VPython Class 6: Phasors and Interference, Part II

1. Introduction

Last week you animated two rotating phasors with closely spaced frequencies, and oberved amplitude beats in the sum of the two phasors. This week you will investigate three (or more) phasors. The phasors will all represent oscillations at the same frequency, but there will be phase differences between them. This will serve as an introduction to N-slit interference, which will be one of the topics in tomorrow's class. (You have already seen a demonstration of 3-slit interference in lab.)

2. Adding phasors head to tail

1. Make a horizontal and a vertical axis as you did last week:

```
xaxis = curve(vec(-5,0,0), vec(5,0,0))
yaxis = curve(vec(0,-5,0), vec(0,5,0))
```

2. Make the following phasors:

    1 A phasor of amplitude 2 with its tail at the origin and lying along the real (horizontal) axis.

    2 A phasor of amplitude 2 with its tail at the head of phasor 1, with a phase difference of $\Delta\phi$ with respect to phasor 1. (Define a variable for $\Delta\phi$. You can start with 0 as the value of the variable, but you want to be able to change it later.)

    3 A phasor of amplitude 2 with its tail at the head of phasor 2, with a phase difference of $\Delta\phi$ with respect to phasor 2 (or equivalently a phase difference of $2\Delta\phi$ with respect to phasor 1).

    4 A phasor, with its head at the origin, that represents the sum of the other 3 phasors.

3. Run your notebook for the following values of $\Delta\phi$:

    (a) 0

    (b) $\pi/6$

    (c) $\pi/3$

    (d) $\pi/2$

    (e) $2\pi/3$

    (f) $5\pi/6$

    (g) π

    (h) $7\pi/6$

    Discuss what you see with an instructor. How does this fit with what you see in a three-slit intensity pattern?

3. Play time

- Make an animation that steps through values of $\Delta\phi = 0$, 0.1, 0.2, 0.3, ...
- Modify your notebook so that it adds four phasors. (Those who know some python might want to use lists so that the notebook adds an arbitrary number of phasors.)