

Bug Report for Energy Skate Park, Version 2.01

Testing on Windows XP Professional, Service Pack 2

Java Version 1.4.2_14

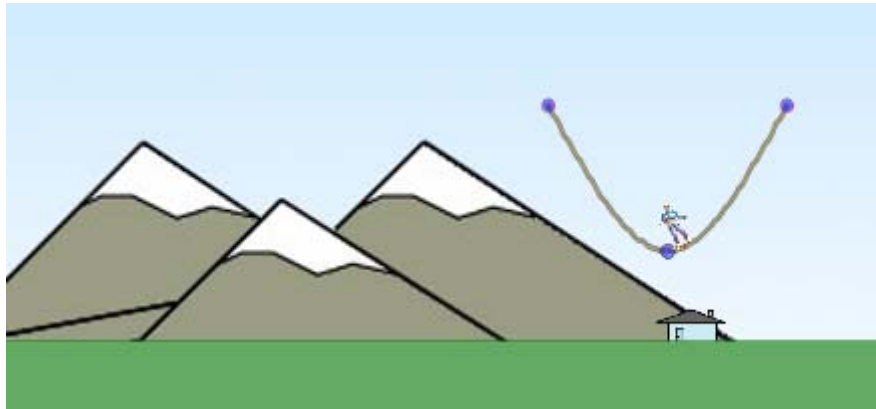
May 21, 2007

Brief Synopsis:

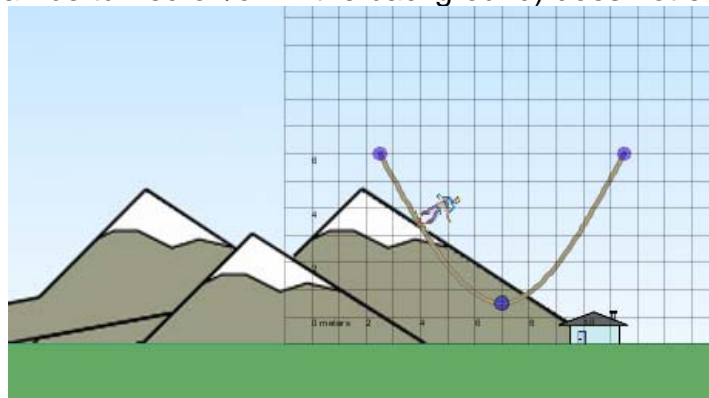
Overall there are no new major bugs. Many of the bugs were also observed in the previous version and are on Sam's list of remaining work. There are some performance issues that should be fixed, such as the delays when zooming in and out and when multiple energy graphs are open with complicated tracks. Additionally, all three energy graphs have multiple bugs that need to be fixed.

General:

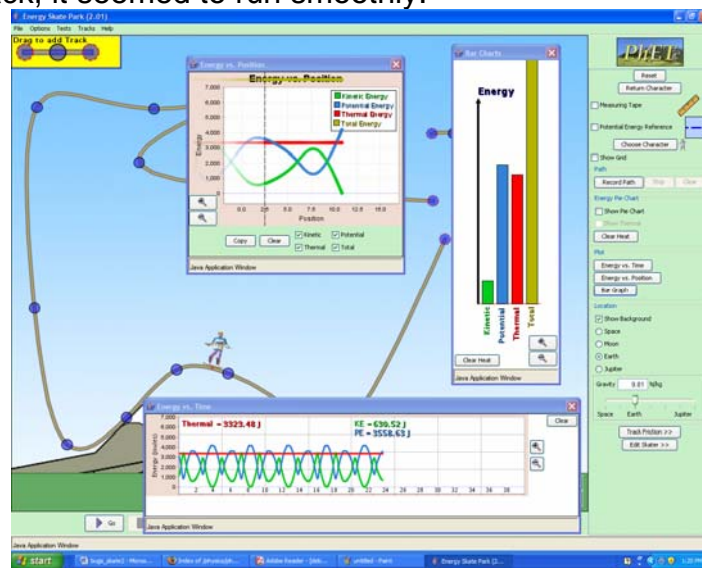
1. When you zoom out, the background mountains do not resize with the skater and track—they simply remain fixed in space. The house does resize, and it gets shifted over to the left.



