

## U3-2.1 Let's explore interrupting the main program

Different computer programming languages have different syntaxes, or rules, which make them look and feel a bit different from each other. No matter the syntax, however, all computer languages work using the same underlying logic.

This is why all computer programs behave in similar ways and follow core programming logic, like sequence.

In EdScratch, the logical flow of a program is to start with the top block and complete each action one block at a time. Programs with loops also follow sequence. When the program sees a loop block, it executes the commands inside that loop in order. When it gets to the bottom of the loop, it goes back to the top of the loop and starts again. Even though loop blocks make programs look a bit different, these programs still follow the logical flow of top-to-bottom sequence.

There is a way to interrupt this sequential flow. You can disrupt **a computer program's flow** by using an **interrupt**.



### Don't forget

**Logic** is the organised way of doing things that makes sense to a computer. Logic determines the flow of a program.

**Syntax** is the rules of how a programming language works.



### Jargon buster

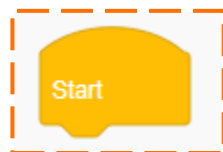
An **interrupt** is a special bit of code that stops the flow of the main code. It's called an interrupt because it *interrupts* the main code. An interrupt is usually used to pause the main code in order to run a **subroutine**.

A **subroutine** is a distinct set of code that is separate from the main program. You can think of a subroutine as a mini program.

To understand how interrupts work, we need to understand what is being interrupted.

### What is the main program?

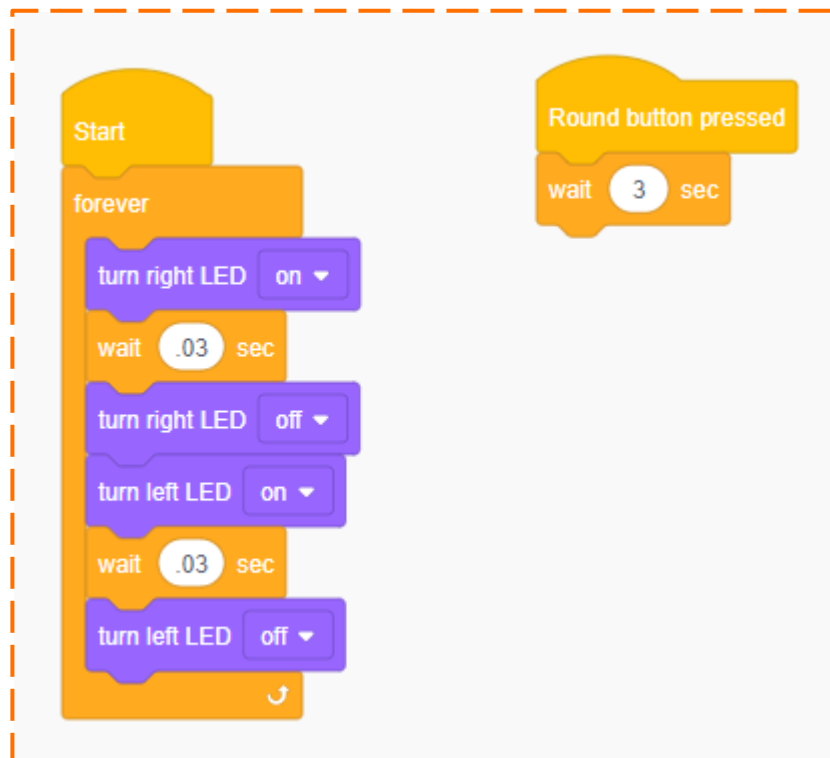
In EdScratch, the main program is whatever is attached to the yellow **start** block.



Whenever you write a program for Edison, you need to have at least one block in the main program attached to the **start** block. When you run a program with your Edison robot by pressing the play (triangle) button, this main program runs block-by-block in sequential order until it reaches the end of the program.

An interrupt can disrupt this flow.

Look at the following program:



This program has two parts: the main program and the subroutine.

1. What does the main program tell Edison to do? *Hint:* only the blocks attached to the **start** block are in the main program.

**Sample student answer: The main program uses an indefinite 'forever' loop to make the robot turn on the right LED, wait .03 secs, turn the right LED off, turn the left LED on, wait .03 secs, and turn the left LED off. It will repeat that loop of actions forever.**

In addition to the main program, there is also a subroutine. What causes the main program to be interrupted and run the subroutine?

Subroutines will only run when a specific **event** happens.



### Jargon buster

In programming, an **event** is something that happens outside of the program code that affects how the program runs. An event might be a button being pressed or information being relayed from a sensor.

In EdScratch, you need to use a block from the **Events** category at the start of any subroutine.

2. Look at the blocks in the **Events** category in EdScratch. What do you notice about the shape of these blocks?

**Sample student answer: All the Event category blocks are yellow and shaped the same as the 'Start' block.**

The **Event** blocks are interrupts that tell the program to look out for that particular event. If the event happens, the **Event** block interrupts the main program immediately and runs the subroutine. Once the subroutine code is complete, the program returns to wherever it left off in the main program.



### Why is that?

We use interrupts in programming because interrupts allow a program to react to an event **at any time while the program is running**. By using interrupts, you don't have to predict when an event will occur. Without interrupts, you would have to know exactly when something was going to happen, even when that event is out of your control!

### Try it out!

Write a program in EdScratch that contains both the main program and the subroutine just as they appear in the picture from earlier in this activity. Download the program to your Edison robot. Press the play (triangle) button on your robot. This will start the main program, causing **Edison's LEDs** to flash on and off. Now press the round button on the robot. This interrupts the main program and runs the subroutine. This subroutine tells Edison to wait 3 seconds, then return to the main program.

You can use this program to turn your Edison robot into a decider bot!

Think of a question that you can answer **with a 'yes' or a 'no'**. The decider bot will help you answer that question. If the right LED is lit up when you press the round button, the answer to your question is 'yes', but if the left LED is lit up, then the answer is 'no'.



### Why is that?

Remember, an interrupt pauses the main program instantly, so it is possible that neither LED will be lit up when the subroutine runs. If the main program has turned off the right LED but **hasn't yet turned on the left LED when the interrupt occurs, then both LEDs will be off**. This is a bit like flipping a coin and having it land on its edge – rare, but it can happen!