SECTION A

ROBOT MOVEMENT

ACTIVITIES

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ACTIVITY 1:
RANDOM MOVEMENT VS. STRUCTURED MOVEMENT

What is random movement? Movement that seems to have no purpose or reason -- it just happens.

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What is structured movement? Movement with a purpose. For RB5X, it is movement that you have programmed that makes RB5X do a certain task.

When would you want the robot to use random movement? When you don't want the robot to seem to pick favorites, when you want it to explore its environment, or if you want the robot to appear to be "doing its own thing."

When would you want the robot to use structured movement? When you have an exact place that you want the robot to go or a special set of movements you want the robot to do.

New Robot Vocabulary

1. MOVE RANDOMLY
2. MOVE TIMED FORWARD
3. MOVE TIMED BACKWARD
4. PIVOT ON LEFT CLOCKWISE
5. PIVOT ON LEFT COUNTERCLOCKWISE
6. PIVOT ON RIGHT CLOCKWISE
7. PIVOT ON RIGHT COUNTERCLOCKWISE
8. STOP ALL MOTION

Let's Practice

BUILD AND LOAD the program called X BETA. See what RB5X does.

Let's Experiment

DEFINE a task using the eight commands above and any commands from the Introduction that you think you need. Using BUILD AND LOAD, see what RB5X does. Do you like X BETA or your own task better?

Let's Experiment Some More

Rearrange the movement commands in your task. See how many different ways you can make the robot move.

ACTIVITY 2: MOVE IN A SQUARE

RB5X can move in any pattern you like. Let's think about how we would get the robot to move in a square. What do we know about squares? All four sides are the same length and all corners are 90 degree angles.

New Robot Vocabulary

1. MOVE DISTANCE BACKWARD for this many feet:
2. MOVE DISTANCE FORWARD for this many feet:
3. SPIN CLOCKWISE this many degrees:
4. SPIN COUNTERCLOCKWISE this many degrees:
5. SPIN LEFT 90 DEGREES
6. SPIN RIGHT 90 DEGREES

Let's Experiment

Decide how big a square you want the robot to make. If you want to check for accuracy, you can either make the square on the floor or draw it on a large piece of paper. Now DEFINE a task using commands that let RB5X make a square pattern. Did the robot do what you wanted?

Let's Experiment Some More

EDIT the square task. Have RB5X retrace its path, only by moving backward. (What other commands do you need?) Once your robot is moving forward and backward accurately, add commands to let it move to a different position before each square movement.

ACTIVITY 3: MOVE IN A TRIANGLE

Now RB5X can move in a square forward or backward. Let's see if you can make the robot move in a different pattern. Try a triangle. For this pattern, you can use the same robot vocabulary used for the square.

Let's Experiment

DEFINE a new task for the triangle. Try an equilateral triangle first, where all three sides are the same length. How many degrees does the robot have to spin at each corner to arrive back where it started?

Let's Experiment Some More

Now that the robot can make a triangle over and over in the same place, after each complete triangle, have the robot move so it can make the following pattern:



How do you change the degrees for each new part of the pattern?

A New Approach

Write a program that lets RB5X make a triangle that has sides of different lengths. What happens to the degrees at each corner or angle?

ACTIVITY 4: MOVE IN A CIRCLE

This job requires some thinking. There are several ways to have RB5X move in a circle. Before you start, stop and think how RCL with Savvy works. It might make the job more efficient. To check for accuracy, draw a large circle on a BIG piece of paper. You use the same robot vocabulary you used to make the square and the triangle.

Let's Experiment

DEFINE a new task for your circle. Put the robot on a point of the circle you have drawn. Experiment with the commands to make the robot follow the line. Does it seem to take a lot of commands?

If it does, there is an easier way. Think about how RCL works again. Also, think about the ways in which you can use loops within your program.

Let's Experiment Some More

Now that the circle is easy for RB5X to make, combine the tasks for circle, square, and triangle in any order you like to have the robot make an interesting pattern. If you used JUMPs and CALLs, you have to do some editing of each task. Also, think how many times you really need to PREPARE THE ROBOT.

NOTE: Figuring out how many degrees the robot should spin is really quite simple. You know there are 360 degrees in a circle. All you need to do is decide how smooth you want the circle to be. The more small spins you include, the smoother the circle. Find a number that divides evenly into 360 (8, 10, 20, 40, etc.). The remainder (45, 36, 18, 9, etc.) is the number of degrees the robot needs to spin each time. The size of the circle depends on how far you tell RB5X to move forward between each spin.

ACTIVITY 5: ROBOT PATHFINDER

Robots don't have to go in symmetrical patterns all the time. Sometimes you might want a robot to go from one place to another and that's all. So let's send RB5X on an errand.

Let's Experiment

On a very large piece of paper (at least 10' x 10') draw the floor plan of your house, a map of the streets you use to go to the nearest store, or a map of some other place with which you are familiar. RB5X needs to get from one side to the other without going through walls or running into obstacles. Now DEFINE a new task and using the commands you already know, write a task that lets the robot get where it is supposed to go. Did RB5X make it without "running into" anything?