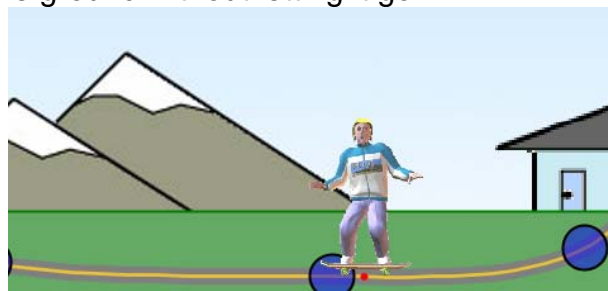
2. When you zoom either in or out, there is a one second delay between clicking the button and the screen actually resizing. During this time, all motion freezes.
3. The grid (that can be turned on/off in the background) does not extend forever.



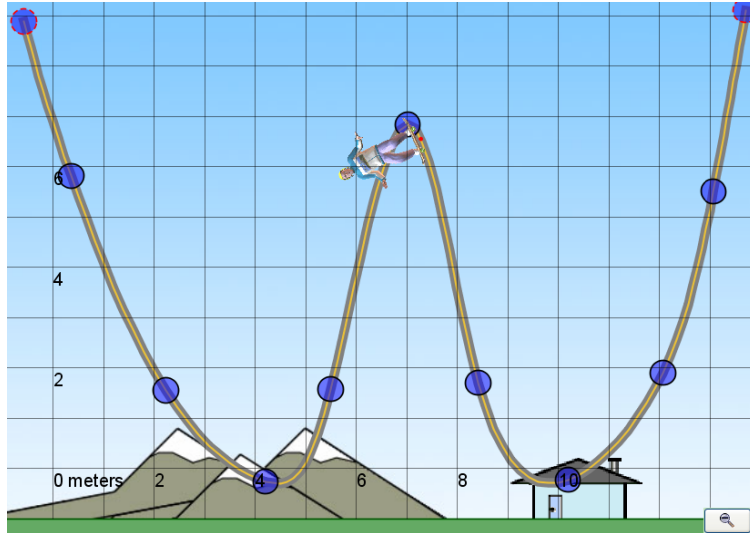
- When you click on the “Reset” button on the top-right corner of the screen, you can click either Yes, No, or Cancel, but No and Cancel are redundant because they do the exact same thing.
- The sim started running a lot slower when you had all three energy plots open, the energy pie chart, and had a complicated track in the play area. The sim was running just fine with a complicated track (and no energy plots open), or when the energy plots were open, and a simple track was in the play area. However, a combination of these slowed down the sim. The motion of the skater would become choppy (momentarily halt) and then would become progressively choppier until the skater came to a complete halt. After pressing “Reset” the skater and track would disappear and would not return. I would have to close the sim and start over. This bug was sometimes hard to reproduce—when I tried to recreate it with another complicated track, it seemed to run smoothly.



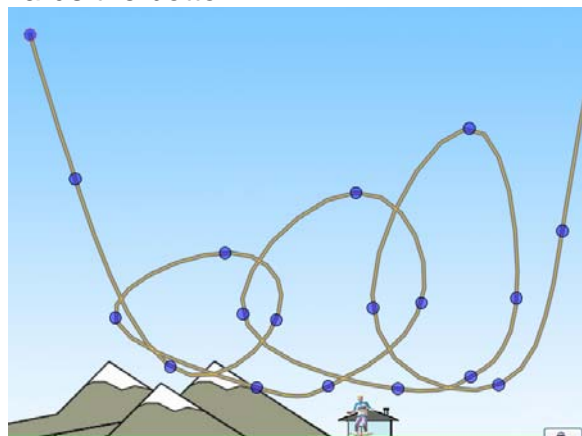
- You can still get the skater and the track to go below the ground if you drag the ramp and hold it below the ground without letting it go.



- It is still possible to have the skater go underneath the track in a double well if the skater has just enough energy to make it over the center peak.



