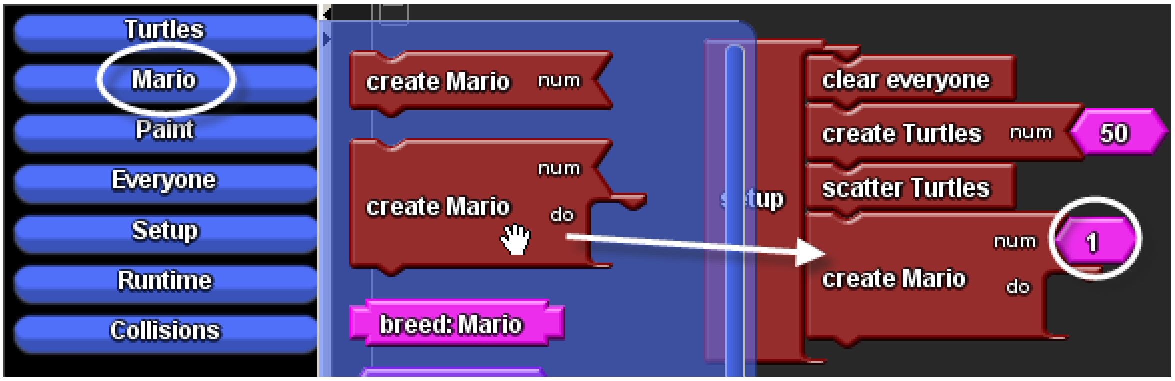


Test out your Setup code by clicking on the Setup button in the Runtime window.

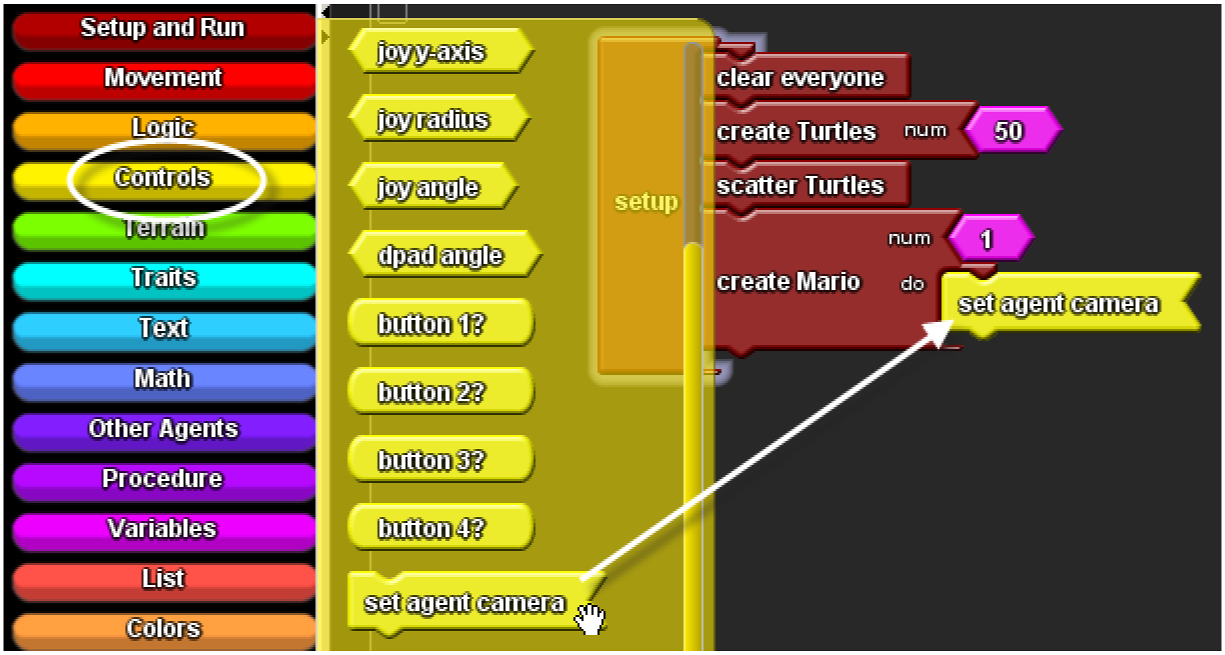


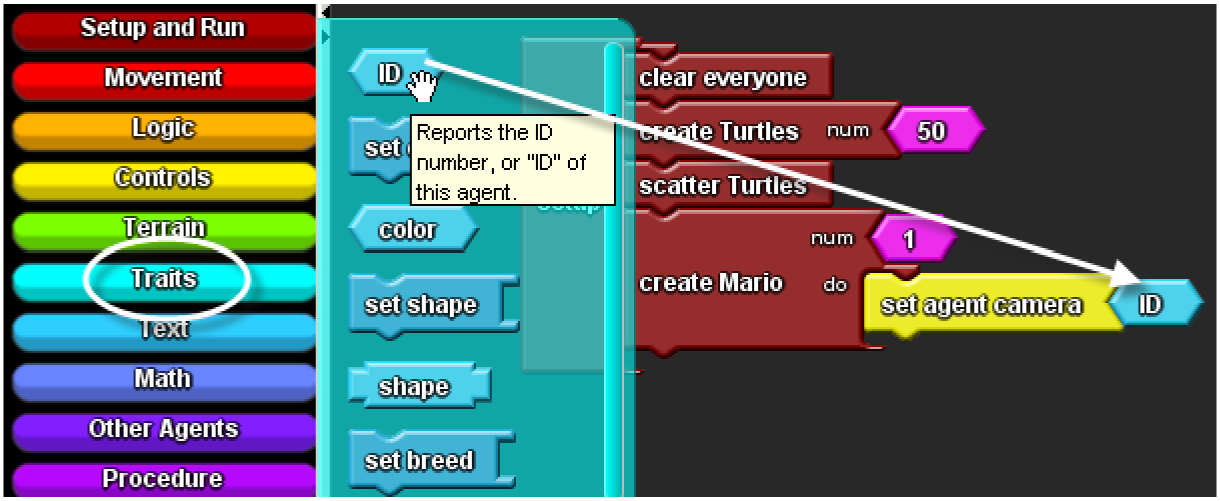
After clicking the setup button, you should see some turtles created and scattered around Spaceland.

Go back to the Setup block and click on the Mario tab in the My Blocks palette. Drag out a Create Mario Do block. This block has two parts - the top part specifies the number of agents to create, and the second part specifies additional instructions for these newly created agents to do once. Change the pink number to 1.



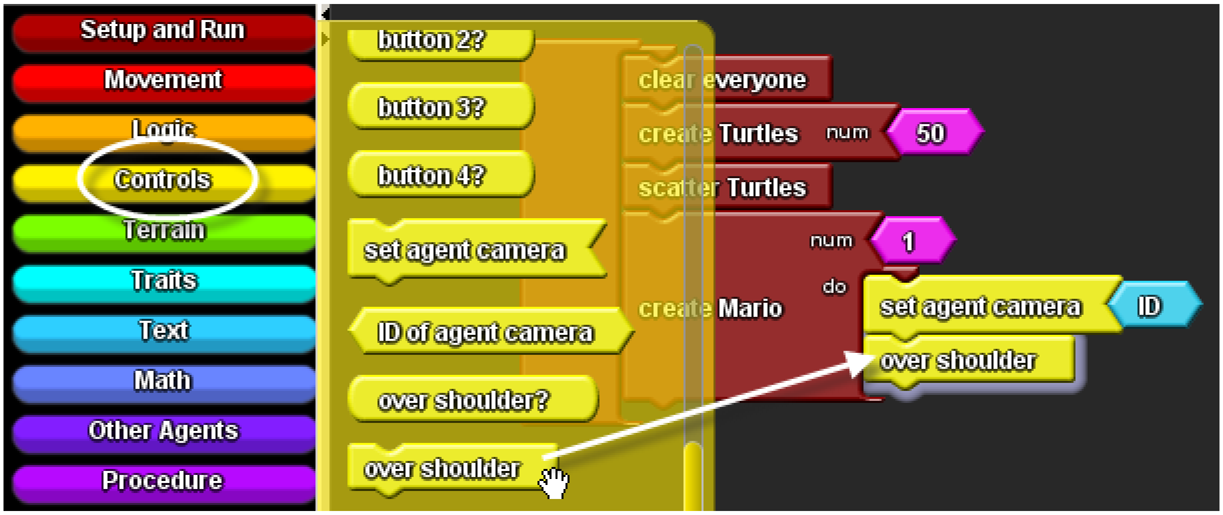
Click on the My Factory button and click on the Controls tab. Drag out the Set Camera block and attach it to the Do section of the Create Mario Do block. Set Camera takes an argument that's the ID of an agent. In this case, we want Mario's ID, so we just go to the Traits tab, drag out the ID block, and attach it to the Set Camera block. This will set the agent camera to follow Mario (note that this doesn't apply to 2D or aerial view).