Let's Experiment Some More

Now that the robot knows how to get where it's going, add to your task so that the robot can safely come back to the starting point. You might want to add a WAIT between the two parts of the task.

ACTIVITY 6: ANIMAL CHARADES

You know how to teach the robot to go from place to place and to make several patterns. Let's teach the robot to imitate some different animals. (Try to pick animals that have very distinct types of movements, such as a snake or a duck.)

New Robot Vocabulary

1. PICK A RANDOM DIRECTION

Let's Experiment

Think about the first animal you picked. How does it move? What are its most distinctive movement patterns? How does it move when it gets excited? What commands that you already know can you use to make the robot move most like the animal? Why would you want to use the command PICK A RANDOM DIRECTION? Remember the very first part of Activity 1 in this section? DEFINE a task and try out your ideas. When you are satisfied with your first animal, DEFINE tasks for all of the other animals.

Let's Experiment Some More

When you are satisfied with all of your animals, put the tasks together the same way you did with the patterns. Try them out on your friends to see if they can guess what RB5X is doing. You might want to put a WAIT after each set of animal movements so your friends have a chance to guess what animal is represented by each task.

ACTIVITY 7: ROCK 'N' ROLL ROBOT

If RB5X can imitate different animals, why can't it dance? Let's see if you can turn the robot into a really flashy dancer. Rock 'n' roll dancing gives you the opportunity to let the robot use a lot of free movement since there is really no one, right way to do it.

New Robot Vocabulary

1. SPIN AROUND CLOCKWISE this many times:
2. SPIN AROUND COUNTERCLOCKWISE this many times:

Let's Experiment

Pick some music that you think you and RB5X will like. Think about the way people who are really good at dancing to rock 'n' roll music look. What kinds of movements do they make? Now think how these movements go with the music you have picked? You might want to close your eyes and imagine how RB5X would look moving to the music you are using.

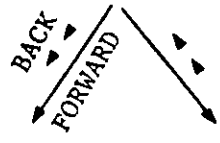
Now DEFINE a task and start programming your "steps." You will probably want to use WAITs to help the robot keep time to the music. Be sure to try the new commands. They will add a lot of flash to RB5X's routine.

ACTIVITY 8: THE ROBOT WALTZ

You can see that RB5X has some talent as a dancer! So do you, for that matter -- you're the one who is teaching it. Now let's teach the robot a dance that is a little more structured. Suppose RB5X is transported back in time. The robot finds itself at a grand ball in honor of the king and queen. To keep from seeming out of place, RB5X needs to know how to waltz right along with the other guests.

Let's Experiment

Pick some waltz music, the kind that has a very strong 1---2,3 count. Remember that when people waltz, they usually make one long movement to the front or side and two short ones back to where they started. You might want to draw a pattern on a piece of paper:



Sometimes people add some spins to the waltz, all the time keeping to the 1---2,3 beat. You could have RB5X do these too. Now that you have your music and your pattern, think about how far the robot should go to follow the pattern and keep time with the music. Remember that WAITs and SPINs can help you keep RB5X in time with the music.

DEFINE a task, put the movements in, and see if your calculations are right. Would RB5X fit right in at the royal ball or would it stand out like a sore thumb?

ACTIVITY 9: SQUARE DANCE PARTNER

It's time that you put RB5X to practical use. Why not have it be your square dance partner? If you know something about square dancing, you can use some steps that are authentic. If not, just invent your own. Remember that there is a lot of moving forward and back, and a lot of turning.

Let's Experiment

Pick out some music. The best would be a piece of square dance music that includes the calls. If you don't have any, just pick some lively music that has a "country" flavor to it.

Plan the figures that you and RB5X will perform. It is easiest to draw these on a piece of paper. Count the music to see how long the robot needs to perform each move. Remember, the robot can't change its mind in the middle of a pattern. Only you can do that.

Now DEFINE a task and program in the commands that allow the robot to execute the figures. Have RB5X perform its part to the music. See if it is in time. Adjust your program where needed. Now are you ready to try square dancing with RB5X? How did it turn out?

ACTIVITY 10: ROBOT BALLET

Now you know all of the major movement commands that RB5X learned before it left the factory. You are ready to teach the robot something quite spectacular. Let's "choreograph" a ballet for RB5X. If you like, you can even make the robot a costume to wear for its performance.

Let's Experiment

Pick out some music. It can be lively or serene, whichever you and RB5X prefer. Now, think of your stage as being 5' x 5'. Listen to the music and visualize your robot as the star performer, moving gracefully to the music. It may help to draw the patterns you see on a piece of paper before you start to write the program.

Using all of the techniques you have learned, DEFINE a task for the robot. Try to use as many movement commands as you can, and try out your task at several stages to see if it is really what you want. There might even be a place for some random movements, since ballet dancers seem to wander around the stage aimlessly from time to time.

Remember that you may be able to incorporate some previous tasks in the ballet. When you are finished and are satisfied with RB5X's performance, invite some friends to enjoy the dance concert with you.