8. If you select “Roller-Coaster Mode” for the track on the screen, and then add another track from the yellow box in the upper left corner of the screen and add this new piece to the existing track, the roller-coaster mode is disabled. It doesn’t matter if you select roller-coaster mode for the new track—connecting tracks together always disables roller-coaster mode.
9. The black grid is hard to see when you are in space and on the moon. Maybe make it white when you are in these locations?
10. When the track is set to roller-coaster mode, and you bring an additional track into the play area, there is a check next to “roller-coaster mode” on the additional track even though the track does not look like it is in roller-coaster mode.
11. If you drop the skater when he is not standing vertical onto a horizontal track, he bounces up and down in that same position, and then stands upright once he is done bouncing. I am not sure if this is expected behavior.
12. In complicated, over-lapping, multiple loop tracks, the skater would sometimes fall through the track towards the bottom.

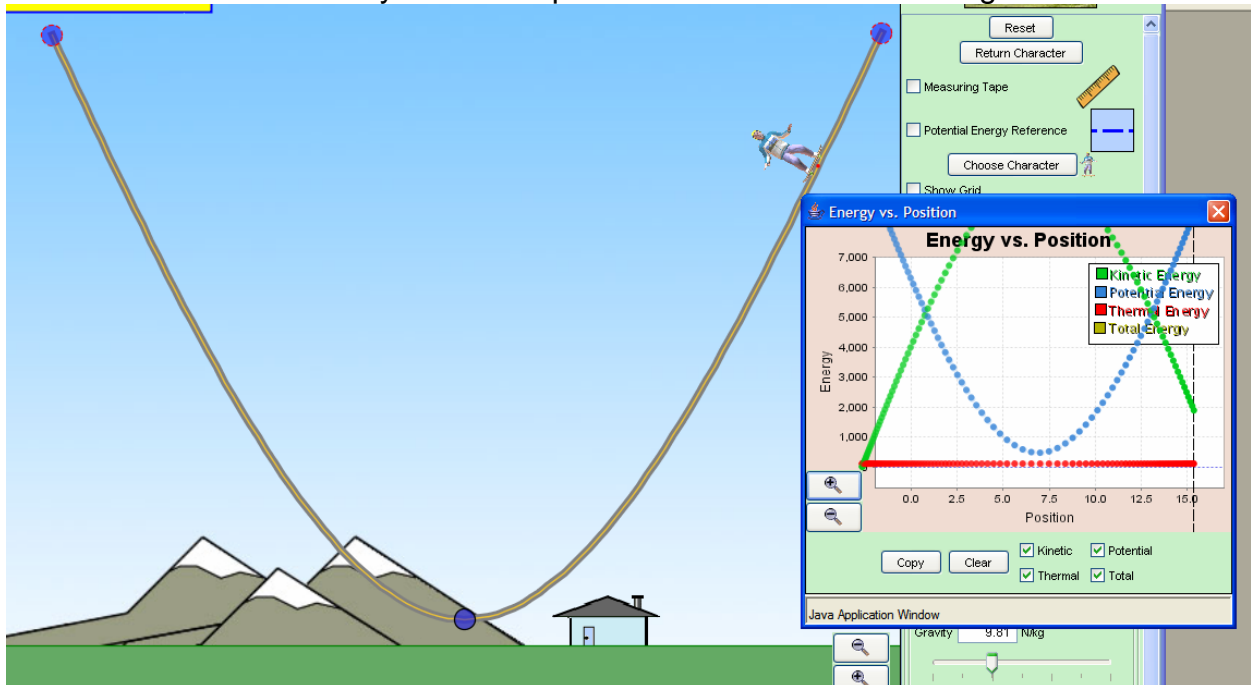


Energy vs. Time Plot:

13. When you press “Pause” and then “Go” to restart the motion, the numerical values on the E vs. T plot continue to function, but the graph no longer works (it stops plotting data). Pressing “Clear” just clears the old data, but does not restart the plotting.
14. When you turn on the Energy vs. Time” plot and click on the zoom (+) button, the scale does not zoom in, but instead expands (-). After you click the zoom (+) button again, then it behaves properly and starts to zoom in.
15. When the Energy vs. Time plot is open and you click on “Reset,” the plot stops plotting information, but still reads the numerical values.
16. The vertical scale (energy) does not show negative values, which is problematic for potential energy, since it can go negative depending on the location of the PE=0 reference line.
17. The other 2 energy plots show all 4 different types of energy (potential, kinetic, thermal, and total). However, the Energy vs. Time plot does not show total energy— is this a mistake, or was total energy left off for a reason?