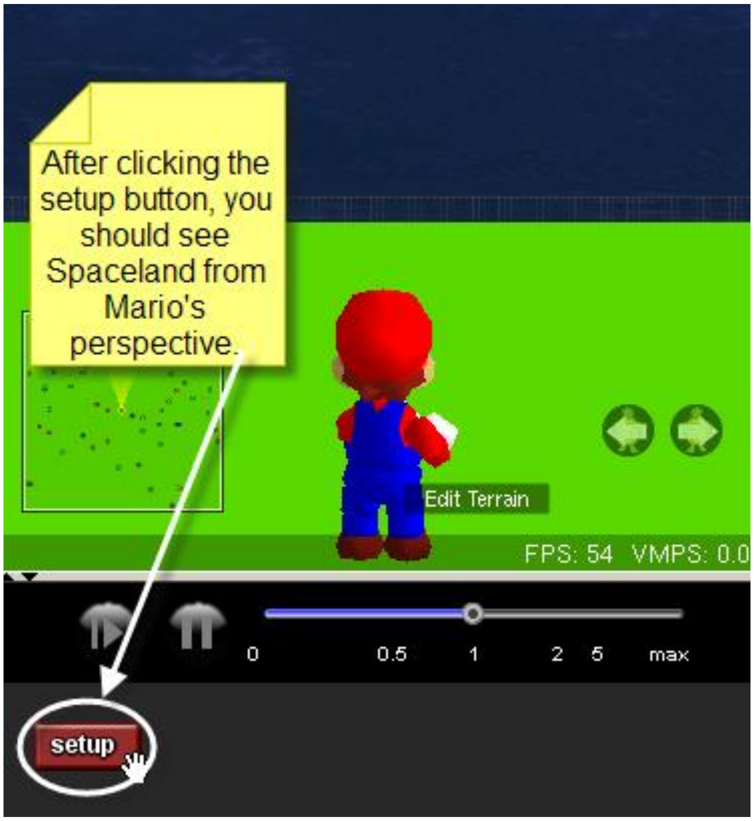


Reports the ID number, or "ID" of this agent.

Finally, to set the camera view so that we "see" from Mario's perspective, click the Controls tab and drag out the Over Shoulder block. Attach this block below the Set Camera block.



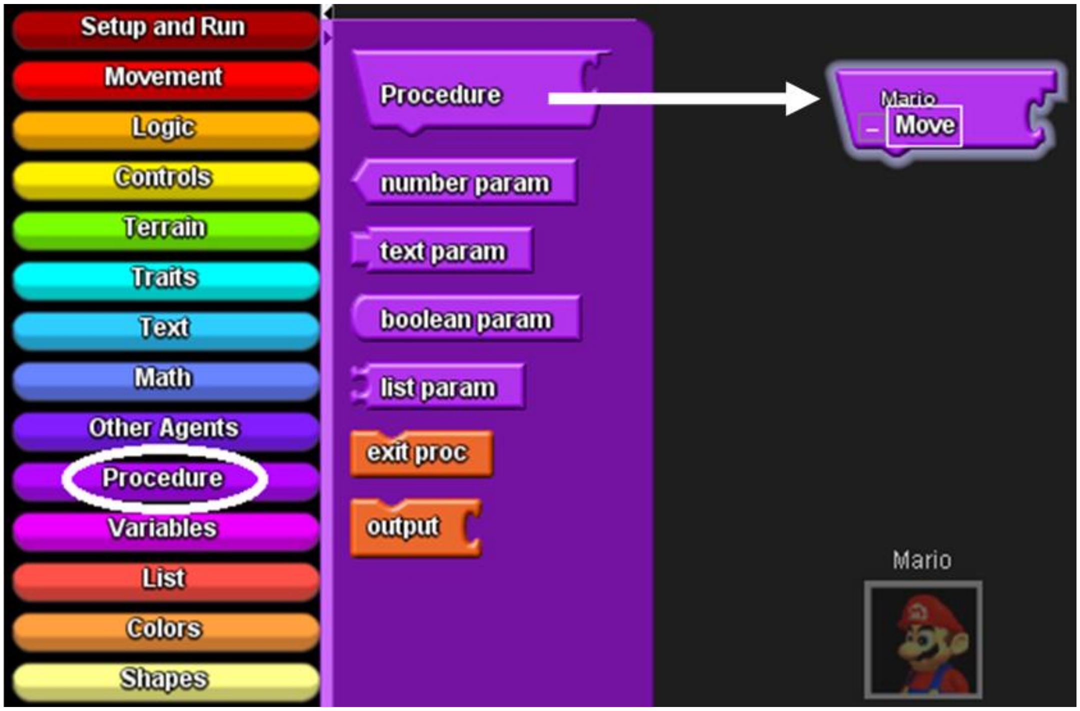
Now test out the Setup code again by clicking the Setup button in the Runtime window.


After clicking the setup button, you should see Spaceland from Mario's perspective.
Edit Terrain
FPS: 54 VMPS: 0.0
0
0.5
1
2
5
max
setup

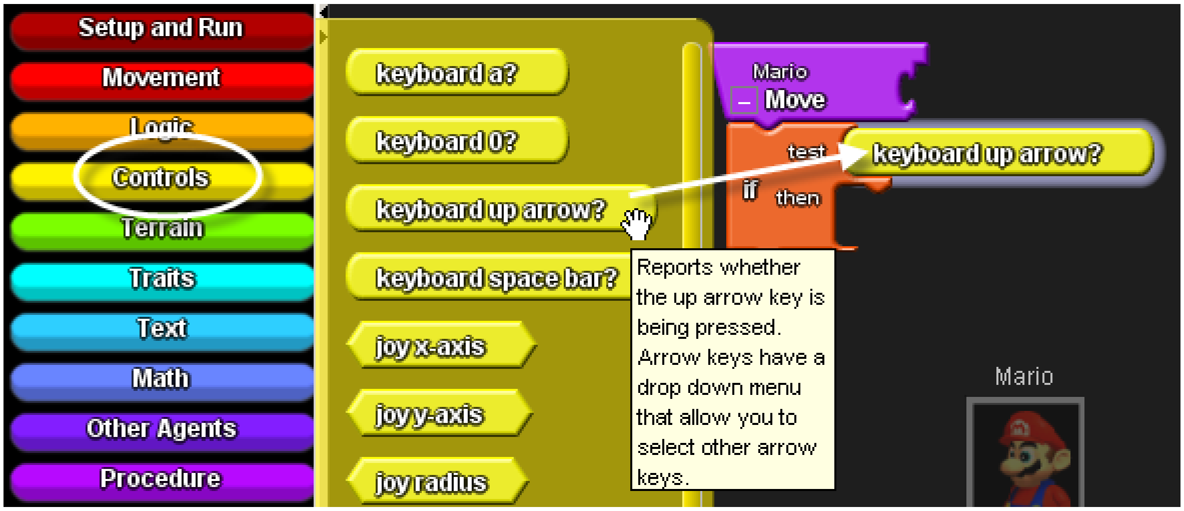
Build a Paintball Game (part 2 of 6)

Movement

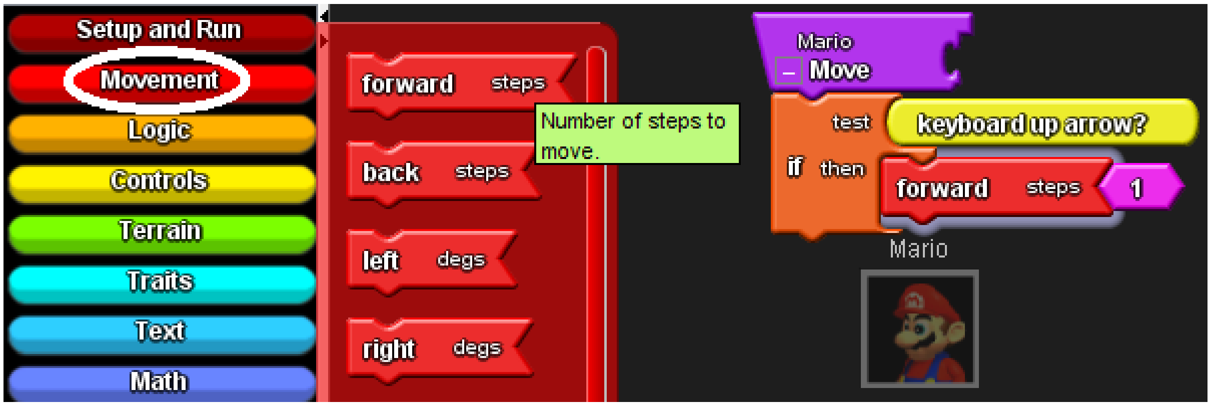
In first person player games, there must be some way for the player to control the movement of the player's character. We will program keyboard arrow keys to make Mario move. For instance, the up arrow key moves Mario forward 1, the down arrow key moves Mario backward 1, and the left and right arrow keys make him turn in place. Let's begin by defining a "Move" procedure. Grab a procedure block from the Procedures tab. Put this on the Mario section of the canvas and rename it Move.



Grab an If block from the Logic tab and attach it underneath the Move procedure hat. For the test condition, go to the Controls tab and grab a block that says "keyboard up arrow?". This block will only be true when someone is pressing the up arrow key. In the Then section of the block, attach a Forward block.

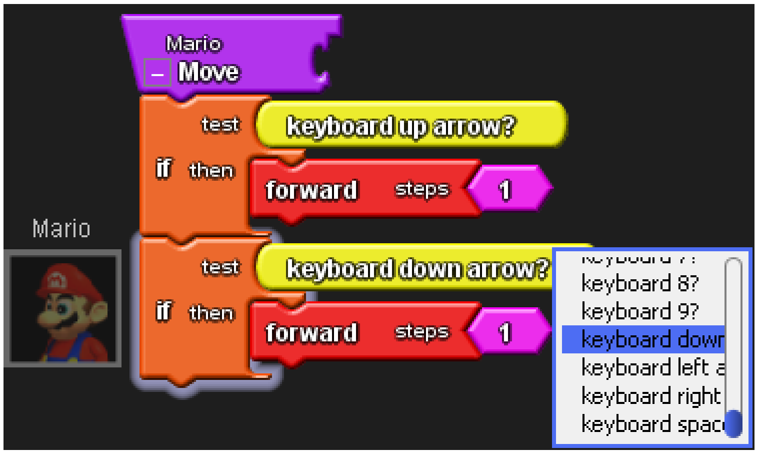


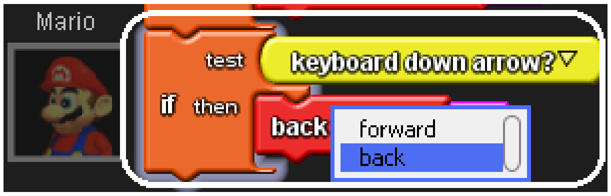
Reports whether the up arrow key is being pressed. Arrow keys have a drop down menu that allow you to select other arrow keys.



