StarLogo Nova Activity: Catching Flies

You will create a simulation in which a Frog moves around and eats Flies that are whizzing by. There are also several extensions to: make the Frog grow each time it eats a fly, create a widget that keeps track of how many Flies the Frog has eaten, allow the user to control the movement, and more.

Prerequisites:

- Navigating to profile
- Creating a new project
- Naming a project
- Navigating to Workspace and SpaceLand
- Dragging blocks
- Creating Agents
- What a Page is and how to use different Pages
- Connecting blocks
- Associating buttons with their blocks

Learning Objectives:

- Explain the difference between placing blocks within the “do” portion of a “create___do” block and outside of it
- Explain what agent traits are and how to change these
- Describe how agents interact with each other
- Create a new breed
- Toggle Edit Widgets mode

New Terms:

- Breeds
- Remix
- Socket

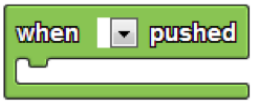
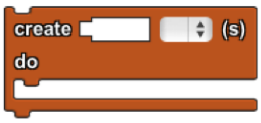
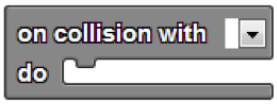
New Blocks:

- "Set my ____ to _____" **(Traits)**
    - Color
    - Built-in Shape
- "Scatter" **(Agents)**
- "While ____ toggled" **(Interface)**
- "On collision with ____ do" **(Detection)**
- "Delete" **(Agents)**

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Blocks Reference Table:

Below are the blocks you will use in Catching Flies. Feel free to read about them, but it is not necessary. The rest of this tutorial will take you step-by-step through building the project.

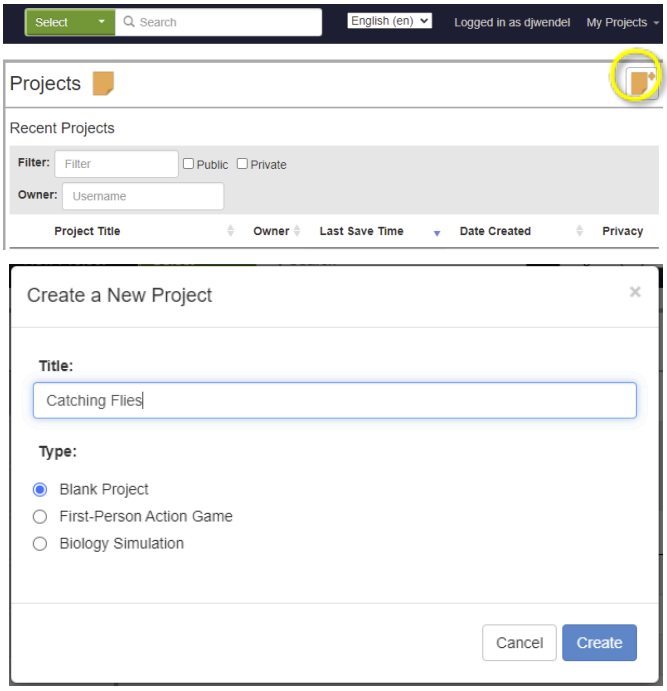
Block	Drawer	What the block does
“when___pushed” 	Interface	Tells the agent what to do when the chosen push button is clicked.
"while ___ toggled" 	Interface	Executes commands (in a forever loop) when the toggle button widget is turned on. When the toggle button widget is turned off, the commands in this block don’t run. Widgets can be created using the Edit Widgets feature.
“delete everyone” 	Agents	Deletes all agents in SpaceLand.
“create ___do” 	Agents	Creates the specified number of agents of the chosen breed. Each newly created agent immediately follows the directions the block makes them "do".
“set my ___ to ___” 	Traits	Changes the agent's trait to some value. The trait is chosen from the drop down menu and includes color, shape, size, etc.
“color:___” 	Traits	Represents a specific color chosen from the drop down menu.
“built-in shape:___” 	Traits	Represents a specific built-in shape chosen from the drop down menu.
“forward ___” 	Movement	Tells the agent how many steps to take during each tick
“on collision with ___ do” 	Detection	Tells the agents what to do when it bumps into an agent of the chosen breed.
“delete” 	Agents	Deletes the agent

