BPhys450 Final Project

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Abstract

The goal of this computational model is to enhance student understanding in a preclass activity for a given week. As such, it should be tailored to the learning goals of previous preclass activities. Using the current list of learning goals for week 7 magnatism in BPHYS122 as a reference, students should be able to:

- Describe similarities and differences between electric and magnetic fields
- Use a compass to identify the direction and relative magnitude of a magnetic field, and to identify the north pole of a bar magnet
- Draw and interpret magnetic field vectors and field lines: (1) in general, (2) for a bar magnet, (3) for a straight current-carrying wire, and (4) for a loop of current
- Calculate the magnetic force on (1) a charged particle moving in a magnetic field, and (2) on a current-carrying wire in a magnetic field
- Explain how a charged particle in an external magnetic field undergoes circular motion, and find the radius of that motion
- Calculate the force on a current-carrying wire in an external magnetic field (magnitude and direction)
- Evaluate the net force on a current loop in an external magnetic field
- Evaluate the net torque on a current loop in an external magnetic field
- Define the magnetic dipole moment of a current loop

For this final project I will focus on creating a preliminary active learning activity with an integrated model that addresses goals 4a and 5. The experiment I conduct will be figuring out how a non-physics person interacts with the model, in an effort to identify if I can use the model to teach basic magnetism.

Program Design

Activity

As this is focused (at the moment) on qualitative understanding, the questions I present will for the most part be pretty open ended. Here is the activity that I designed:

Introduction

In this activity you will interact with a model. This model involves a particle with mass, velocity, and charge. When the experiment is run, the particle will travel through empty space for some time. Then a magnetic field pointing either into the page (marked with Xs) or out of the page (marked with dots) will appear for some time. Then the field will turn off.

Question 1

Change some parameters and run some experiments. Write down 5 observations that you noticed.

Question 2

Part a

What are some ways that you can get the particle to travel in a straight line?

Part b

For each method you listed, why do you think the particle traveled in a straight line?

Question 3

Sometimes the particle travels along a curve. How can you relate each of the properties given by the model to the radius of that curve?

Question 4

What are two questions you have about the system?
I then provided this activity and simulation to a family member with no physics background and observed them. I've included their responses in the included