Creating a Curved Trajectory

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For Angry Birds a curved trajectory is needed – which is based on the angle a bird is fired at, and the “energy” (in real terms) used by the player to pull it back in the slingshot.

Initially for this project I looked at a number of different approaches to this curve. First, I considered a quadratic curve.

-y = (launch angle) / x2

This function gives a correct-looking trajectory and along with having the X axis it peaked at modified by the pullback energy given by the player it seemed convincing. Initial tests of this worked well but it did not produce the result I was aiming for, as the curve was not like the curve found within the real Angry Birds game, which I was interested in recreating.

I moved on to briefly look at Bezier curves however again quickly found that these did not produce the result I was after.

Eventually I landed on what is probably the simplest solution of them all – very basic gravity. To achieve this, I recorded a few parameters:

* Bird flight time (reset when the bird is loaded into the slingshot, counted from the moment the bird is fired to the moment it is destroyed or leaves the screen).
* Bird launch angle (based on the position of the bird when fired relative to the centre point of the slingshot).
* Bird launch power (based on the distance of the bird when fired to the centre point of the slingshot).

I then used this data to achieve the curve in two parts. By **subtracting** the pullback angle multiplied by a modifier from the Y value of the bird I create the effect of the bird being fired in the specified direction. Then, by **adding** the flight time multiplied by a modifier, the bird is slowly brought back down as if gravity is affecting it.

y = y + ((launch angle) \* (modifier) \* (frame time)) – ((flight time) \* (modifier) \* (frame time))

Of course this only gives us an up/down movement in the Y axis, so additionally the X position must be updated, which is simply done by using the launch power data multiplied by another modifier.

x = x + ((launch power) \* (modifier) \* (frame time))