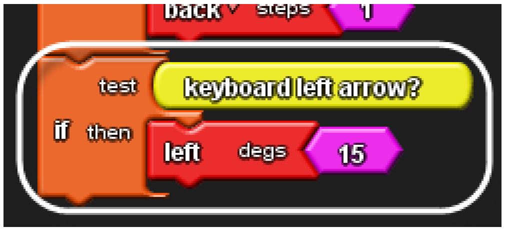
Number of steps to move.

Bring out another If block (or copy the one that is out there using control/command-c to copy and control/command-v to paste) and instead of the up arrow key, use the drop-down menu to change this to the down arrow key. Change the movement block to Back 1.

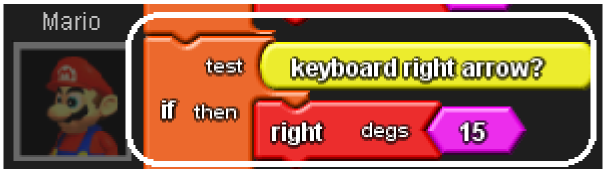




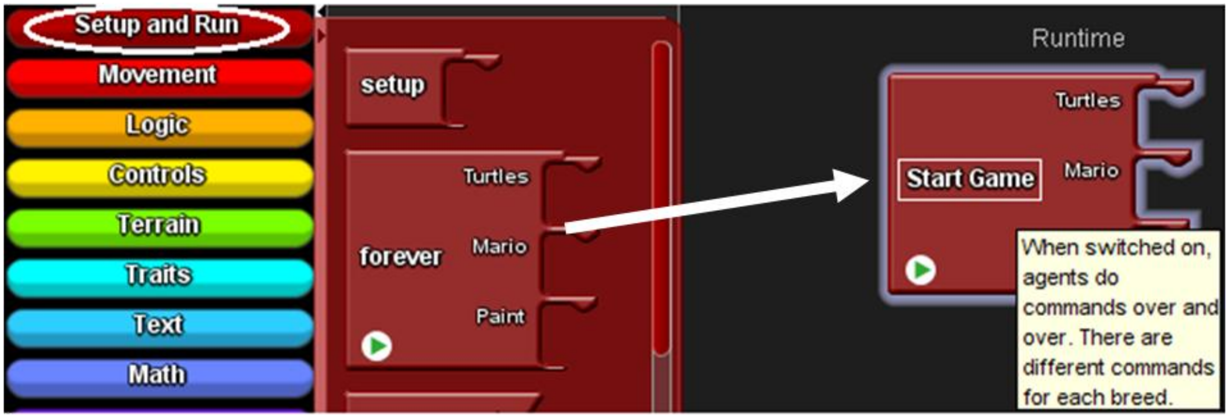
Copy the If block again, and change the key to be the left arrow key. Change the movement block to Left, and the argument to 15, for 15 degrees.



Finally, repeat that last step only using a right arrow key and a right 15 block. This can all be easily done by copying the last block you used and changing the conditions.

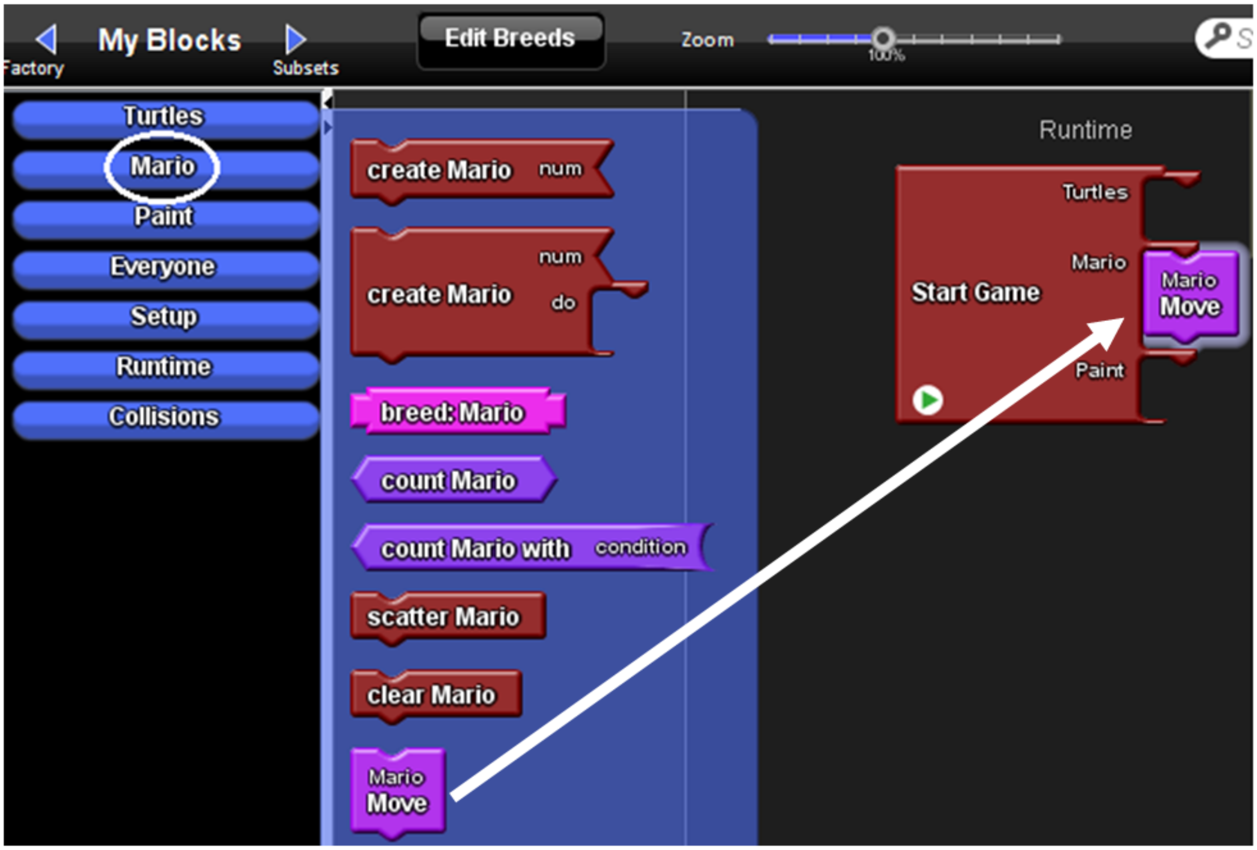


Drag out a Forever block onto the Runtime section of the canvas. Note that there are three sections in the Forever block, one for each breed. Rename the Forever block to Start Game.

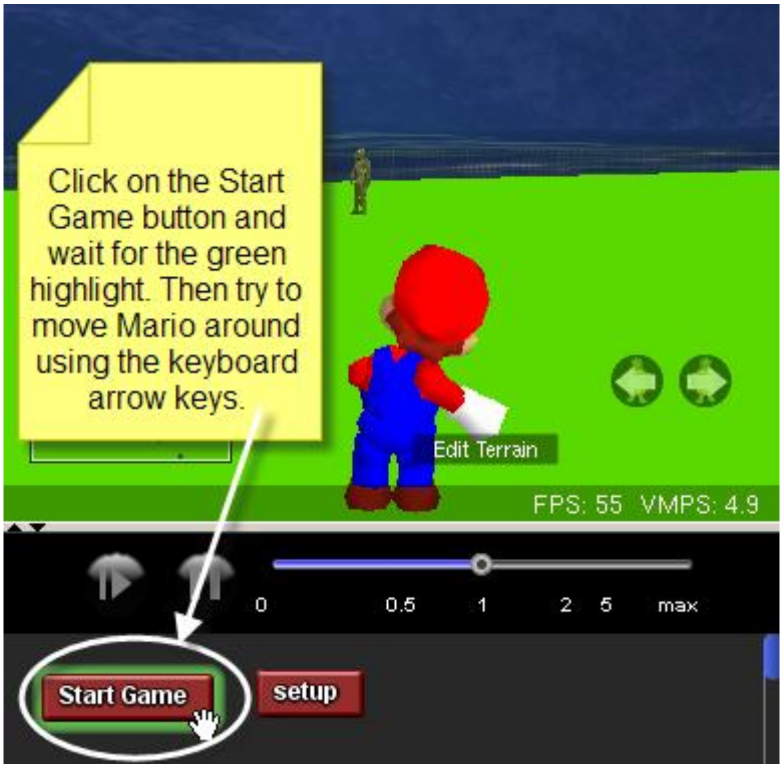


When switched on, agents do commands over and over. There are different commands for each breed.

Drag out a Move call block from the Mario drawer (My Blocks palette) and attach it to the Mario section of the Forever block.

