

December 15th, 2008

Student's Name:

Period #:

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Introduction

In this activity you will learn about room acoustics and speech intelligibility in a simulated room environment. Speech intelligibility can simply be defined as how well you can understand what someone is saying in a situation where other noises, or interference, occurs. For example, at a party you tend to be in a room full of people where everyone is talking at one time and you are trying to listen to your friend sitting across from you. The interference comes from other people talking and the speech intelligibility is judged by how well you can understand what your friend is saying. In this activity we will explore the affect various amount of echo strength has on the audio generated in the room. To do this, we'll be using an online game called Hide & Speak that allows you to configure a acoustic room environment and attempt to identify the if a spy is present in rooms created by other players.

Setting Up

1. Make sure you have a set of headphones
 2. Make sure that you're computer's volume is set at a reasonable level. Test using the keys at the top of the keyboard
 3. Open up the FireFox web browser on your computer
 4. Your homepage should be set to the METgames homepage.
(<http://schubert.ece.drexel.edu/~travis/webpage/WebPage.html>)
 5. If you have not previously registered for an account please do so by entering your **First Name** and **Last Name** in the form at the center of the screen and click the **Register** button. Otherwise, if you already have an account proceed to step 7.
 6. Fill out the next form with your information and click **Submit** to create your account.
 7. Now enter your username and password in the fields at the top of the screen. If you just created an account this will automatically be populated, otherwise please enter your **Username** from last time and **CAPA** for the **Password** and click the **login** button.
 8. Now that you are logged in, click the **hide&speak** button to continue to on with the activity. In the game menu click **Play Game**, then click **Normal** and finally click **Hide the Spy** to begin.
 9. Read on before using the interface
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Controls Description:

White Circle: Represents your listening location in the room

Red Circle: Represents the location of the person you are attempting to listen to (target person).

Green Circle: Represents other person in the room that you do not care to listen to. (Not shown yet!)

Up and Down Arrows: Allows you to change the number of people or amount of echo in the room.

Listen Button: Allows you to listen to the simulated room you're viewing

Submit Button: Submits your room configuration to a database for storage and evaluation

Exercise 1: Understanding Relation Between Echo And The Source Distance From Listener

You are now presented with an interface that allows you to modify and listen to an acoustic room environment, as shown in the figure below (the position of the red and white circles may be different from the one shown).

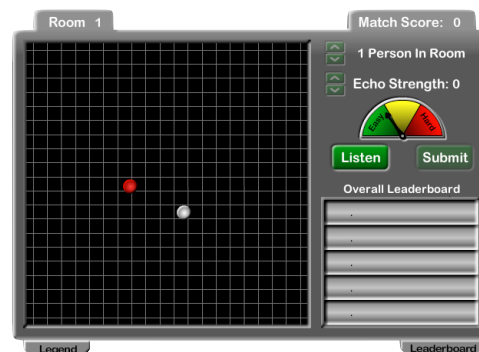


Figure 1: Room Creation Interface

1. Start by moving the target speaker (red circle) slightly and clicking the **Listen** button to listen to their voice. The audio you are listening to is generated based on the positions of both you (the listener) and the person you are listening to.
 - b. After listening to the target person alone, you are now able to change the number of people and the strength of the echo in the room (**Although we will not be doing that just yet!**).
2. Now that you're more familiar with the interface, we'll be able to start. Using your mouse, click the up arrow button beside **Echo Strength** to increase the number to **8**. Now move the **White Circle** (you) to the center of the room and the **Red Circle** near the **White Circle** on the right.

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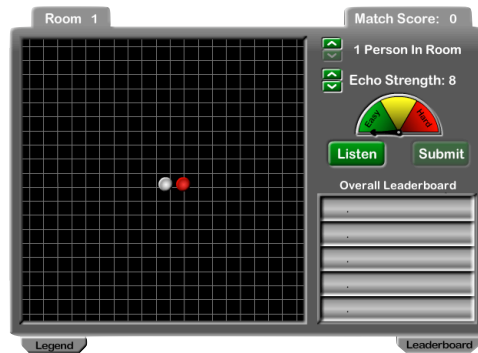


Figure 2: Example of listener and target at step 2.

3. Click the **Listen** button to hear the **Red Circle** speaking in the room. Take notice to the amount of echo that you hear.
4. Now move the **Red Circle** far away from you and click the **Listen** button. Take notice to the amount of echo that you hear.

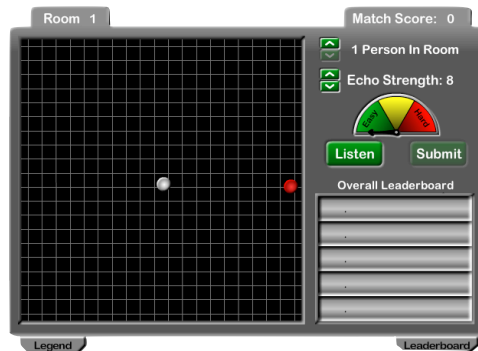
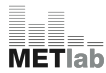


Figure 3: Example of listener and target at step 4.

