SECTION C

AUDIO-VISUAL COMMUNICATION

ACTIVITIES

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ACTIVITY 1: SOUND PATTERN #1

Now you know something about how robots move and how they sense their environment. Robots can communicate with the world in other ways, too. Using sound is one way. RB5X has a horn that it can honk for different lengths of time.

New Robot Vocabulary

1. TURN ON THE HORN
2. TURN OFF THE HORN

Let's Experiment

DEFINE a new robot task for sound. Using the new vocabulary and some commands from the Introduction, write a program that lets the robot sound its horn for one long and two short beeps. Write the task so the robot can do this over and over. What commands from the Introduction are needed to make this work?

Let's Experiment Some More

Now that you know how to have the robot sound its horn in some sort of pattern, go ahead and EDIT your task to create a more complicated pattern that repeats over and over. You might want to try something like this: long, short, long, long, short, short, medium, medium, long, short, medium, long, long, long. Or make up your own.

ACTIVITY 2: SOUND PATTERN TO MUSIC

What else could the robot do with its horn? Why not have RB5X honk its horn in time to some music?

New Robot Vocabulary

1. Honk the horn for this many seconds:

Let's Experiment

Pick out a piece of music that has a nice repeating rhythm. Listen to the beat to see how many long and short shounds it has. Make notes of the pattern. Now DEFINE a task and using the new vocabulary, write a program that lets RB5X honk in time to the music. Think about how you solved Activity 1, "Sound Pattern #1." Can you use the same technique for this activity?

Remember that if you put a period, or decimal, in front of the number for seconds, you will get parts of seconds instead of whole seconds. What kind of musician is RB5X?

Let's Experiment Some More

Now that RB5X can keep the beat, try to teach the robot to honk with the melody. This will take some careful planning. Listen closely to the timing of the melody and jot down the pattern. DEFINE a new task or EDIT the previous task to include the proper commands. Don't forget that WAIT might be a useful command in this task. How does RB5X sound?

ACTIVITY 3: MORSE CODE

Morse code has been used for communication in many different ways over the years. It consists of combinations of short and long sounds or dots and dashes that stand for letters. A new way to use Morse code is to involve the robot. Do you think that RB5X can sound out a code message?

Let's Experiment

Morse code has been used many times by people who were in distress. Here are the symbols for the phrase, "S.O.S. Robot in distress!":

(B -...,D -..,E .,I ..,N -.,O - - -,R .-.,S ...,T -)

DEFINE a task and write a program that allows RB5X to use the horn to communicate the message.

Let's Experiment Some More

Find a book on Morse code at the library or look in an encyclopedia. Select some messages for RB5X to transmit and write the appropriate programs. Once you are satisfied with the results, invite some friends to figure out what the robot is trying to communicate.

ACTIVITY 4: LIGHT PATTERN #1 OR A BRIGHT IDEA

You have learned one way to have RB5X communicate. Here is another method. The lights under the robot's dome are its LEDs (light-emitting diodes). You can use the lights to signal the beginning or end of parts of robot tasks or you can use them just to make the robot appear happy and friendly.

New Robot Vocabulary

1. TURN ON THE FLASHING LIGHTS
2. TURN OFF THE FLASHING LIGHTS

Let's Experiment

DEFINE a task that is a lights routine. You've seen the cartoons that show a light bulb in a balloon when someone has a "bright idea." Well, let's write a program that gives the impression that RB5X is thinking for a while and then has a bright idea. Very short bursts of lights flashing could indicate thinking while a long period of flashing lights could indicate a great idea. Arrange it to suit yourself. What kind of effect does it give?

Let's Experiment Some More

Using one of the movement tasks you previously wrote, add the flashing lights at appropriate spots to make RB5X appear to be thinking about what is to be done next.

ACTIVITY 5: LIGHT PATTERN #2

There are other things you can do with the LEDs besides making them flash. There are five LEDs that can be switched on and off independent of each other. You can use these to create many different effects.

New Robot Vocabulary

1. TURN ON LED (#)
2. TURN OFF LED (#)

Let's Experiment

To learn which number corresponds to which LED, DEFINE a new task. Have the robot switch on each LED from one to five, then have RB5X switch off each LED in the same order. Remember which number goes with which LED and make a note of it.