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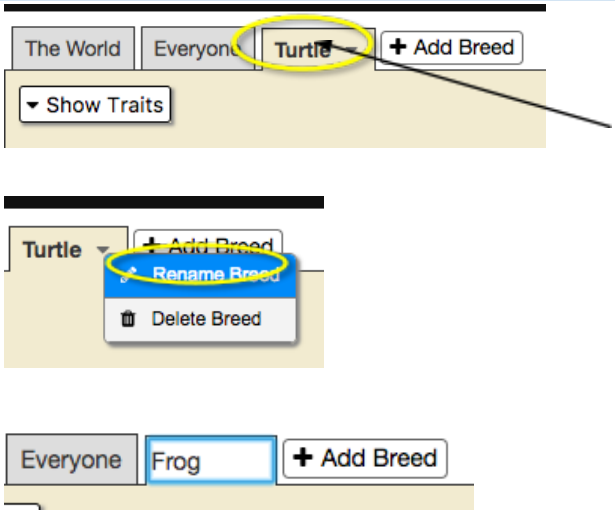
Part 1: Create new project and add new Breeds

In this section, you will create the two agent “breeds” (types of agents) that exist in the project: Flies and Frogs.



1. Create a new project

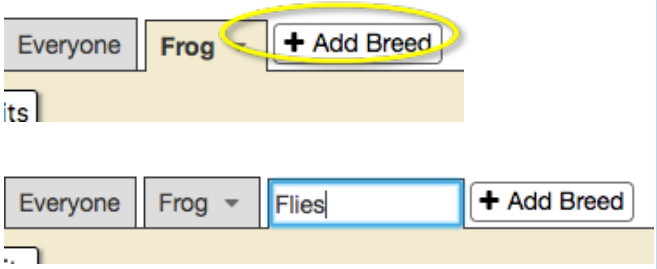
- If you’ve just logged in and are on the projects page, you’ll see the button for creating a new project on the right side of the window. (It looks like a piece of paper with a plus symbol.)
- If you’re working on a different project, click on “My Projects” to get back to the projects page.
- Create a new blank project and title it “Catching Flies”.
- Your project will save automatically



2. Rename an existing breed

- Click the “Turtle” tab at the top of the code area.
- Click the triangle to the left of the “Turtle” name
- Choose “Rename breed” in the menu that pops up.
- On that menu click the “Rename” button next to "Turtle".
- Type "Frog" in the textbox and click OK

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3. Add and name a new breed
- Click the “Add Breed” button next to the row of breed tabs to add a new breed.
- Name your new breed "Flies"

More info: A breed is a category of agents. All agents of a specific breed share the same traits and follow the same instructions.



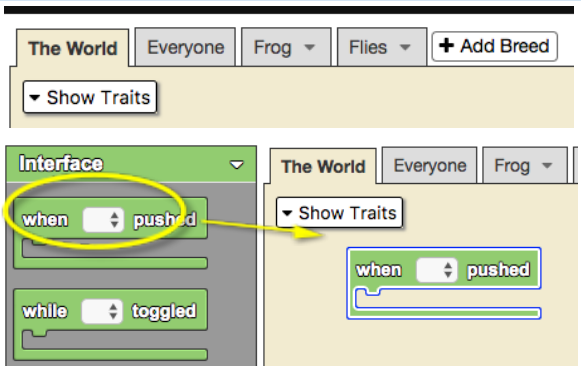
4. Check your progress
- Scroll down to the Workspace
- You should see tabs for "Flies" and "Frog" plus the default "Everyone" and "The World" tabs

More info:
- *The page you drag a block onto determines what breed(s) will run that command; therefore, where you put the blocks makes a difference in what your program will do.*
- *"The World" is an agent that controls the environment. Like any other agent it can have traits and can run code. It always exists; you cannot create it nor delete it. The World creates the first agents.*

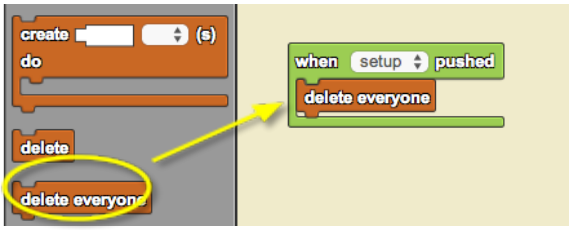
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Part 2: Setup - Clear SpaceLand

In this section you will program code so that each time you click the "setup" button, SpaceLand will reset.