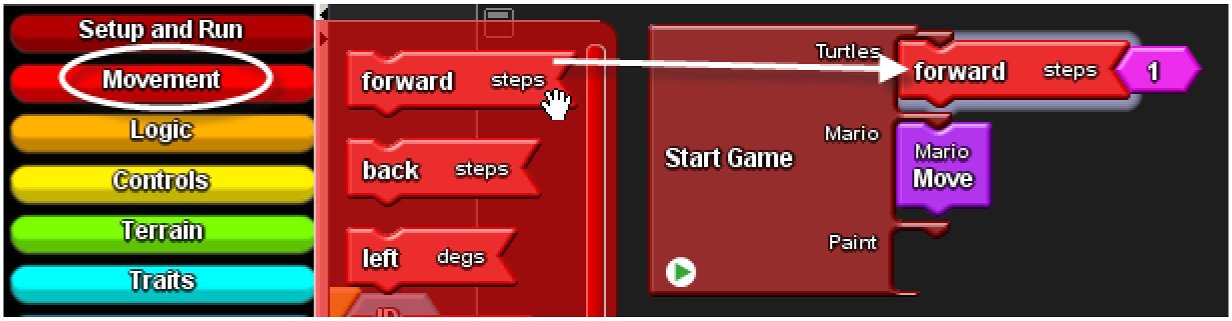


Now start the Forever block by clicking on the Start Game button in the Runtime window or clicking on the green arrow in the Start Game block on the canvas. Try navigating around using the arrow keys. See how Mario moves around the world.



Click on the Start Game button and wait for the green highlight. Then try to move Mario around using the keyboard arrow keys.

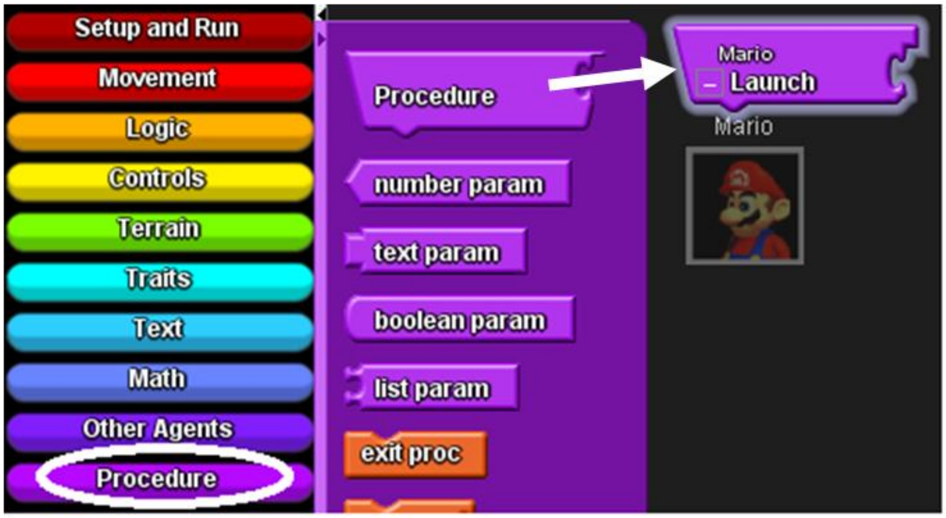
Notice that the turtles aren't moving. To make them move, drag a Forward block to the Turtles section of the Start Game (forever) block. Then start the game and see the turtles move.



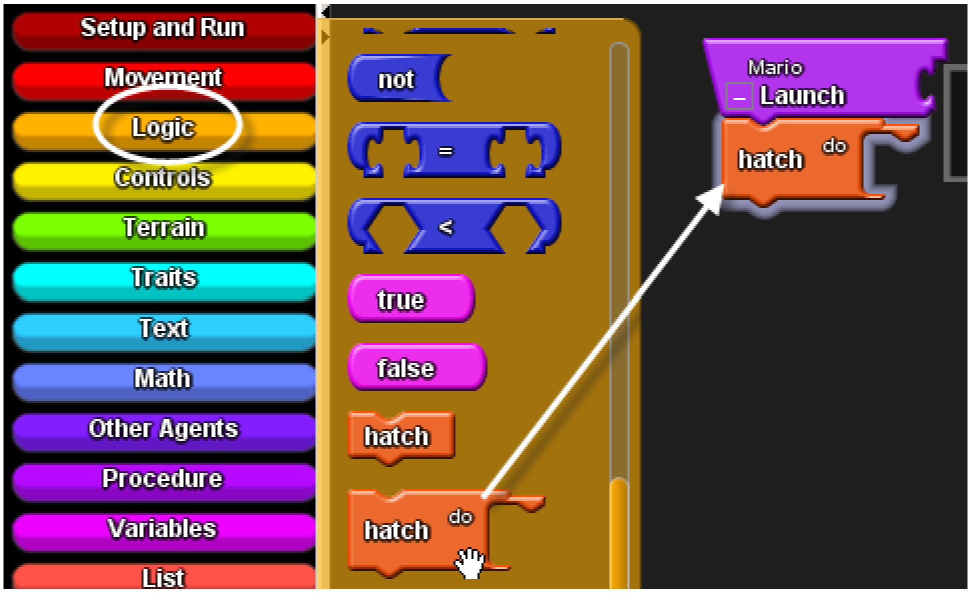
Build a Paintball Game (part 3 of 6)

Launching Paintballs

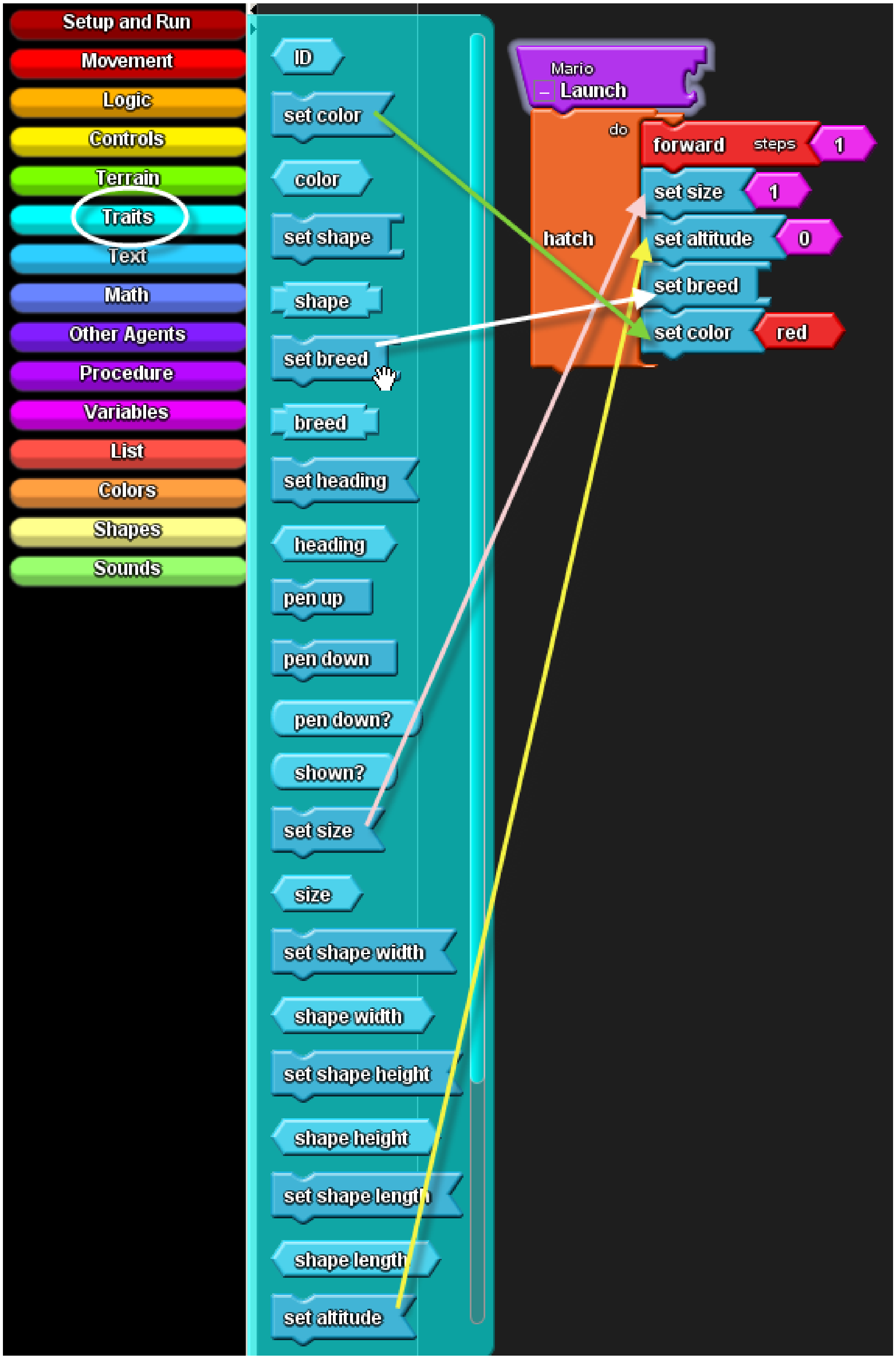
Let's program Mario to launch paintballs. We'll create a new procedure called Launch in the Mario section of the canvas.



