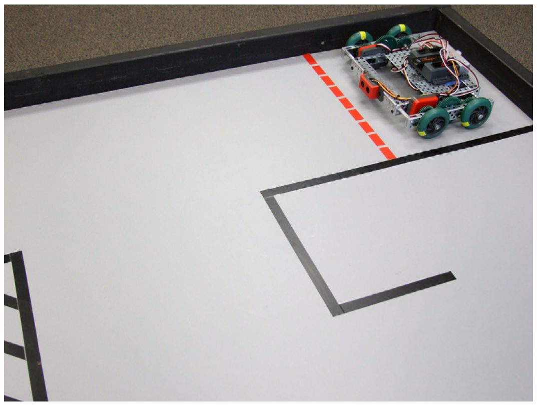
Behaviors

A **behavior** is anything your robot does: turning on a single motor is a behavior, moving forward is a behavior, tracking a line is a behavior, navigating a maze is a behavior. There are three main types of behaviors that we are concerned with: **basic** behaviors, **simple** behaviors, and **complex** behaviors.



Basic Behaviors

Example: Turn on Motor Port 3 at half power

At the most basic level, everything in a program must be broken down into tiny behaviors that your robot can understand and perform directly. In ROBOTC, these are behaviors the size of **single statements**, like **turning on a single motor**, or **resetting a timer**.

Simple Behaviors

Example: Move forward for 2 seconds

Simple behaviors are small, bite-size behaviors that allow your robot to perform a **simple, yet significant task**, like **moving forward for a certain amount of time**. These are perhaps the most useful behaviors to think about, because they are big enough that you can describe **useful actions** with them, but small enough that you can program them easily from basic ROBOTC commands.

Complex Behaviors

Example: Follow a defined path through an entire maze

These are behaviors at the **highest levels**, such as **navigating an entire maze**. Though they may seem complicated, one nice property of complex behaviors is that they are always composed of smaller behaviors. If you observe a complex behavior, you can always break it down into smaller and smaller behaviors until you eventually reach something you recognize.

```
task main()
{
  motor[leftMotor] = 63;
  motor[rightMotor] = 63;
  wait1Msec(2000);

  motor[leftMotor] = -63;
  motor[rightMotor] = 63;
  wait1Msec(400);

  motor[leftMotor] = 63;
  motor[rightMotor] = 63;
  wait1Msec(2000);
}
```

Basic behavior
This code turns the left motor on at half power.

Simple behavior
This code makes the robot go forward for 2 seconds at half power.

Complex behavior
This code makes the robot move around a corner.

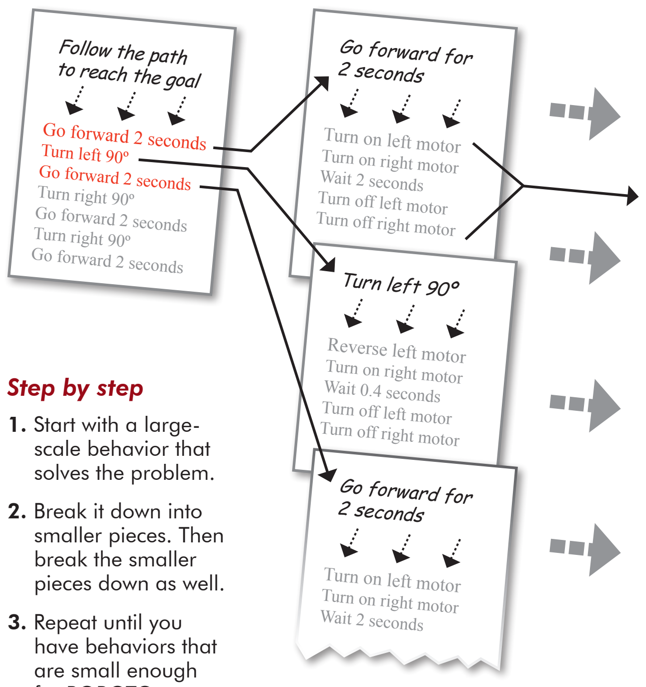
Behaviors

Composition and Analysis

Perhaps the most important idea in behaviors is that they can be **built up or broken down into other behaviors**. Complex behaviors, like going through a maze, can always be broken down into **smaller, simpler behaviors**. These in turn can be broken down further and further until you reach simple or basic behaviors that you recognize and can program.

By looking back at the path of behaviors you broke down, you can also see how the smaller behaviors should be programmed so that they **combine back together**, and produce the larger behavior. In this way, analyzing a complex behavior **maps out the pieces** that need to be programmed, then allows you to **program them**, and **put them together** to build the final product.