1. Create new block
   - Click "The World" tab to display "The World" page
   - Open the **Interface** drawer
   - Drag a "when ____ pushed" block from the Interface drawer
   - Select the option "setup" from the drop down menu
     - The "setup" option refers to the "setup" button which is located in SpaceLand



2. Add a new block to an existing one
   - Open the **Agents** drawer.
   - Drag the "delete everyone" block and place it inside the "when ___ pushed block".

More info: Blocks represent instructions that agents follow. A program is a sequence of commands for agents to follow. To compose a program, blocks are connected to one another. For instance, connecting blocks inside of the "when ____ pushed" block tells the agent what to do when the chosen push button is clicked.



3. Check Your Progress
   - Click the "Run Code" button on the Navigation bar and then the "setup" button located in SpaceLand.
   - The terrain should appear completely green with no agents.

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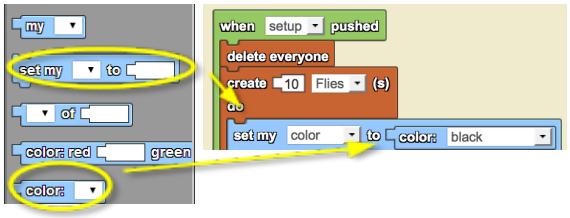
Part 3: Setup - Creating Flies

In this section you will create Flies and edit their traits.



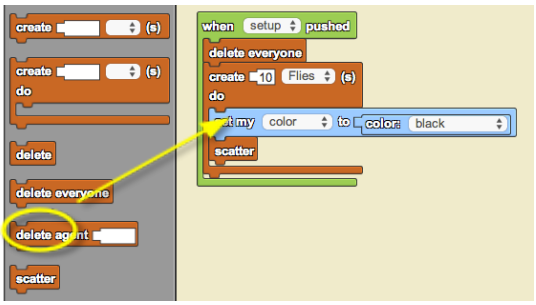
1. Create 10 Flies
   - Open the **Agents** drawer.
   - Drag the "create___ each do" block into "The World" page and connect it below the "delete everyone" block.
   - Type the number "10" into the empty socket on the "create ___ each do" block.
   - Select "Flies" from the drop-down menu in the block.

More info: Each of the newly created agents immediately follows the directions you specify in the "do" section of the "create___ do" block.



2. Set the color of the Flies
   - Open the **Traits** drawer
   - Drag the "set my ___ to ___" block and connect it inside the "do" part of the "create___ do" block.
   - Also get the "color:___" block and place it into the socket on the right hand side of the "set my___ to ___ " block.
   - Choose the color black from the drop down menu of the “color ___” block for these 10 Flies.

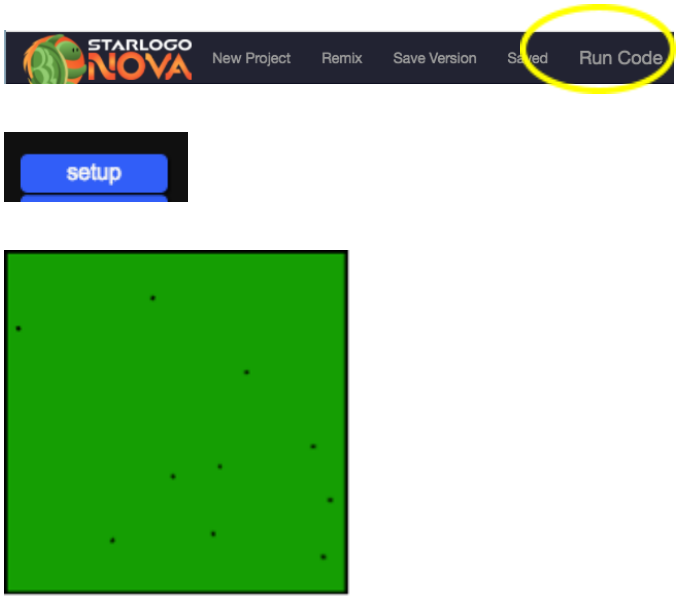
More info: The "set my ___ to ___" block is used to set or change the traits of the agents. The trait is chosen from the drop down menu and includes color, shape, size, etc. The "color:___" block represents a specific color chosen from the drop down menu. When specifying colors you must use one of the "color" blocks. Agents will not understand typed-in words like red, purple, yellow, etc.