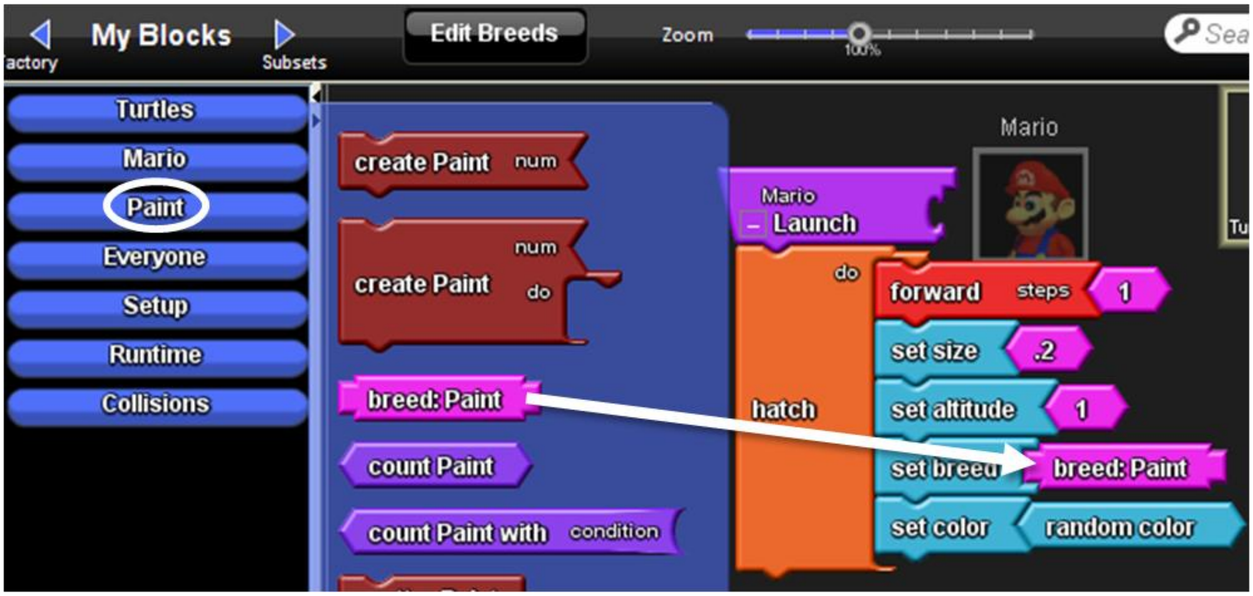
This procedure will "hatch" a new agent. Hatch creates an exact copy of an agent. But it also allows us to do some things to that newly created agent. In this case we want to create a small sphere and set it going. Grab a Hatch-Do block from the Logic tab and attach it to the Launch procedure.



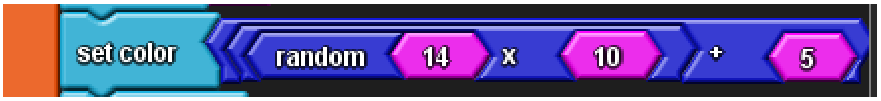
Inside of the Do section of the Hatch block, we want to have that new agent move forward a little, get a lot smaller, move off the ground, change its color to a random color and change its breed to "Paint". Drag out the Forward block from the Movement tab, and the Set Size, Set Altitude, Set Breed, and Set Color blocks from the Traits drawer.



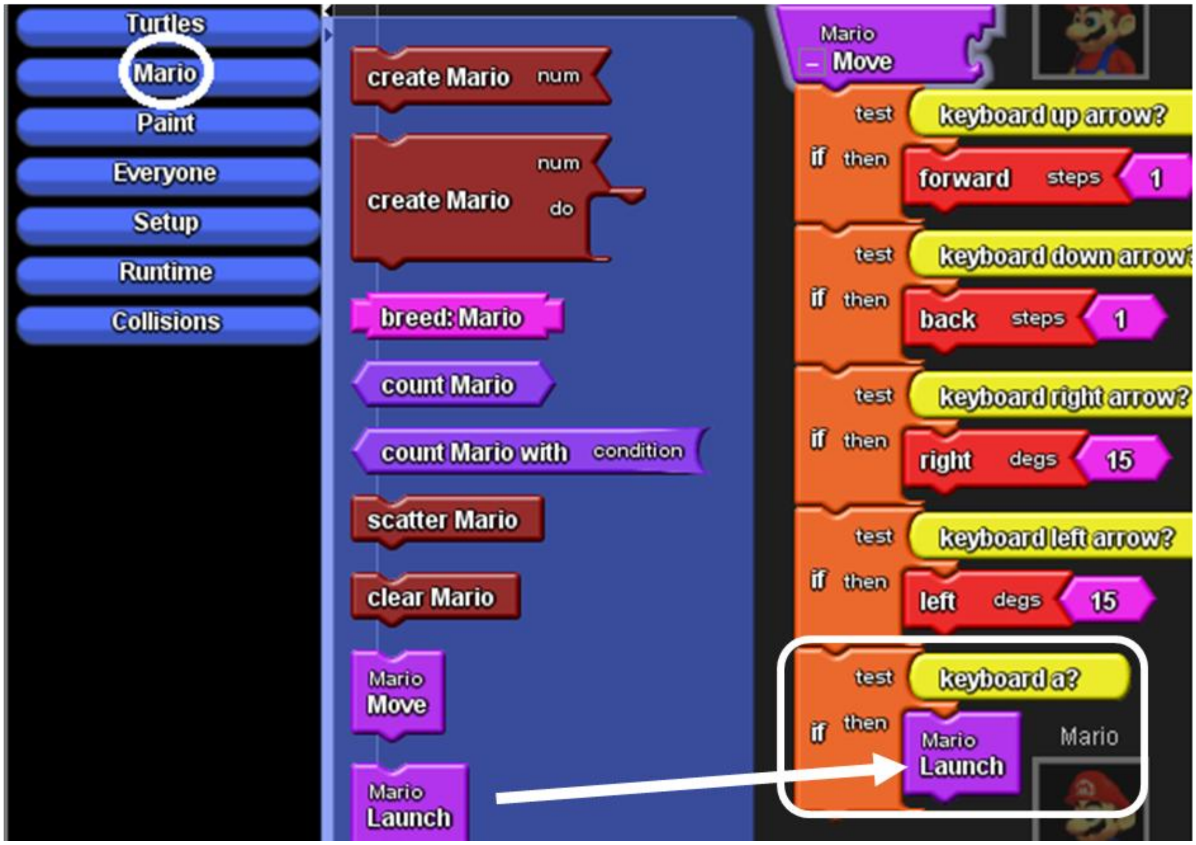
Set the agent size .2 and set agent altitude to 1. Set the color to random color (delete the default color red and find the Random Color block in the Colors tab).* Finally, find the Paint breed block in the Paint tab of the My Blocks palette.



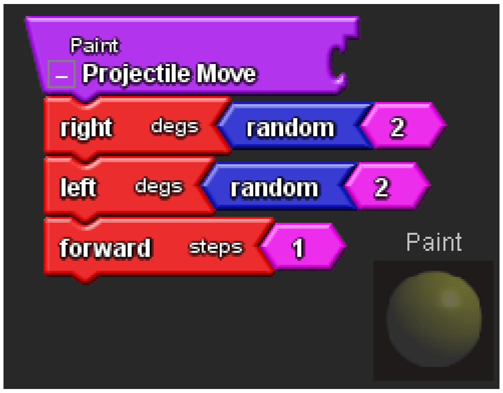
* ***If you are using StarLogo TNG 1.2:*** Color is a little tricky. There are 140 whole number colors in StarLogo TNG (there can be fractional numbers as well). The "main" colors in StarLogo are all of those that end in 5 (5, 15, 25, 35, etc.). These are all of the named colors. To create agents of only those colors you take a random multiple of 10 and add 5 to it. The blocks here show how to do that:



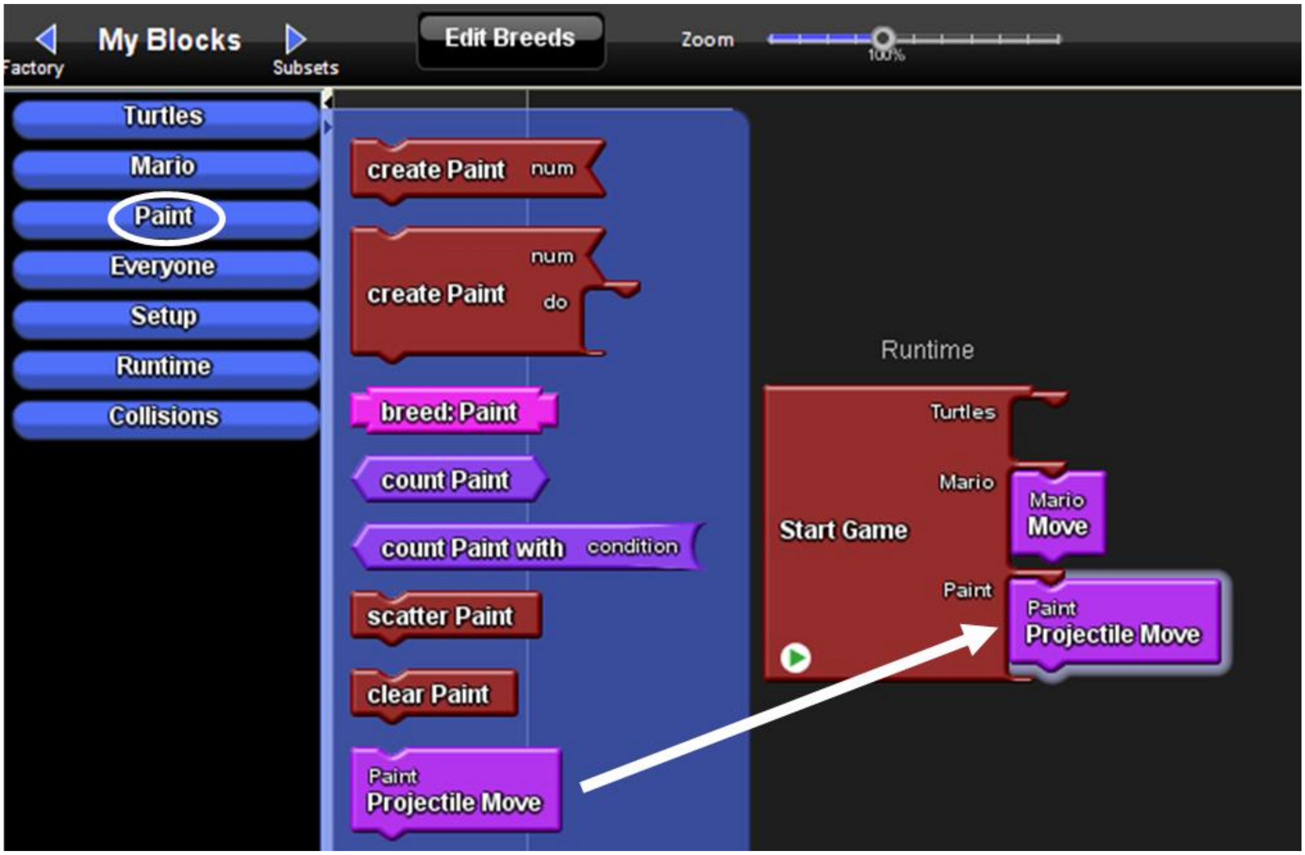
Now we have a procedure to launch paintballs. To program Mario to run the procedure, add another keyboard control at the end of the Move procedure that has the "a" key call this launch procedure. This way when we press the "a" key a new paintball will launch. The Launch procedure call block is found in the Mario tab of the My Blocks palette.


