Block Based Programming

Learning How To Create Your Own Traffic Light

Training Session Agenda

- User interface/pairing

- Traffic light lesson

- Learning outcomes / future ready skills

SAM Space Overview

Pairing

User panel

Connect SAMs 🔍

morten
Offline
Sign Out   Edit Profile

Untitled Project

Canvas

My Projects   +
Examples   +
My Apps   +

My Computer   —

Camera | SPACE Keyboard | To Key

Control Cursor | To Keyboard | Sound Player

Internet   —

Tweet Out | Facebook Out

Toolbox

IFTTT Out

Commands   —

Text | Morse Code | Custom Code

Onboarding

Welcome to **SAM**
Space Education!

Ready to start building? Follow this simple
tutorial to learn the ins and outs of SAM.

Start the tutorial

Behaviours   —
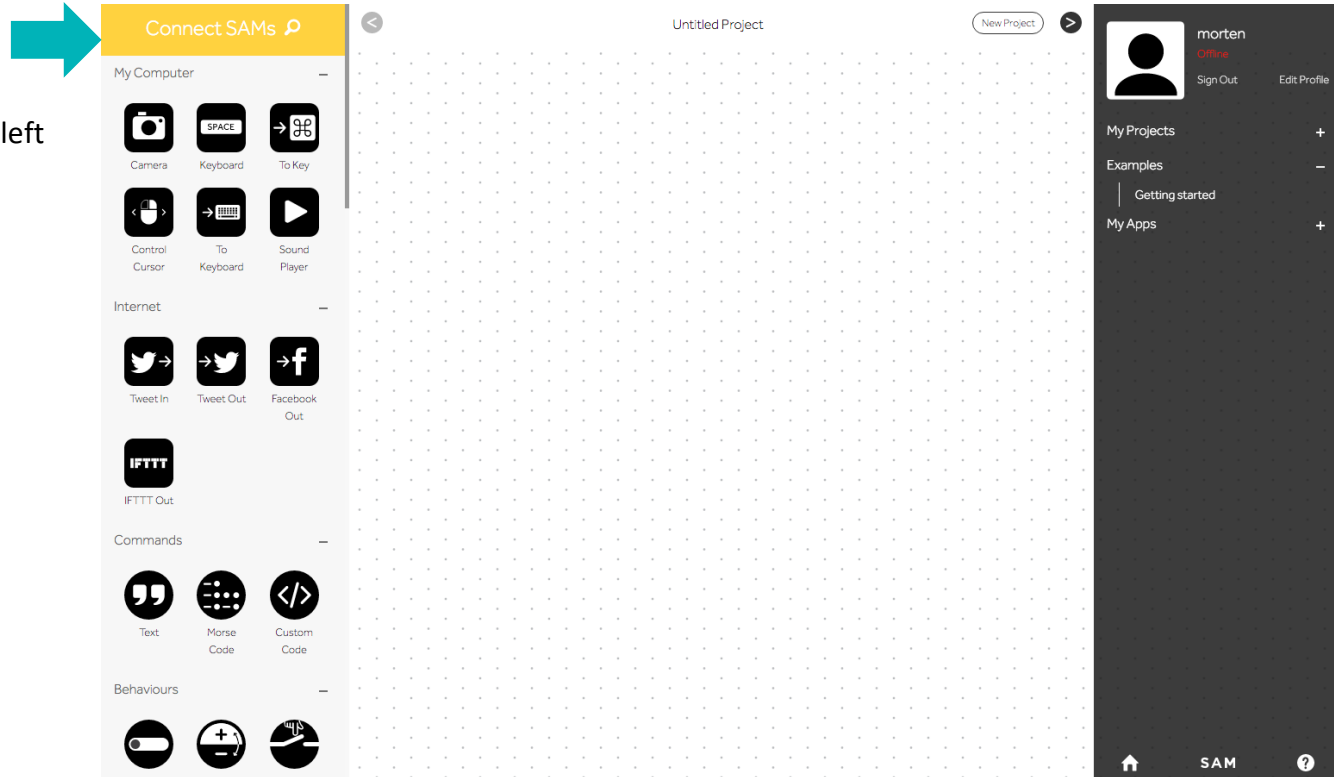
🏠   SAM   ❓

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Pairing

The first step in getting set up in SAM Space, is pairing the blocks

Step 1

Open the pairing window in the top left

Pairing

Step 2

Once the pairing window is open, turn on the SAM blocks.

For this project, we will be using a RGB LED and a Button

Pairing

Step 3

You will now see the blocks appear in the central column of the pairing window

My SAMs	SAMs near me

HOLD 2 SEC

Turn on your blocks and hold them near the computer

✖ Click to close

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My Projects   +
Examples   −
    Getting started
My Apps   +

Unpair all   ?   ?   🏠   SAM   ❓

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Pairing

Click on a block to open the pairing option.