3. Scatter the Flies
   - Open the **Agents** drawer.
   - Drag the "scatter" block and place it below the "set my___ to___ " block (which is still inside the "create___ do" block).

More Info: The "Scatter" block allows each of the 10 Flies to set its location to a random position in SpaceLand

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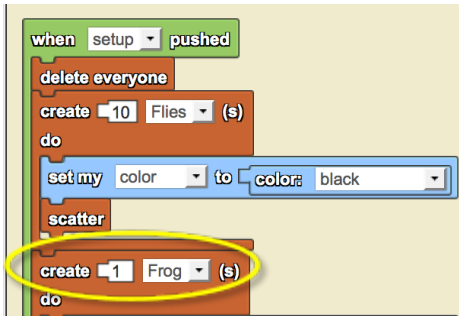
4. Check Your Progress

- Click the “Run Code” on the Navigation Bar and then the "setup" button located in SpaceLand.
- You should see 10 black Flies (cubes) randomly scattered within SpaceLand.

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Part 4: Setup - Creating a Frog

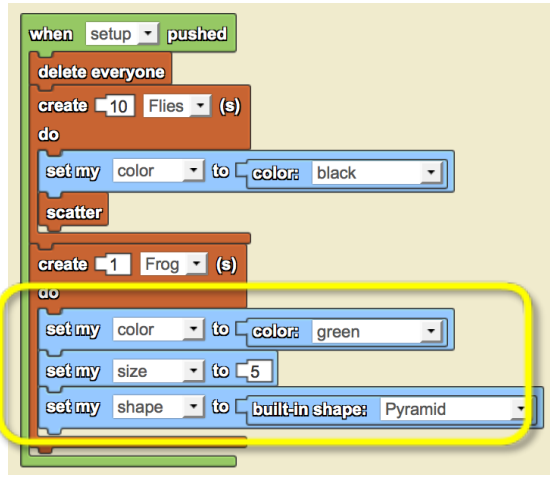
In this section, you will create a Frog and edit its traits.



1. Create a Frog

- Drag another "create___ do" block from the **Agents** drawer and connect it underneath (NOT inside) the first "create___ do" block.

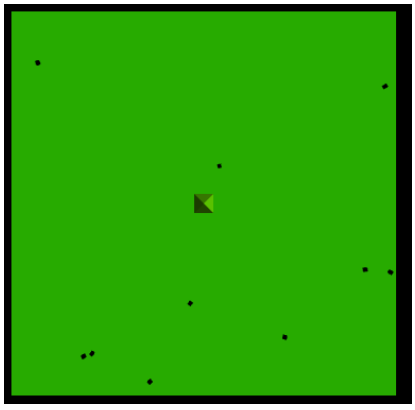
*More info: The "create 1 Frog" block should be placed directly **beneath** the "create 10 Flies" block. If you accidentally place the "create 1 Frog" inside the "create 10 Flies" block, each of the 10 Flies will create 1 Frog. This will result in 10 Frogs.*



2. Set the Frog's color, size, and shape

- Open the **Traits** drawer.
- Use three "set my ___ to___" block(s) to change the following traits of the Frog: size, shape, and color.
- Use the "color" block to set the color of the Frog to green.
- Type the size of the Frog to be 5.
- Use the "built-in shape" block to set the shape of the Frog to Pyramid.