Turtles
Mario
Paint
Everyone
Setup
Runtime
Collisions
create Mario num
create Mario num do
breed: Mario
count Mario
count Mario with condition
scatter Mario
clear Mario
Mario Move
Mario Launch
Mario Move
if test keyboard up arrow? then forward steps 1
if test keyboard down arrow? then back steps 1
if test keyboard right arrow? then right degs 15
if test keyboard left arrow? then left degs 15
if test keyboard a? then Mario Launch
Mario

If you try to run your procedure now, you'll find that it doesn't do much. It creates a new sphere but the sphere doesn't go anywhere. In order to get it moving we need to tell the Paint breed how to move. One way to do this is to tell them to move forward, but add a little bit of randomness. The block stack below shows a new procedure called Projectile Move that runs such a random walk. Put this procedure in the Paint section of the canvas.



Then go to the Paint tab (My Blocks palette) and pull out a Projectile Move call procedure block and attach it in the Paint section of the Start Game (forever) block.

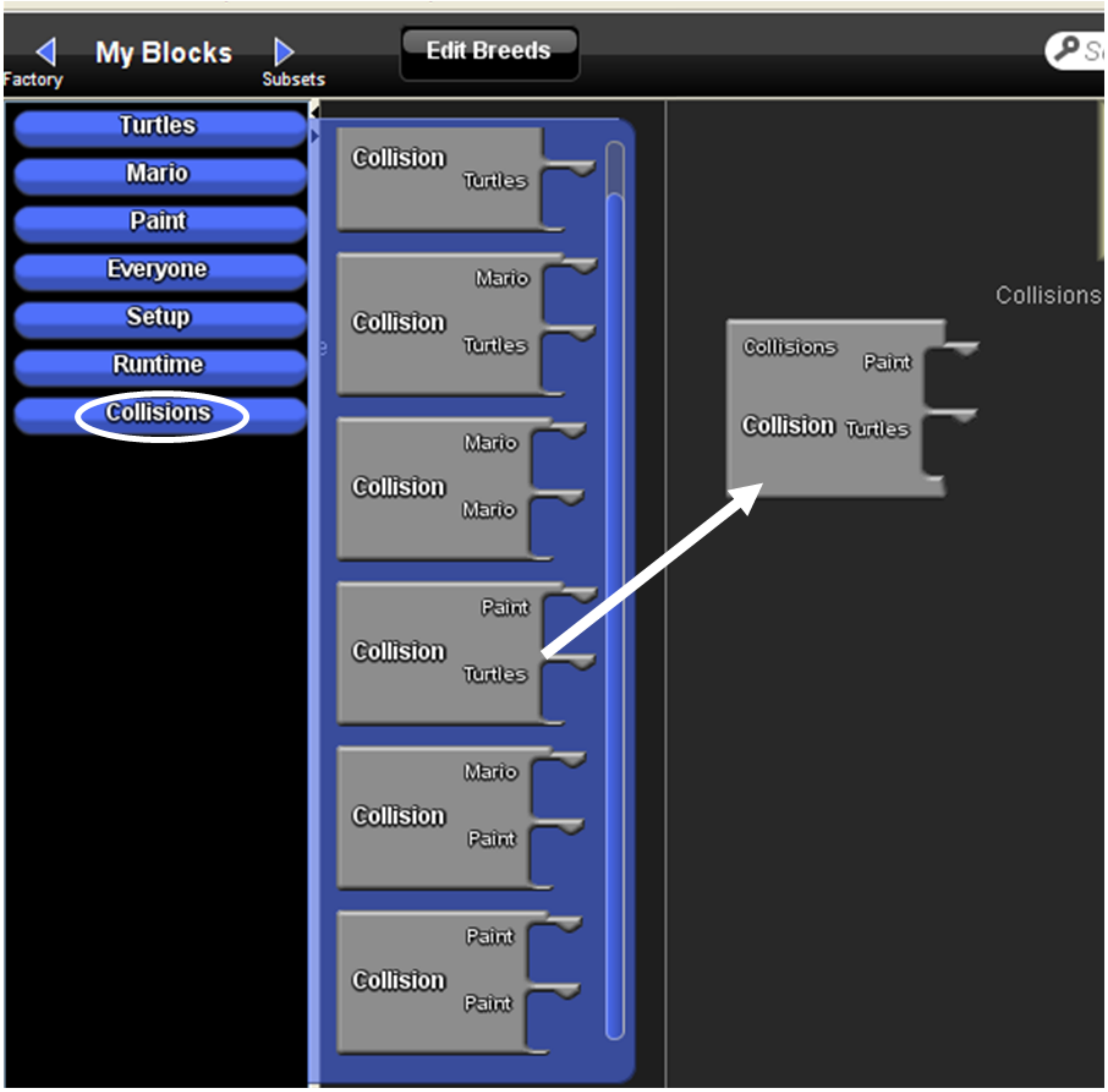


Run your game and shoot some paintballs. But they're just passing through the turtles! We'll program some interactions between the paintballs and the turtles next.

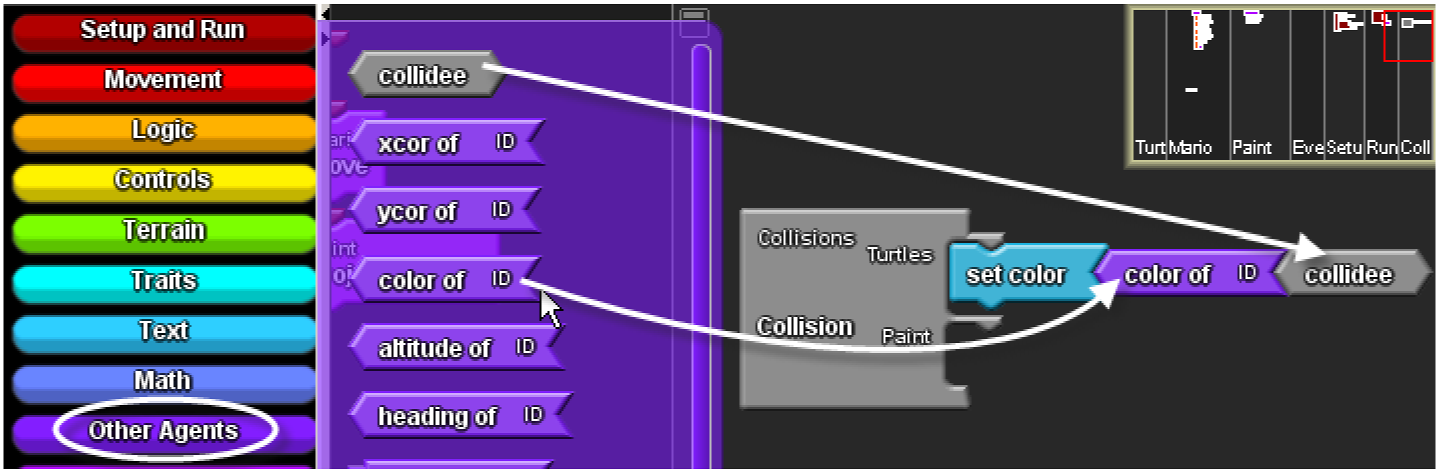
Build a Paintball Game (part 4 of 6)

Collisions

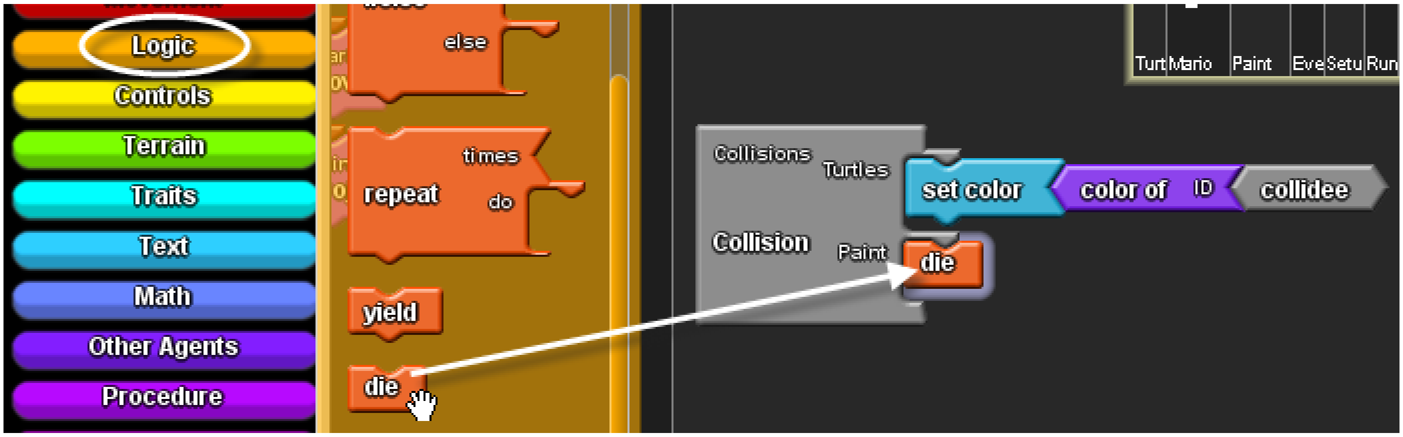
Now that Mario can move around and launch paintballs, we actually want the paintballs to change the color of the turtles that they collide into. We do this using a Collision block between the Paint and Turtles breeds. Drag out the appropriate collision block from the Collisions tab (My Blocks palette) and put it on the Collisions section of the canvas.