Energy vs. Position Plot:

18. The colored lines are plotted on top of the scale on the vertical axis and the legend, where it seems like they should be plotted behind the axes and legend.



19. As the vertical dashed line passes behind the legend, it interfered with the text and caused it to bulge where the line would be.
20. The zoom in and out buttons are reversed.
21. You cannot change the horizontal scale (position). When you physically zoom out (so that skater looks smaller) this is a problem since the plot can no longer handle these dimensions.
22. The vertical axis (energy) does not show negative values.
23. The algorithm used to zoom in and out is a bit odd—when you zoom in all the way, all you see are negative energy values (no positive energy values). It doesn't seem to be expanding around some fixed value (such as zero).
24. When you click “Copy” it takes a snapshot of the current graph and puts in a new window. However, you cannot zoom in and out even though the buttons are still present. Maybe either enable these buttons or have the copy not show these buttons.

Energy Bar Chart:

25. The vertical scale for energy has no units.
26. The bar graph does not show negative energy values very well.
27. When you zoom in or out, it takes about a second for the total energy to respond.
28. When you zoom in or out, the thermal energy does not rescale—it simply remains the same.
29. When the skater lands on the ground and comes to a stop, the total energy is equal to the thermal energy (which is expected). However, you can no longer zoom in and out at this point when the skater is stationary on the ground—likewise, any time when thermal and total energy are equal.

Tape Measure:

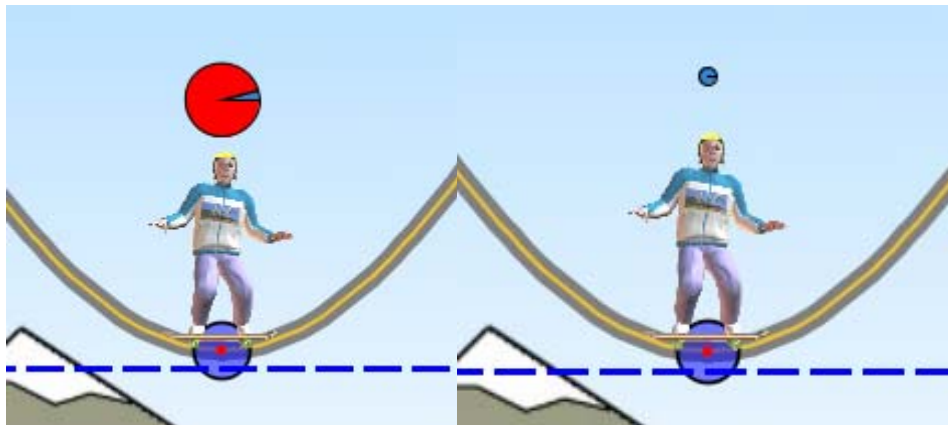
30. The tape measure does not scale properly when you zoom in and out--the numerical value it reads does not change until you move the tape measure. There are two options to fix this: 1) As you zoom in and out, the length of the tape (relative to the real world) should remain fixed and the numerical value it reads should change accordingly as you zoom. 2) The numerical value it reads remain fixed, and the length of the tape (relative to the real world) should change accordingly.
31. The icon to the right of the check box for “Measuring Tape” is a graphic of a ruler, yet the actual tape measure is not a ruler—just a little inconsistent, so I thought I'd point it out.

Gravity:

