

Sean V. Cashin
676124673
10-25-13
Test Particle in a Magnetic Field
VPython

My proposal is a visual representation of a charged particle spiraling through a changing magnetic field. I took Physics C Electricity and Magnetism last year in high school, and I am currently a freshman in Calculus 3, where I am learning about space curves and surfaces. I was looking at different applications of space curves in my textbook, and the motion of a charged particle in a magnetic field was an example that looked applicable to my intended major in electrical engineering.

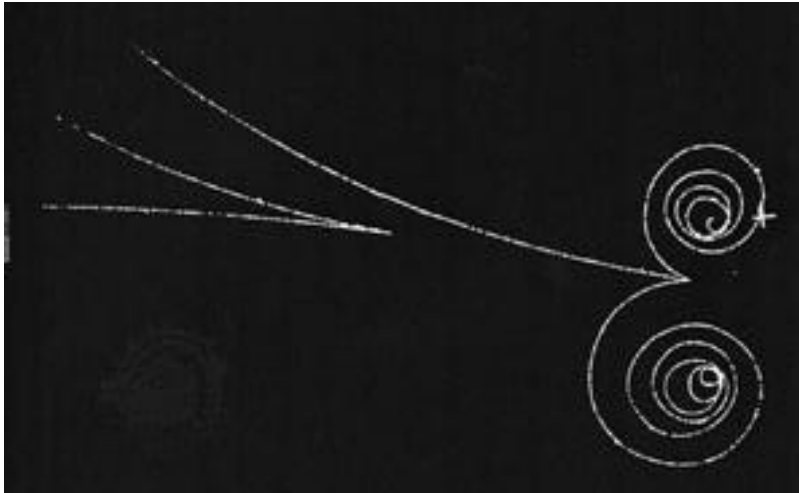
To complete this project, I will need to develop my understanding of turtle, which looks like the perfect programming language for this task. However, I have no experience in any programming whatsoever, and still do not even know how to access the class repository.

I know the physics behind magnetic fields, but I will have to improve my understanding on what mathematical equations I will need to use. Also, I need to learn how to translate them into a computer program.

A magnetic field has a direction, which is usually represented by field lines. Unlike an electric field, which exerts a force on a particle at rest, the force exerted by a magnetic field is proportional to the speed of the test charge.

$$F_b = q \langle v \rangle \times \langle B \rangle$$

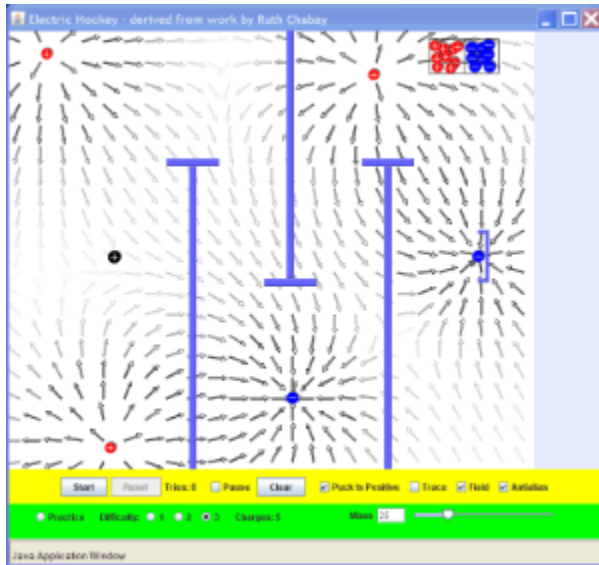
The direction of the force on this particle is perpendicular to both its velocity and the magnetic field's direction (right hand rule). It is opposite for negatively charged particles (electrons vs. positrons).



To find the contingent acceleration, relate this force to the mass.

$$a = (q\langle v \rangle \times \langle B \rangle) / m$$

I found a similar program, written in Java, which displays these field lines in the background to give the user an impression of how the test charge will move once it is released. However, this program is for electric fields, which can exert a force on test charges at rest.



My first step is to learn how to create a vector field and set variables for a test charge in Visual Python. I hope to accomplish this with the help of my mentor by October 25.

My next step will be learning how to program tracers for the test charge to better display its motion, and figure out a method that the user can employ to place test charges or vary the magnetic vector field.