The selected physical block will now flash on the side to indicate which block is which.

Click on the tick to pair each block.

A paired block will have a white status light on the side.

And that's it!

My SAMs

SAMs near me

HOLD 2 SEC

Turn on your blocks and hold them near the computer

Click to close

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My Projects   +

Examples   −

    Getting started

My Apps   +

Unpair all

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The traffic light is a great way to showcase a few features of SAM in a relatable project.

It covers:

- Inputs and outputs

- Combining hardware and software

- Computational thinking

- Using number and timing controls

- Has a step-by-step, iterative approach

Traffic Light Lesson

Step 1

Turn on both of the RGB LED and Button. They will be visible in your toolbox in the top left
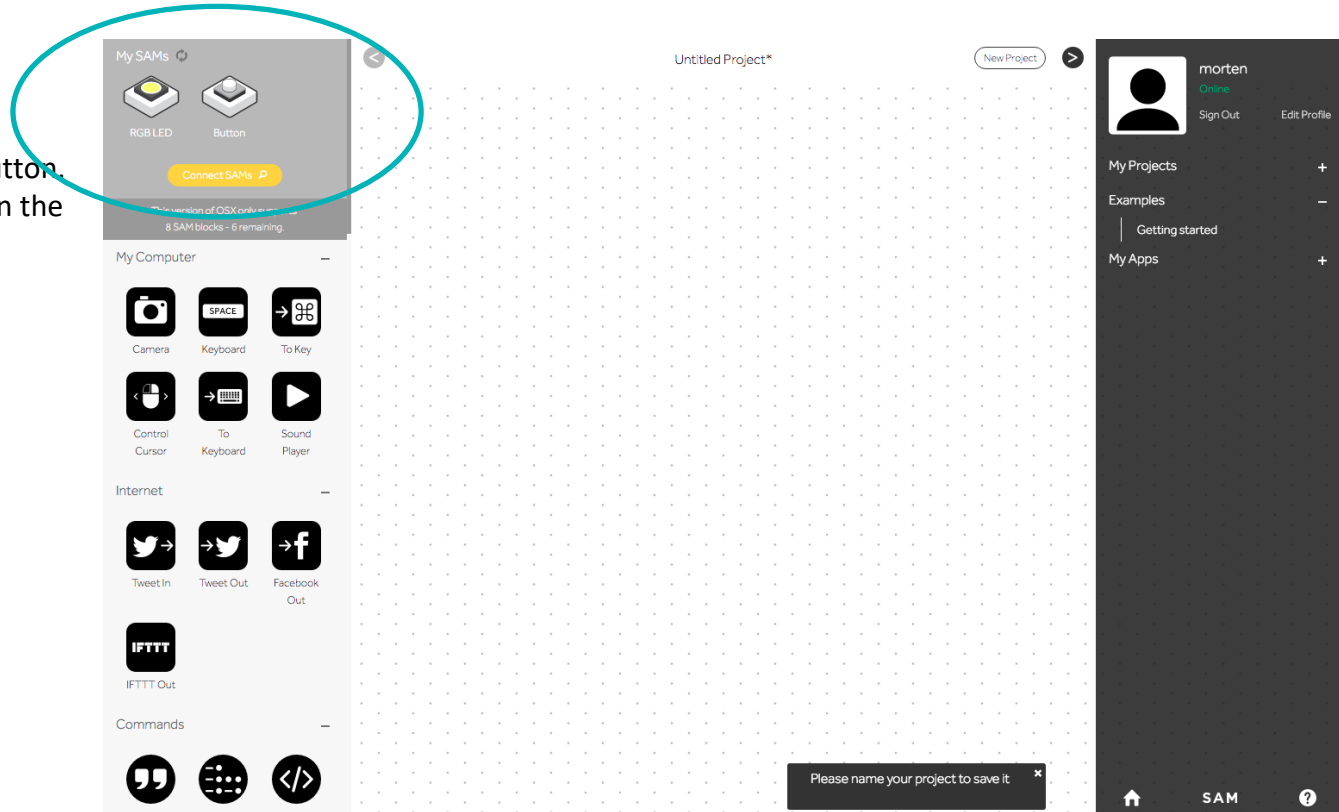
Traffic Light Lesson

Step 2

Drag the button and the RGB LED onto the canvas. They will change to two different colours. This shows which circuit they are a part of.

In this case, the button is part of the blue circuit and the RGB LED is part of the orange circuit

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Traffic Light Lesson

Step 3

Connect the blocks by dragging from the full blue circle next to the button to the orange ring next to the RGB LED.