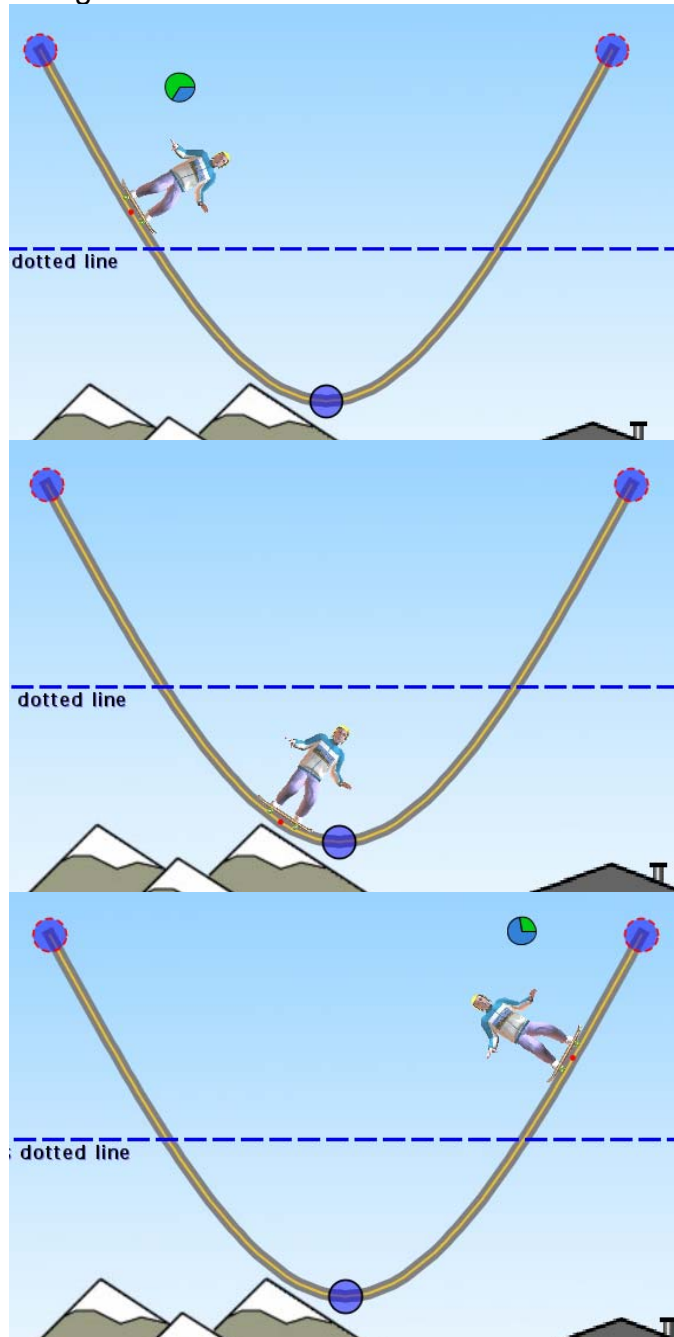
32. When the skater is in space, a ground (impenetrable barrier) still exists in the same location as it did when the skater was on Earth (even though the background image does not show a ground). When you thrust your rocket down, the skater stops at this imaginary ground. When you try to thrust back up, he remains stuck on the ground for a few seconds and then finally breaks free.
33. You can use the arrow keys to thrust the skater in any location (not just space). Possibly this is for test purposes.
34. When you are in space, you can still display the $PE=0$ line, even though it doesn't mean anything in outer space. I'm not sure if this is intentional or not.

Energy Pie Chart:

35. The default is to not show the thermal energy, but the user can check a box which displays it. There could be a problem with this. When the pie chart does not show thermal energy, the area of the pie chart represents the total energy of the skater (kinetic and potential energy). As the proportion of kinetic and potential energies change as the skater oscillates in a well with zero friction, the user can assume that the total energy of the skater is constant. When you have friction present and you display the thermal energy, again the area is constant, but the thermal energy is not an energy that the skater has (like kinetic and potential)—it's the total thermal energy in the entire system. It's a different type of energy. I wonder if having the thermal energy present may lead students to believe that this thermal energy is now part of the skater (maybe the skater is hotter???).
36. It is odd to be able to either display or not display the thermal energy. It may be difficult to convey to users that the area of the pie chart is the total energy. In the images below, the thermal energy is displayed on the left, and no thermal energy is displayed on the right. Which one is the total energy of the skater?