More info: By default, the size of the agents is set to 1, the shape of the agents is set to Cube, and the color of the agents is set to white, unless you specify otherwise.



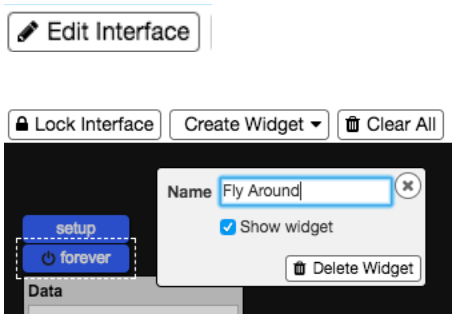
3. Check your progress

- Click the “Run Code” button on the Navigation bar and then the "setup" button located in SpaceLand.
- You should see a green Frog (pyramid) appear in the middle, and 10 smaller black Flies appear scattered around SpaceLand.

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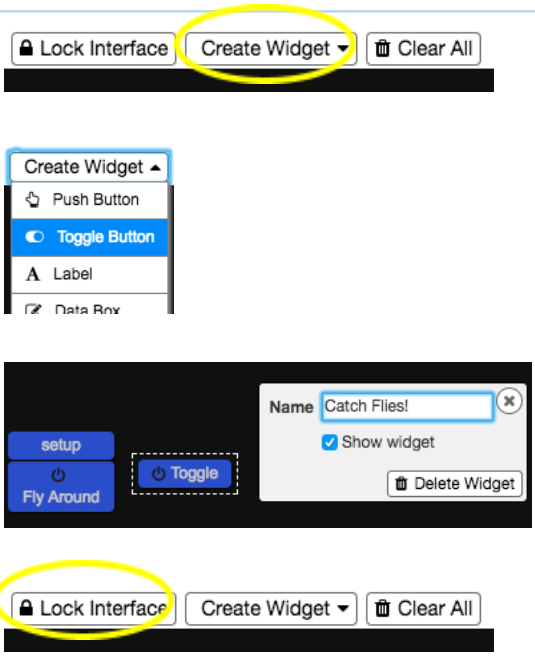
Part 5: Creating and Editing Widgets

In this section, you will create new button widgets - "Fly Around" and "Catch Flies!". In the next section you will assign functions to these buttons.



1. Rename the "forever" button to say "Fly Around"

- Click on the "Edit Interface" button on the bar above SpaceLand.
- Click on the "forever" button text so that a "Name" box appears.
- Type in "Fly Around" and click the “(X)”.
- Stay in the "Edit Interface" mode (you should then see the “Lock Interface” button).



2. Create a new Toggle Button Widget

- Click the "Create Widget" button.
- Select “Toggle Button” in the menu that appears.
- A button labeled “Toggle” will appear
- Click on it and drag it to an appropriate place.
- Click it again and name it "Catch Flies!"
- To exit the “Edit Interface” mode just click on the “Lock Interface” button.

More Info: There is a large variety of widgets. You will frequently use "Toggle Button" and "Push Button" to control your program. Other options such as "Labels" and "Graphs" allow you to display information to the user. "Data Boxes" and "Sliders" can be used to either display information or take input from the user. Blocks used to interact with these widgets are in the Interface drawer.

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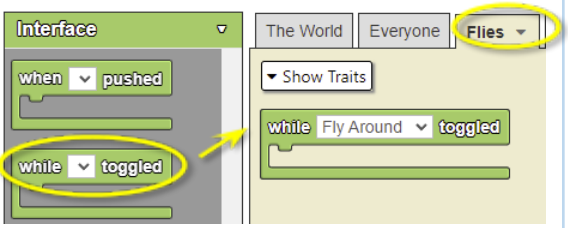
3. Check Your Progress

- In SpaceLand, there should be four widgets: "Catch Flies!", "Fly Around", "setup", and "data".
- *If you cannot see one of your widgets, this could mean one widget is on top of another. Go onto the "Edit Interface" Mode and move your widgets around to check they are not overlapping.*