The connection must always be made from an input (full circle) to an output (ring)

Both blocks will now be the same colour (blue in this example)

We now have the basic connection between the button and the light.

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Traffic Light Lesson

Step 4

Press the button on the physical block to turn on the light. This will produce a white light on the RGB LED.

The app with give visual feedback on this as well: both on the button being depressed and the light cone appearing.

This visual feedback helps children make the association between the physical actions they do, and the programming logic powering SAM.

Traffic Light Lesson

Next we will change the colour of the LED.

To do this, we double click on the block to open a contextual menu.

Click anywhere on the colourwheel to select a colour. For this demo, we will select red.

When you have selected the colour, press ok.

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Traffic Light Lesson

Step 6

When you now press the button, the RGB LED will shine a red light.

Step 7

But of course, traffic lights need more than one colour.

We will therefore now need to use the software blocks to program the RGB LED to shine different colours.

In the toolbox on the left, we have over 40 different features. They are sorted by type. We will scroll down to the "RGB LED" section.

Step 8

Drag and drop the "Colour" icon onto the canvas 3 times.

Make sure that they do not connect to the line between the button and the RGB LED.

Traffic Light Lesson

Step 9

Next we will change these three colours to the colours of a traffic light. This is done by double-clicking on each colour icon and selecting the colour from the colourwheel.

The visual layout of SAM makes the association with a real traffic light very strong.

Traffic Light Lesson

Step 10

To test that it works to send a new colour to the RGB LED, we will connect it to the button and the RGB LED.

But first we must remove the existing connection: this is done by clicking on the line and clicking on the "X"

Traffic Light Lesson

We will now draw a line from the button (full blue circle) to the ring on the left of the colour block that has the colour orange programmed.

Then we will draw a line from the full blue circle next to the colour block to the ring next to the RGB LED.

Traffic Light Lesson

Step 12

Now to test that sending a colour works, we will press the physical button, and the RGB LED will shine orange.

SUCCESS!

p.s. the light will stay on, because the colour block sends an RGB array [0,0,0] but does not send a false after it to turn the light off like a button would do. This is ok.

Traffic Light Lesson

Now that we have tested that the colour sending works, we will need to set up a sequence to send a message to the different blocks in turn.

To do this, we will go to the numbers section and use the Counter and the Compare.

This will allow us to count how many times the button has been pressed, compare that to a specific number, and pass a message through if true.

Traffic Light Lesson

Drag a counter onto the canvas and drop it on the line between the button and the middle colour block. It will automatically connect.

Then drag a compare block onto the line between the counter and the colour block.

p.s. You might need to move the blocks around a bit to make room.

Traffic Light Lesson

Step 15

To test that the counter works, press the button a few times. In this example, the button was pressed 5 times.

Then double click on the compare block and change the default 60 value to 2. This is because the orange light is the second light in the sequence.

Traffic Light Lesson

Step 16

Double click on the counter and press the "reset" button to bring it back to 0.

Then drag and drop two more compare blocks onto the canvas: one near the top colour block and one near the bottom one.

Draw a line from the counter (full circle to the right) to each compare block (ring on the left). Do the same from each compare block to the colour blocks.

Double-click on the top compare block and change this to 1. Double-click on the bottom one and change this to 3.

Now connect from the two colour blocks to the RGB LED.

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Traffic Light Lesson

Step 17

Now we will test the sequence by pressing the button 3 times. The RGB LED will first go red, then orange, and finally green.

Traffic Light Lesson

Step 18

The problem is now that if we keep clicking on the button, the counter goes up and the RGB remains green.

We will therefore need to find a solution: we will need a loop.

For this, we will drag on one more compare block and set this to 4.

Connect from the counter to the compare block

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Traffic Light Lesson

Step 19

When the counter reaches 4, we want the counter to reset to 0.

We will therefore go to the "command" section in our toolbox and drag on the Text block.

Place this to the left of the "4" compare block.

Double-click on the text block and write "reset".

Then connect the counter to the text block.

Then connect text block to compare 4, and from compare back to the counter.

This will send a reset command form the text block to the counter.

Step 20

Now reset the counter by double-clicking on it and pressing the "reset" button. It should now be back on 0.

Then click the button 3 times to go through the sequence of red, orange and green.

Then press the button again to see the counter reset when it goes to 4.

There are many alternative ways to build this loop (using the Number block to send 0, defining the loop range in the counter contextual menu from 0-4, etc.)

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Traffic Light Lesson

Step 21

The next step is to automate the traffic light so that you don't need to press the button for each change of lights.