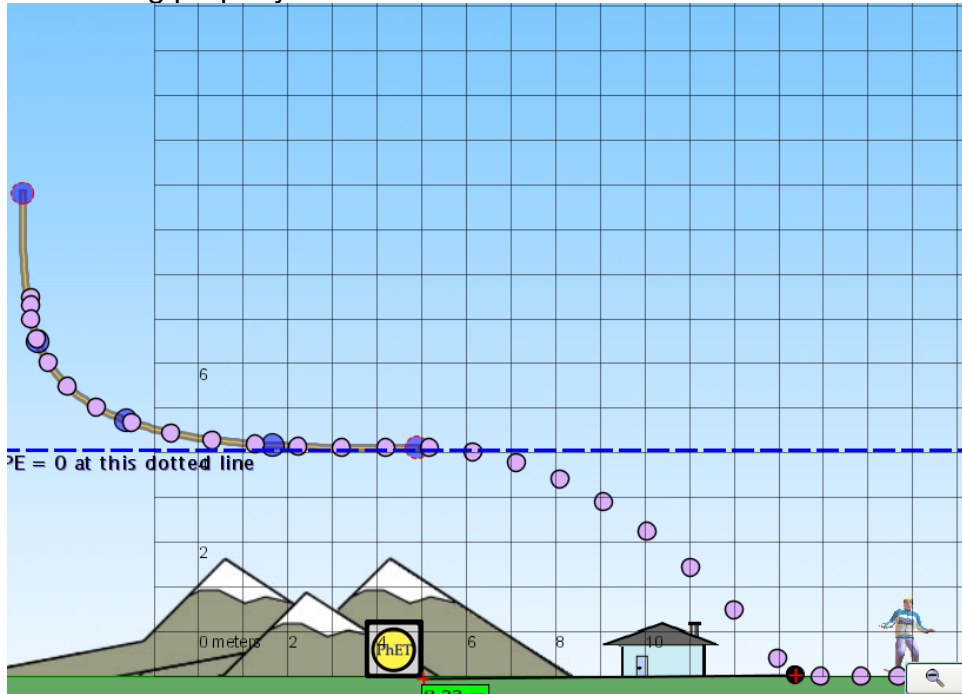
37. When the skater drops below the PE=0 mark, his energy pie chart disappears (I realize this was done to avoid any confusion with negative potential energy, which is difficult to represent with a pie chart). However, if you have the following situation, the pie chart switches on and off as the skater goes above and below the PE=0 line. This may be confusing for students.



38. The “Clear Heat” button is located in the Energy Pie Chart box. However, even when the energy pie chart is not present, this button works. Maybe it would be best to move this button somewhere else so that users don’t assume that this only clears heat in the energy pie chart, or only when the energy pie chart is displayed.

Physical Accuracy:

39. I did a test to make sure that the skater travels the proper horizontal distance based on his initial horizontal velocity when he leaves the track. Everything seems to be working properly.

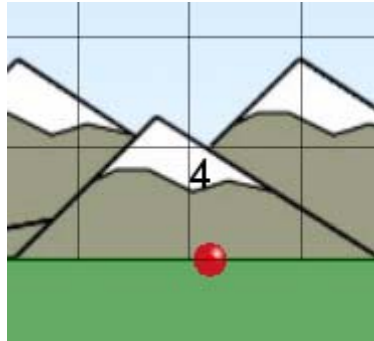


40. I also tested the physics for rolling along a loop to find out how high from the ground the skater needs to be so that he completes the loop without falling off the top of the track. The physics appears to be correct. I set up the following experiment, as shown in the picture below. To ensure that the track/loop is circular, you can use the tape measure as a compass. In order for the skater to just make it past the top of the loop, the height of the skater's original position needs to be $h = (5/2)R$, where R is the radius of the loop. For points below the minimum height, the skater falls off the track. For points at and above the minimum height, the skater completes the loop.

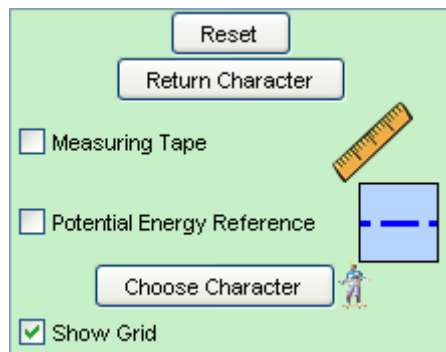


Different Skater Characters:

41. When you switch the skater to the red ball and drop the ball on the ground on the left-hand side of the screen, you cannot click on the ball to move it (the white pointer hand does not appear). It doesn't seem to matter if you click, drag, and drop the ball on the ground, or if it falls off the track and lands there. It appears that if the ball is to the right of the 4 meter mark, you can move the ball. However, if the ball is to the left of the 4 meter mark, you cannot. After playing around with the other characters, it seems that there may be some invisible barrier on the left-hand side of the screen that does not allow you to click and grab the character on the bottom of the character's image. When I put other characters on the left-hand side, I cannot click and grab them on the bottom of the image near the ground. When the character is on the right-hand side of the screen, you can click anywhere on the image to move them.



