

TRAINER PREPARATION GUIDE 4.3: WORK WITH COLLISIONS

Lesson Objective 4.3:

Work with collisions. *Topics:* rectangle and per pixel collisions, collision detection, collision response, and fundamentals of physics simulation.

Required materials to teach this lesson:

1. A workstation with Windows 7®, Windows Vista®, or Windows XP®
2. Microsoft Visual Studio® or Microsoft Visual C# Express® (2008 or 2010)
3. XNA® Game Studio 2.0, 3.0, 3.1, or 4.0
4. 98-374-ENU-4.3-LP
5. 98-374-ENU-4.3-IC
6. 98-374-ENU-4.3-IC-4.3_Key
7. 98-374-ENU-4.3-IC_Key.zip
8. 98-374-ENU-PC-4.3
9. OrangeBall.png, PurpleBall.png, and TealBall.png, located in 98-374-ENU-4.3-IC-resources.zip

Preparation Tasks

Technical preparation activities:

1. Install Visual Studio 2010 and XNA 4.0
2. Download and unzip the collision solution file 98-374-ENU-4.3-IC_Key.zip.
3. **Vocabulary**

animation: a simulation of movement created by displaying a series of pictures, or frames.

pixel: gives the color of a single small area of the display screen. The more pixels that a screen contains the higher the quality of the picture, the more memory will be used, and the more time it will take to create the image.

sprite: a small bitmap image, often used in animated games but sometimes used as a synonym for the word *icon*.

vector: a line or movement defined by its end points, or by its current position plus one other point.

4. **Additional readings and resources:**

MSDN®:

Tutorial 5: 3D Transformation: <http://msdn.microsoft.com/en-us/library/ff729722>

App Hub: <http://create.msdn.com/en-us/education/gamedevelopment>

Getting Started with XNA Game Studio: [http://msdn.microsoft.com/en-us/library/bb203894\(v=XNAGameStudio.31\).aspx](http://msdn.microsoft.com/en-us/library/bb203894(v=XNAGameStudio.31).aspx)

XNA Game Studio: <http://msdn.microsoft.com/en-us/library/cc178930.aspx>

Other resources (books, e-reference):

Miles, Rob. *Microsoft XNA Game Studio 4.0: Learn Programming Now!* (Redmond, Wash.: Microsoft Press, 2011).

Riemer's 2D & 3D XNA: <http://www.riemers.net/>.

XNA Game Development: <http://www.xnadevelopment.com/tutorials.shtml>

Stahler, Wendy. *Game Design and Development: Fundamentals of Math and Physics for Game Programmers* (Prentice Hall, 2006).

Instructor computer setup:

1. Install XNA Game Studio.
2. Unzip and open the collision program solution (98-374-ENU-4.3-IC_Key.zip) to preview for students.

Instructional preparation activities:

1. Review the instructor notes in the notes panes of Microsoft PowerPoint® presentation 98-374-ENU-4.3-LP.
2. Make copies of student documents available as needed.
3. Instruct students to create their own image to use instead of the images provided, if desired.
4. Review the XNA project solution file 98-374-ENU-4.3-IC_Key.zip.

Lesson sequence (50 minutes)

Activating prior knowledge/lesson staging (5 minutes):

Direct students to answer each question in the "Guiding questions" section of the In-class Activity document or their personal class notes.

Guiding questions:

1. **What should happen when two objects in the animation collide?** This can be answered in several different ways, depending on the environment. Maybe one object should blow up or disappear; maybe they should bounce off in different directions; or maybe one gets bigger.
2. **Why is testing for a collision using the bounding rectangle deceiving?** Testing to see if the bounding rectangles overlap can be deceiving because there might be extra space around the object that is not part of the sprite, but is included in the rectangle. The result is that the bounding rectangles collide but not the actual image.
3. **Why is an understanding of physics important to animation and game design?** Understanding physics helps make the animation more realistic. An example might be taking into consideration the velocity, acceleration, and the relationship to time and space.

Lesson activity (40 minutes):

1. Teacher instruction (20 minutes):
Use the included PowerPoint presentation to review working with collisions.
2. In-class activity (15 minutes):
Students are to complete ERK-98-374-ENU-IC-4.3.

3. Post-class activity (5 minutes):

Provide instruction for the post-class activity as needed. Establish a completion date.

Lesson review (5 minutes):

1. Discuss the guiding questions.
2. Instruct students to write and submit any questions they have or any topics about which they would like more assistance.
3. After class, look through the student responses and follow up with any student requiring additional help.