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Part 6: Fly Movement

In this section, you will make the Flies move around SpaceLand



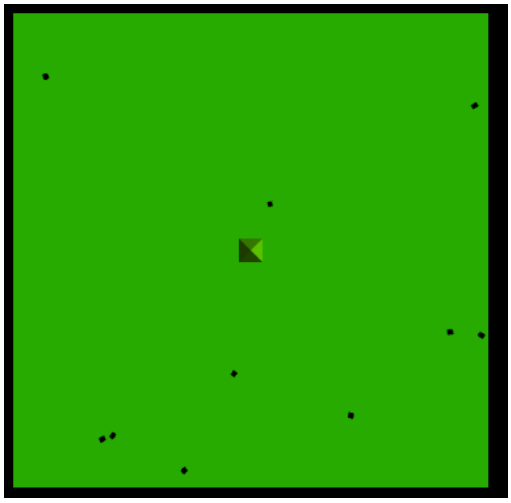
1. Program the Flies Agents.
   - Go to the "Flies" tab in Workspace.
   - Open the **Interface** drawer.
   - Drag out the "while___ toggled" block and select the "Fly Around" option from the drop-down menu.

More Info: The "while___ toggled" block tells the Flies what to do while the specified toggle button is toggled on.



2. Program Flies' Movement.
   - Open the **Movement** drawer.
   - Drag a "forward" block and connect it in your "while___ toggled" block.
   - Type “1” in the socket of the "forward" block.

More Info: The "1" tells each Flies agent to take 1 step during each tick (The StarLogo clock ticks 5 times per second when it is running at default speed). A higher number of steps will make it appear as though the Flies are moving faster.

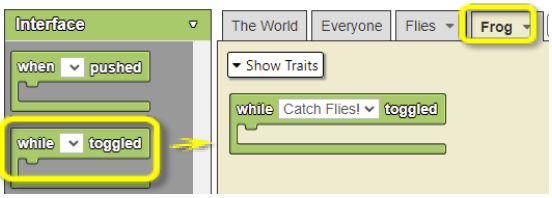


3. Check your progress
   - Click the “Run Code” button on the Navigation bar and then the "setup" button and finally the “fly around” button located in SpaceLand
   - Your Flies should be moving around SpaceLand.
   - Click "Fly Around" again to stop the movement.

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Part 7: Frog Movement

In this section, you will make the Frog move around SpaceLand



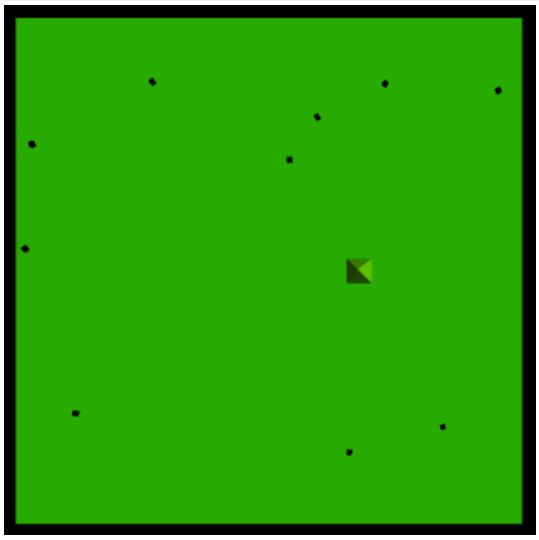
1. Program the Frog Agents.

- Go to the "Frog" tab in Workspace.
- Open the **Interface** drawer.
- Drag out the "while___ toggled" block and select the "Catch Flies!" option from the drop-down menu.



2. Program the Frog's Movement

- Open the **Movement** drawer
- Drag the "forward" block and place it inside the "while ___ toggled" block
- Type 3 in the socket of the "forward" block so that the Frog can move faster than the Flies.



3. Check your progress

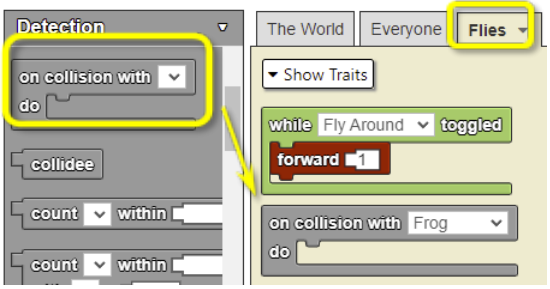
- Click “Run Code”, “setup”, "Fly Around" and "Catch Flies"
- You should see your Flies moving around SpaceLand and your Frog should be moving from side to side across SpaceLand because your Frog starts out facing right.

