The mathematics of free will

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GNU FDL*

A computer simulation shows a particle bouncing around inside an equilateral triangle. The trajectory of the particle appears to curve slightly, particularly when the particle approaches one of the vertices of the triangle, but in fact the motion is purely inertial—the particle always moves exactly straight ahead, only the space inside the triangle is 'negatively curved', which is what makes its trajectory appear curved.

When I say that the particle moves exactly straight ahead, I mean *absolutely exactly*. No matter how long the simulation proceeds, the particle's trajectory as portrayed on the screen will never deviate by even so much as a pixel from the true portrait of a particle moving absolutely straight ahead.

Because this is a classical system, observing the past motion of the particle would allow you to predict its future motion—up to a point. Because of the pixellation of the screen, there is some imprecision about where the particle is, and has been. And since you don't know the past motion precisely, you can't predict the future exactly. In fact, you can't predict even gross, qualitative features of the future motion more than a few seconds in advance, even if you have observed the motion on the screen throughout its entire infinite past. (Of course, the particle doesn't *have* an entire infinite past, because the simulation hasn't been running forever—but it might as well have been, for all the good it would do you.)

Now you might choose to assume that while your knowledge of the past motion of the particle is limited by the pixellation of the trajectory on the

screen, the particle nevertheless has an absolutely precise position and direction at any time, and if you only knew the exact state of the particle, you would be able to predict its entire future exactly—and to reconstruct its entire past, as well. Nothing about the motion of the particle will ever contradict this assumption. Every move this particle will ever make will be consistent with its having at any instant an absolutely precise position and direction, which completely determine its motion throughout the entire future. However, this is not the case. I know, because I wrote the program.

The way this program works is that at any point, the particle's state is only determined to the precision necessary to determine exactly the trajectory shown on the screen. Most of the past and future is there for anyone to determine. The way you do this is by pressing one of two buttons. Pressing the button on the right directs the particle into a regular motion at the center of the triangle, bouncing off each of the three sides of the triangle in succession. Pressing the button on the left directs the particle into an 'erratic' motion, where the sequence of 'cushions' it hits is completely random, subject only to the constraint of not hitting any side twice in succession.

These two buttons do not *steer* the particle: The particle always proceeds exactly straight ahead. These buttons *direct* the particle by determining its future. Pushing the right button gives the particle a simple, orderly future. Pushing the left button gives it a random, disorderly future. Note that the decision can be reversed at any time. Push the left-hand button and within a few seconds the particle will be bouncing around at random, even after the particle has been bouncing in an orderly way around the middle of the triangle for an hour—or for an eternity. Push the right-hand button, and within seconds the motion becomes orderly, even though the particle may have been careening around at random for infinitely many years. Alternate between the buttons—not too rapidly—and the character of the motion changes back and forth between order and disorder.

In this system, anything that can happen, may happen. The future remains always unwritten—and the past as well, for that matter. Put that in your determinist pipe and smoke it!