In the Turtles part of the Collision block, attach a Set Color block (Traits tab) and change the color to the color of the sphere being collided with. You can get that color by going to the Other Agents tab and grabbing a Color-Of block. Attach a Collidee block to the Color-Of block and the agent running the code will set its color to the color of the agent it is colliding with.



Once the Paint agent has Collided with a Turtle agent, the Paint agent's job is done and it can disappear or "die". Grab a Die block from the Logic tab and attach it to the Paint part of the Collision block.

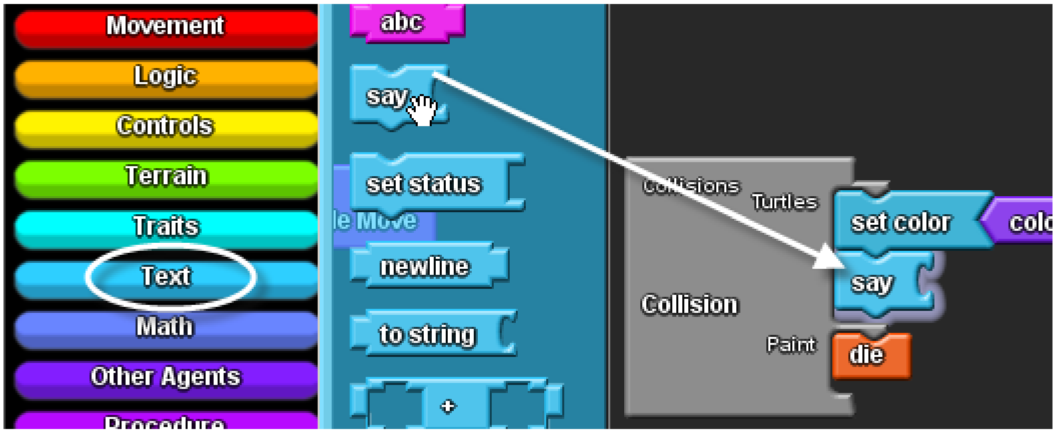


Now try running the project. You should be able to paint the turtles now.

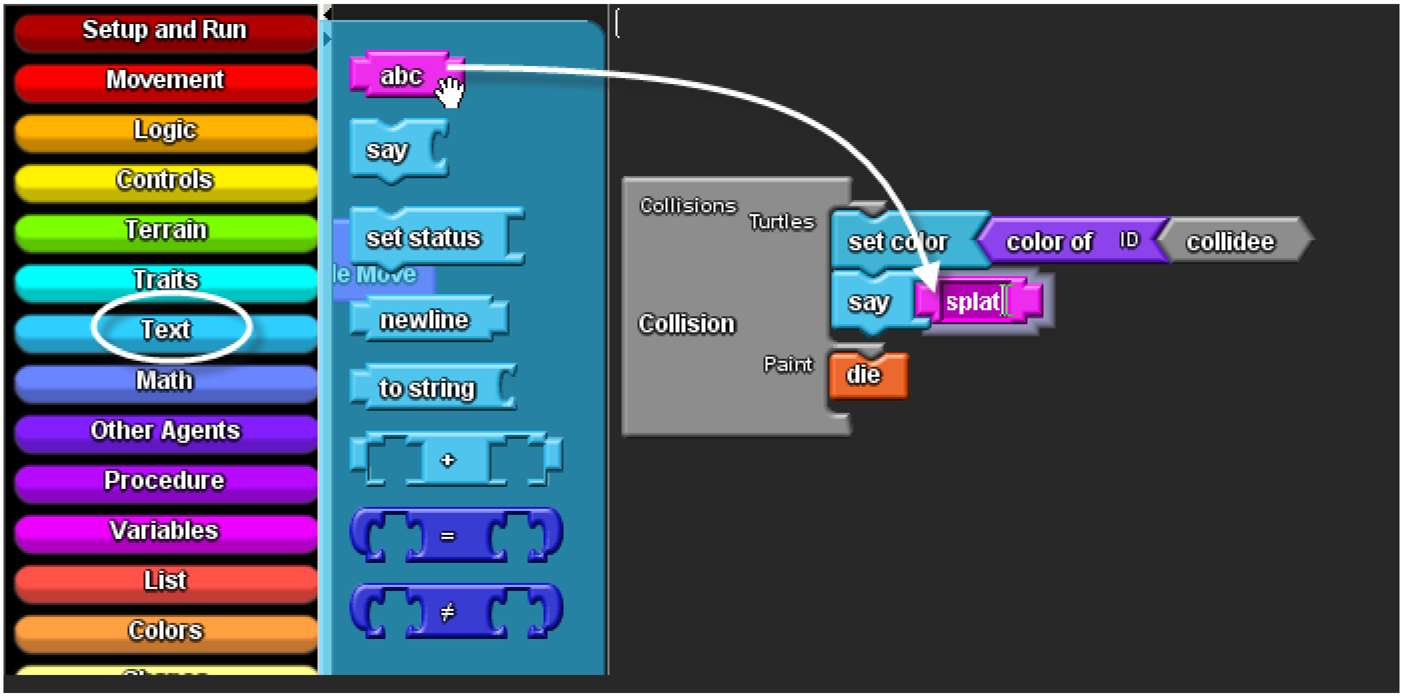
Build a Paintball Game (part 5 of 6)

"Speech"

Agents can "say" things through "say bubbles," much like the speech bubbles that you see in comic strips. To get agents to say things, use the Say block found in the Text tab. Let's add a "splat" when a sphere collides into a Turtle. Grab a Say block and attach it beneath the Set Color block in the Collision block between Paint and Turtles.



Go to the Text tab and bring out the "abc" block. Edit the block to say "splat" (no quotes) or whatever you like.

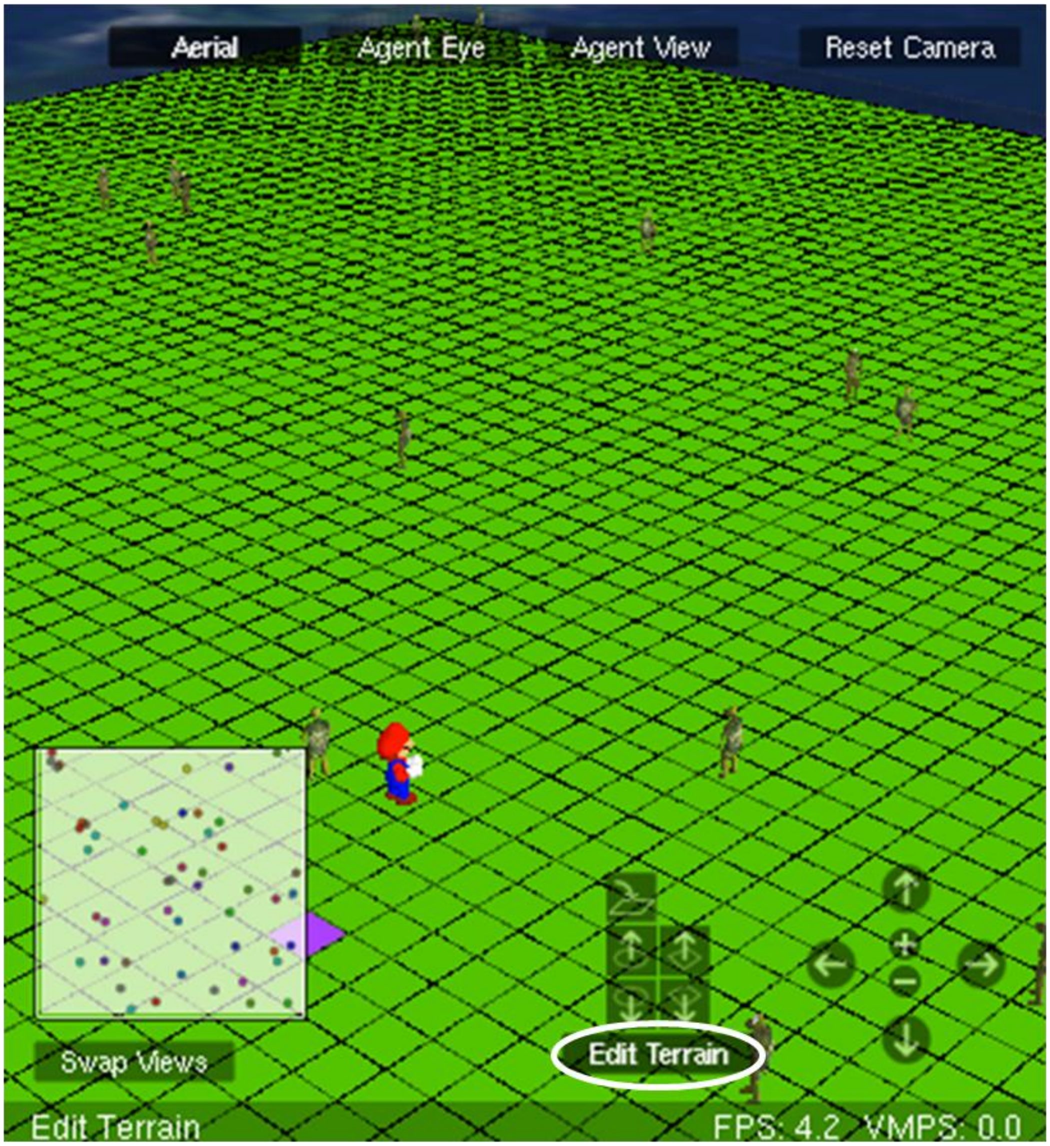


Now run the model and see what it looks like when paintballs collide into turtles.