More info: Right now, if a Fly collides with your Frog nothing happens. In the next part we will create the code for a collision between the Frog and the fly. By doing so, the Frog will "eat" the fly when they collide.

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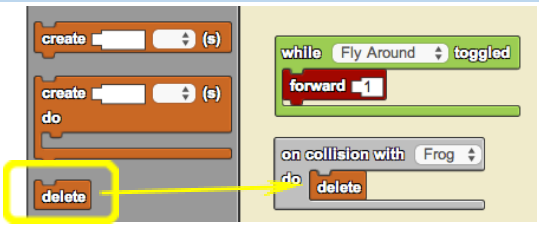
Part 8: Collisions

In this section you will write code so that when the Frog and a Fly collide, the Frog "eats" the Fly.



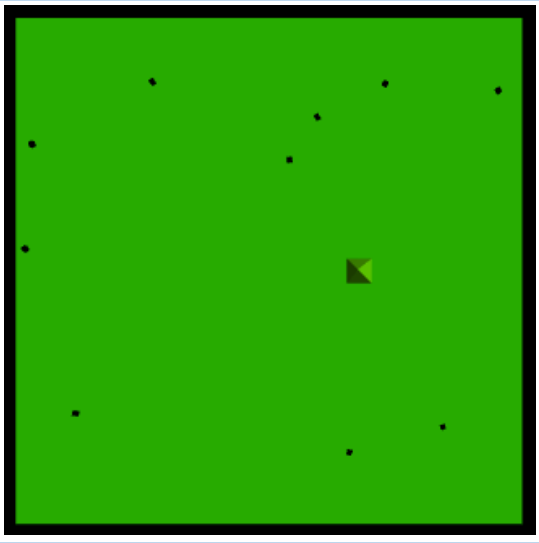
1. Program the Collision.
   - Navigate to the Flies Page.
   - Open the **Detection** drawer.
   - Drag the "on collision with ___ " block onto the page and place it next to your other code.
   - Select "Frog" from the drop down menu to indicate who the Flies will be colliding with.

More info: The "on collision with ___ " block tells the agent whose page it is, in this case the Flies, what to do when they bump into an agent of the selected breed, in this case the Frog.



2. Program the "getting eaten" of the Fly
   - Navigate to the **Agents** page.
   - Drag the "delete" block into the "on collision with ___ " block.

More info: The "delete" block tells the agent to delete itself. In this case, since the "on collision with ___" block is on the Flies page, it is the Flies agent that deletes itself.



3. Check Your Progress
   - Click “Run Code”, “setups”, "Fly Around" and "Catch Flies" widgets.
   - You should be able to see Flies agents disappear as they collide with the Frog agent.
   - Click "Fly Around" and "Catch Flies" to stop the simulation.

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Part 9: Extensions

If you have time, try some extensions from the list below to develop your simulation. The extensions tend to progress from easy to hard tasks. Some of them require new skills and blocks that you have not used before. Also, feel free to explore/try different things not included here on your own.

- Add more Frogs and make them different colors.
    - CHALLENGE: Do this using one create block.
- Use blocks from the **Movement** drawer to make the Frogs turn and move around more of SpaceLand.
- Change to the Frog's perspective by telling the Frog to "take camera" (from the **Agents** drawer) when the Frog is created in setup.
- Make a new toggle widget called "Turn left a little" and program a "while ___ toggled**"** block to make the Frog turn left by a small amount like 5 degrees. Toggle this button on/off while Catch Flies! is toggled on to control the Frog's movement.
- Make the Frog get bigger every time it "eats" a fly.
- Program the score textbox to automatically keep track of how many Flies the Frog has eaten
    - HINT: use a "set data ___" block from the **Interface** drawer.

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