Now you know how to switch on and off the LEDs you want. Let's create a more complicated pattern. Work out a pattern on paper, marking which LEDs are to be on at each step. EDIT your LED task and program in the pattern. Does it look the way you expected it to? Try as many patterns as you wish.

ACTIVITY 6: THE FESTIVE ROBOT

You know how to use all of the lights commands so let's put them together to make RB5X sparkle. You can have your robot imitate a Christmas tree, a neon sign, or a mini-fireworks display just by combining different light patterns.

Let's Experiment

Using your imagination, pick something festive you would like the robot to imitate. Decide how to combine the commands to let RB5X give the best possible imitation. DEFINE a task and write the program. Can someone else guess what the robot is supposed to be?

Let's Experiment Some More

RB5X has had a lot of excitement with all of the festivities. Now it's time to wind everyting down and let the robot drop off to sleep. DEFINE a new task. Start out with lots of flashing lights, then work out a pattern where

fewer lights flash, slower and slower, until none are flashing. You can use this task as a general utility in other robot tasks to give RB5X some of its own personality.

ACTIVITY 7: PUTTING SOUNDS AND LIGHTS TOGETHER

Now that you know how to use the commands for both the horn and the LEDs, let's combine the two sets of commands to produce more complex effects. The horn and LEDs can be helpful in alerting people to the robot's whereabouts.

Let's Experiment

Let's add sound and lights to one of your previous movement tasks. You can pick any task you think will be improved by this addition. Decide on the effects you want to create. (You did a little of this by adding "A Bright Idea" to the "Square" task.)

Once you have decided on the task, EDIT the task and add the commands for horn and LEDs in the most logical places. Does this improve the appearance of the task? Could you add more flourishes for an even better effect?

ACTIVITY 8: BACK TO MORSE CODE

You have used the horn to sound out messages in Morse code. Now let's be sure that those messages are communicated in a noisy room as well as one where the horn can be heard. We can do that by adding long and short light flashes to the task we created in Activity 3, "Morse Code."

Let's Experiment

EDIT the task you created in Activity 3, "Morse Code." Before you add the LED commands, you need to decide if you want RB5X to use the horn all through a message and then change to the LEDs, or if you want to use horn and LEDs together for each separate letter. Choose the method that

you like best. What kind of effect does the combination of lights and horn give? Can your friends decode the message?

ACTIVITY 9: NEW YEAR'S EVE

Whatever the season, RB5X likes to share in the excitement. The robot can do an excellent job of helping you celebrate the arrival of the New Year. The lights and horn are perfect for this. Let's write a program that lets the robot participate right along with everyone else.

Let's Experiment

First, write a script that shows when RB5X is going to flash its LEDs and when it is going to sound the horn. Decide how long you want each of these activities to last. Think of some of the other tasks you have written. Are there parts from these that you could use in this task? What is helpful about this idea?

Once you have decided what to do and how to proceed, DEFINE a new task and enter the commands in the proper order. Try out your task. Does RB5X look like it is celebrating at a New Year's Eve party? Make any additions or changes you like. Now your task is ready when that time of the year comes.

ACTIVITY 10: SENTRY ROBOT

RB5X can put its horn and LEDs to real, practical use by alerting you if anyone or anything enters a room. The robot can either sound its horn or flash its lights or both. This can be very helpful. Imagine, for example, that it's been raining and someone lets the dog in. The dog heads for the nice, clean carpet in the living room to shake and roll. It would be nice to know this in time to catch the dog and save the carpet. RB5X can help out there.

Let's Experiment

First, decide where RB5X can best be put to work. Then decide how the robot is going to help alert you. How much time do you need from the time the robot alerts you to the time you can do something about the warning? How do you want the robot to signal you -- with horn, with LEDs, or with both?

Now you are ready to DEFINE a task. You need some commands from Section B, "Sensing Devices," since RB5X needs to use sonar to sense the presence of the object. Once your task is written, check to see if the sonar responds the way you want it to. When it does, put RB5X in the proper location and wait for results.