5. Experiment by moving the **Red Circle** (target person) different distances away from the **White Circle** (you) and listening to the resulting sound in the room. Observe how the distance between you and the speaker determines the amount of echo you hear.



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Notecard Question 1

(Stop here and answer the instructor's question on the notecard provided to you)

Response Question 1:

Compare the amount of echo you heard in each room configuration you created in the activity. For example, when the distance between you and the target speaker is small, is there a little echo, a lot of echo or even any at all? Do you think it is easier to understand the person when they are closer or farther away from you? Explain your reasons for your answer.

Exercise 2: Exploring Your Ability To Understand A Person with Interfering Speakers

When you are talking to a friend in a crowded mall, the noise coming from the other people is called *interference* because they make it more difficult to hear your friend (the target). In this exercise, we'll be analyzing the effects of interference in the simulated rooms we've been working with. As in the previous exercise, you will be represented by the White Circle, the target by the Red Circle and the *interferers*, or people making the interference, by the Green Circles. We'll also introduce echo into these rooms to look at the combined effects of echo and interference.

Consider the following scenario:

You are a rogue FBI agent and you are trying to communicate with a spy (**Red Circle**), but you don't want the FBI to know who you are communicating with. Therefore, you need to hide the spy in a room full of people. You do this by creating a situation where you can hear the spy, but you can barely understand what they are saying due to the *interfering* people (**Green Circles**) in the room. The locations of these interfering speakers and the echo in the room determine how well you can hear the spy. Therefore, you want to make it difficult for the FBI to determine who the spy is by listening with the microphone they planted in the room.

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1. Start by listening to listening to the spy in the room with only you and the spy in the room (**White and Red Circles only**) by clicking the **Listen** button. Make sure you listen closely to what the spy is saying and remember how that sounds. Now you are given the option to add more people to the room and to change the Echo Strength.
2. Start by adding one interfering person to the room, which should place a **Green Circle** in the room.

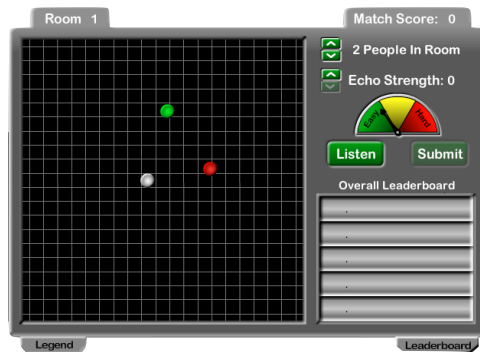
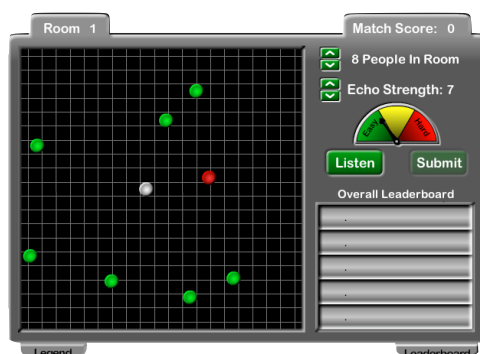
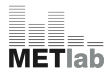


Figure 4: Example of step 2.

3. Listen to the new room and see if you can still understand what the spy is saying.
4. Try adjusting the **Echo Strength** by clicking the up and down arrows (The larger the number the more Echo Strength).
5. Listen to the room with the new **Echo Strength** and see if you can still understand what the spy is saying.
6. Adjust the **number of interfering people in the room**, **echo strength** and the **location of each person** until you can barely understand the spy.
7. After you reach this point you can submit the room to the database to be played by other people by clicking the **Submit** button.





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Figure 5: Example of a possible room configuration.

Notecard Question 2

(Stop here and answer the instructor's question on the notecard provided to you)

Response Question 2:

In this exercise you created rooms with *interfering* speakers so that you could hide the identity of a spy from the FBI. Did changing the Echo Strength make it easier or harder to understand the spy? At what point did you find that the interference from the listeners and/or echo made it too difficult to understand the spy? You can answer this by drawing an example room where the interfering speakers and locations made it too difficult to hear the spy. Use circles to indicate people with a label (W for white, R for red, G for green) to indicate their color.

Now draw a room where it would be easy for the FBI to understand what the spy was saying even with other people in the room. Again, make sure you label the circles with the appropriate colors or labels.

Congratulations! Now that you're a master at hiding the spy, you get to help the FBI find the spies you and your friends hid! From the game menu, select "Play Game" and then select "Normal." Finally select "Find the Spy".