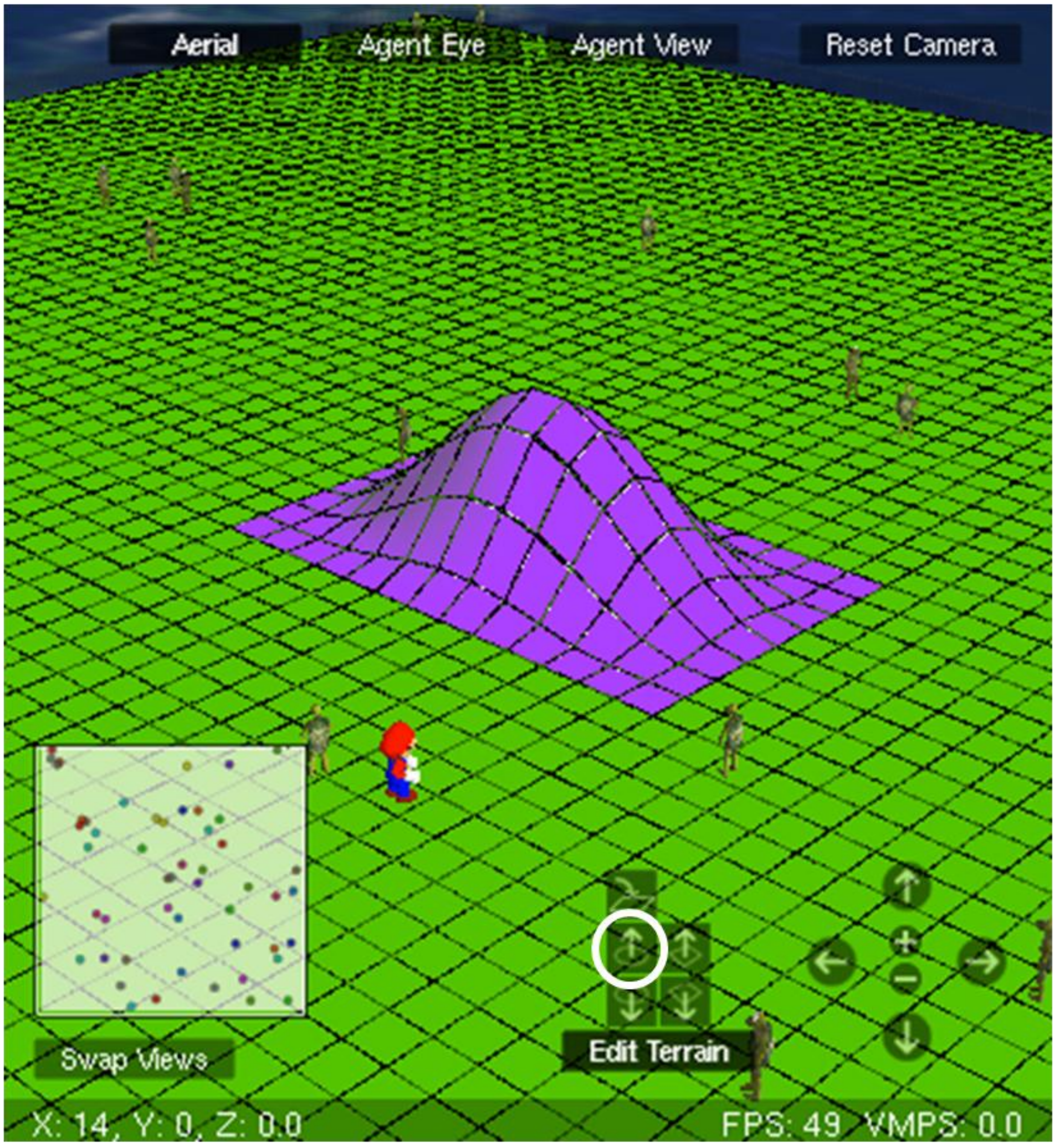
Build a Paintball Game (part 6 of 6)

Editing Terrain

One other interesting thing you can do with StarLogo TNG is edit the "terrain." The landscape need not be a flat green square; you can add craters, mounds, plateaus and colors. To edit the terrain, click on the Edit Terrain button at the bottom of Spaceland. This will take you into terrain editor mode. Notice that a grid is shown and when you mouse over the terrain, you can see the x and y coordinates of each patch.

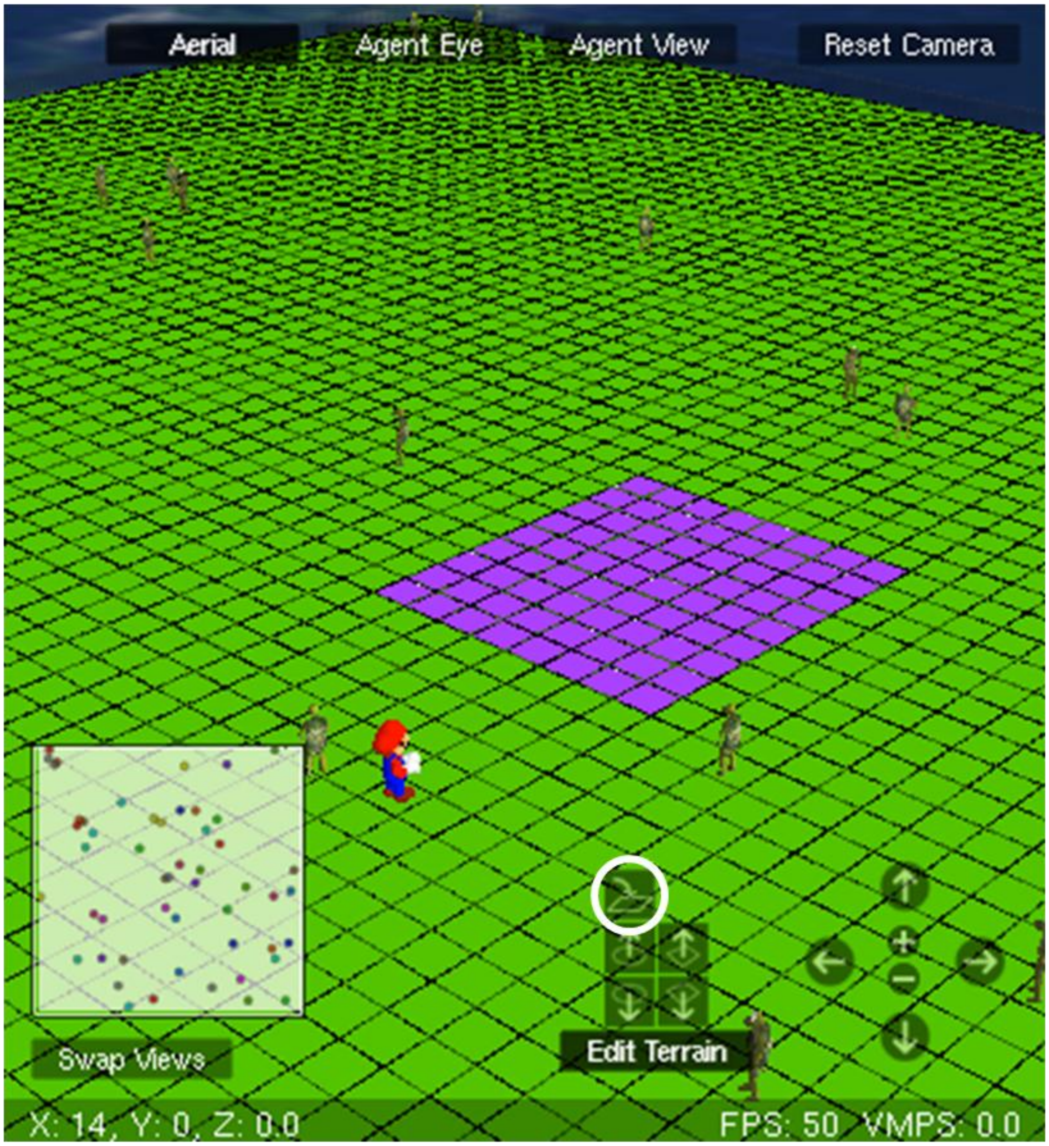


Mousing over each of the tools will give you a short description of what the tool does. There are four tools for changing the shape of terrain. These tools build a hill, build a wall (or platform), dig a wall, and build a crater. To use these tools, first drag out a rectangular area of the terrain. Then click on a tool to see its effect on the area you selected.



You can control the height of the hills or depth of the craters with the mouse wheel or by clicking on the buttons multiple times.

If you want to reset the height of a patch to 0, click on the top left button.



When you are done editing your terrain just click the Edit Terrain button again.

When you view your terrain in StarLogo TNG you should see the mounds and craters that you built. Note that all agents glide along the surface of the world by default, staying at their current "height above (or below) ground". Consequently, if you launch a sphere from one side of a crater, over the crater, it will come down into the crater and then come back up on the other side. It is possible to have more "realistic" interactions, but you'll have to experiment with that by programming the kind of motion you want.

Another thing you might want to try is to add a scoring feature. There is a built-in score variable in the Setup and Run tab. Another thing to try is to program the paintballs to "die" when they hit the edge of the world. Currently, they would just bounce off the edge and keep going until they hit a turtle. You may also want to experiment with making the motion of the paintball more realistic.