42. The button that reads “Choose Character” looks out of place—it’s sandwiched between two other check boxes. Maybe move it right below the “Return Character” button?

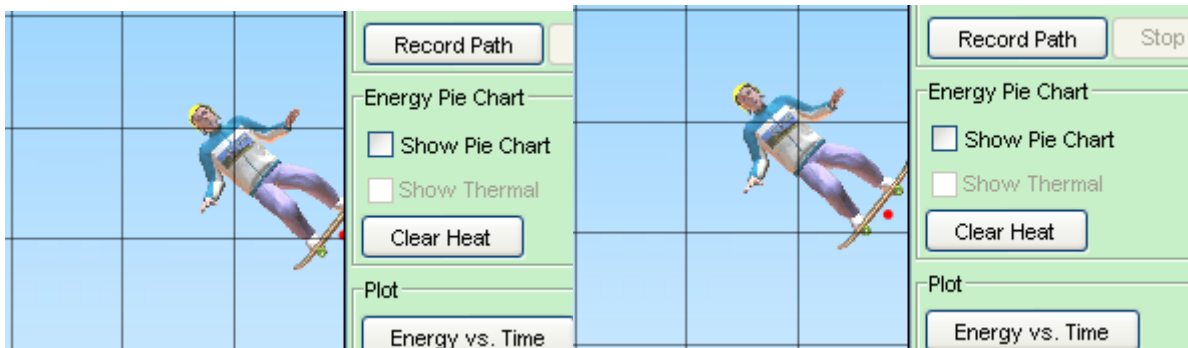


Frictionless Landing:

43. When “Frictionless Landing” is checked, it seems to work for the most part. However, if you drop the skater in the very bottom of the default track (or any horizontal track), then he bounces around and thermal energy is generated. Also, he slows down on the green ground when falling off the track and comes to a complete stop. I assumed he would keep on going forever since there is suppose to be no more friction when he lands when this button is checked.

Record/Playback Controls:

44. The video playback controls are still a bit odd and may not be behaving as expected. If I start recording the motion of the skater, and then pause it, the natural thing to do is to want to replay the motion you just recorded. When I press “Playback” it automatically rewinds the motion, and starts where I began recording and replays the motion. This is expected, and all is in order. After the skater gets to the point where you stopped the recording, he stops (again, this is expected). At the end of replaying the motion, if I want to replay the motion a second time, I cannot press “Playback” like I did before. Now I have to press “Rewind”, and then hit “Playback”. In this case, “Playback,” “Playback Slow” and “Step” are not grayed-out, even though they don’t do anything. Possibly if the skater gets to the end of his motion (the point where you pressed pause), then maybe the default should be to automatically rewind the motion so that all the user has to do is hit “Playback.”
45. When you stop the recording and then playback the motion, the skater does not get to the same position as he did when you stopped recording—he comes up a bit short (see before & after pictures below). This is very minor, but I thought I’d point it out.



46. This is the same comment that I had in the last bug report, but I thought I would repeat it because I think it is noteworthy. Although interviews may disagree with me, it seems like it would be wise to use the international video button symbols for the playback functions. Instead of having a picture of a film strip and the words “Record Path” on the button, why not stick with the universal red dot and the word “REC”? Also, you use a different symbol for “Playback” instead of the commonly used solid right-ward arrow, which is what is used for “Go” (which also seems vague—“Go” where?). The same symbol is used for “Step” and “Playback Slow.”
47. There are two buttons for “Go,” which seems a bit redundant—one of them is permanently on the bottom left and the other only appears when you need it. Why not remove the permanent one on the video controls toolbar at the bottom?



48. When you are recording and make changes to the $PE=0$ line, those changes are not recorded.
49. When you are recording and make changes to gravity by either selecting the preset locations or moving the slider, weird things happen to the color of the ground and the house (present on earth) when you playback the video. It's hard to identify what happens under certain circumstances.