Large behavior | **Smaller behaviors** | **ROBOTC-ready behaviors**



1. Turn on left motor
2. Turn on right motor
3. Wait 2 seconds
4. Turn off left motor
5. Turn off right motor

---

6. Reverse left motor
7. Turn on right motor
8. Wait 0.4 seconds
9. Turn off left motor
10. Turn off right motor

---

11. Turn on left motor
12. Turn on right motor
13. Wait 2 seconds

...

Step by step

1. Start with a large-scale behavior that solves the problem.
2. Break it down into smaller pieces. Then break the smaller pieces down as well.
3. Repeat until you have behaviors that are small enough for ROBOTC to understand.

Sometimes it can be hard to tell whether a behavior is "simple" or "complex". Some programs are so complex they need multiple layers of simple behaviors before they reach the basic ones!

"Basic," "Simple," and "Complex" are categories of behaviors which are meant to help you **think about the structure of programs**. They are points of reference in the world of behaviors. Use these distinctions to help you, but don't worry if your "complex" behavior suddenly becomes a "simple" part of your next program... just pick the point of reference that's most useful for what you need.

Behaviors with Natural Language

Behavior Based Programming with the ROBOTC Natural Language

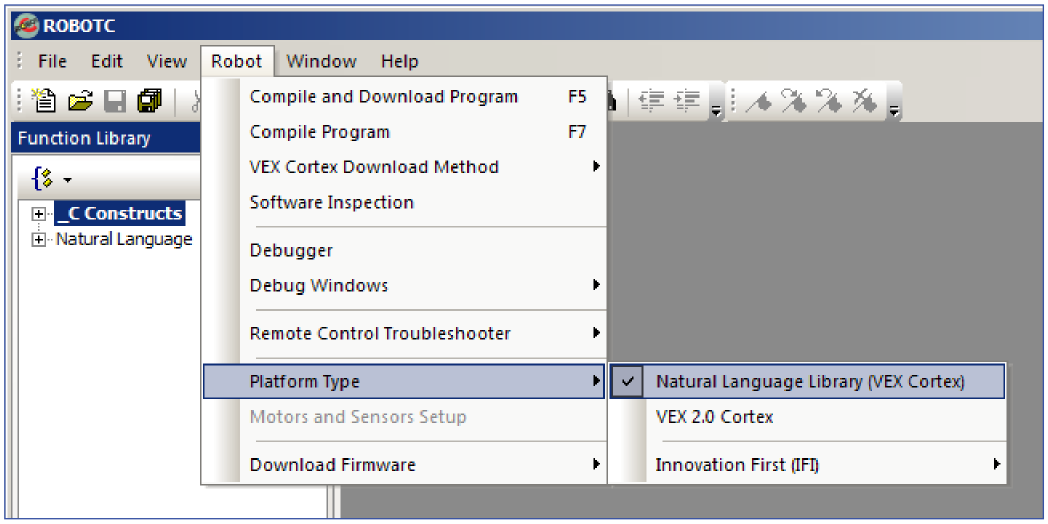
The ROBOTC Natural Language is designed to lower the barrier of entry into syntax-based programming by combining multiple basic behaviors into single commands. In other words, programmers can write their programs at the “simple behavior” level, without worrying about each basic behavior. The names of these new commands are also designed to be more intuitive and easier to remember.

The sample code below causes the robot to perform the same exact complex behavior as before (turn around a corner), but is several lines shorter and can be understood more easily.

```
task main()
{
  robotType(recbot);

  forward(63);
  wait(2.0);

  pointTurn(right, 63);
  wait(0.4);

  forward(63);
  wait(2.0);
}
```

Many additional commands are available in the Natural Language than what appear in this sample code. Common behaviors such as line tracking, moving straight, waiting for particular sensor values, remote control and others are available. For more information, reference the ROBOTC Natural Language document or the built-in ROBOTC Help.

In ROBOTC, the Natural Language can be enabled by selecting it as the Robot > Platform Type.


ROBOTC
File
Edit
View
Robot
Window
Help
Function Library
_C Constructs
Natural Language
Compile and Download Program F5
Compile Program F7
VEX Cortex Download Method
Software Inspection
Debugger
Debug Windows
Remote Control Troubleshooter
Platform Type
Motors and Sensors Setup
Download Firmware
Natural Language Library (VEX Cortex)
VEX 2.0 Cortex
Innovation First (IFI)