For this, we will need the toggle block from Behaviours, and the interval block from Timing

Traffic Light Lesson

Step 22

Move the button up to the top left to give yourself some more room.

Then drag and drop the toggle onto the line between the button and the counter.

Then drag and drop the interval block between the toggle and the counter.

The toggle will switch between the "False" state on the left and the "True state" on the right.

The interval converts this True message into a pulse of False and True. It will first be False and then True.

Traffic Light Lesson

Step 23

Now press the button.

This will switch the toggle to True, essentially "turning on" the traffic light.

The Interval converts the True signal to a pulse of False and True (nothing will therefore happen for the first second).

Every time the interval is True, the counter will go up by one. The lihts will therefore also toggle between red, orange and green.

This will continue for as long as the toggle is in True and the system is "on".
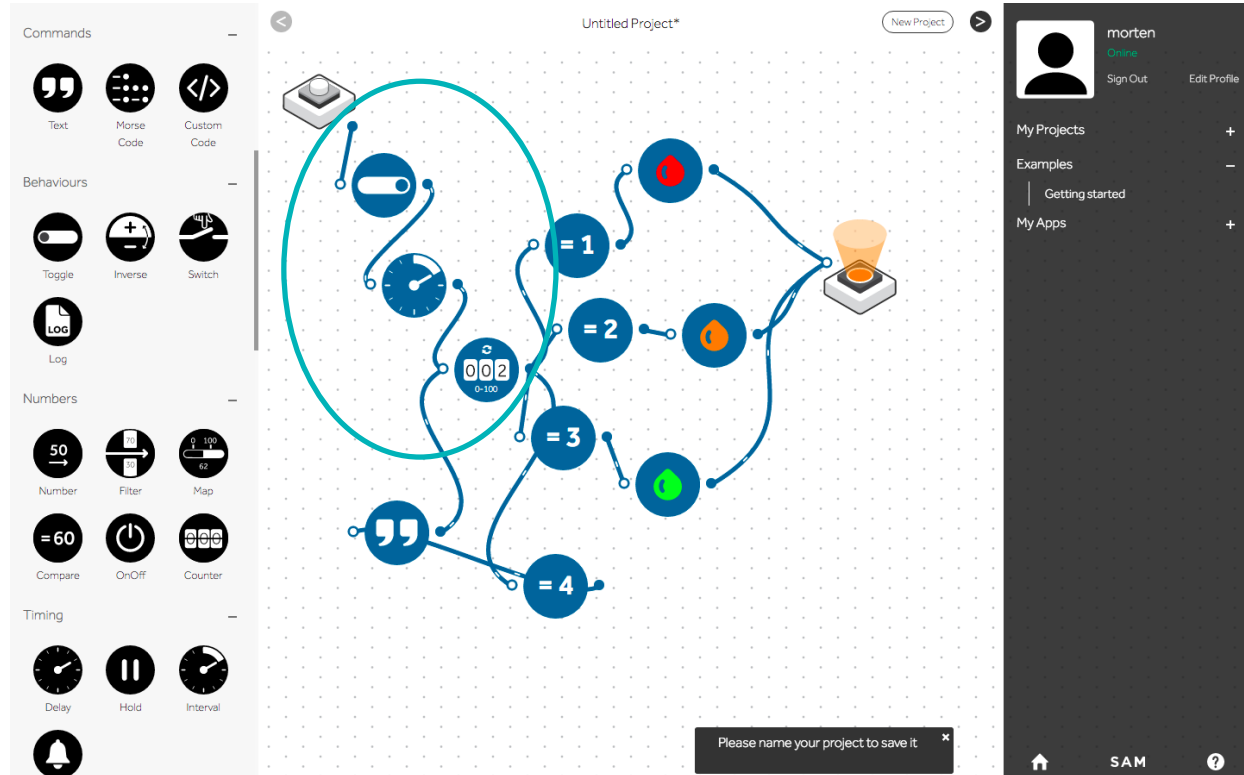
Traffic Light Lesson

Step 24

Currently, the timing of the traffic light is not correct as the Red is on for 2 seconds (when the counter is 1), the orange for 2 seconds (when the counter is 2) and green for 4 seconds (when the counter is 3 and 0).

You can adjust the length of time on each light by changing the compare blocks. To set the red light for 6 seconds, the orange light for 2 seconds and the green light for 8 seconds, set the compare blocks to 7,4,3,8 from the top to bottom.

You can also change the timing of the interval by double clicking on it. Each count will be double the length of time of the interval.

Traffic Light Lesson

And that's it!

Now name the project by clicking on the name at the top and typing in your name.

The project is saved in the cloud and can be reopened on another device by logging in.

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Local support in all regions coming late 2017 onwards

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