Vectors

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Vectors are arrows that you can add together.

Vectors have (1) direction, and (2) magnitude. For example, if you travel 3 miles east, then your direction is east, and your distance (magnitude) is 3 miles. Consequently, your travel can be referred to as a vector.

Now suppose you travel another 3 miles east, how far have you traveled "as the crow flies"? Obviously, the answer is 6 miles (east). Now suppose rather than traveling an additional 3 miles east, you decided to travel 3 miles west. How far have you traveled? Answer: zero.

Now suppose your total travel was 4 miles east followed by 3 miles north. How far have you traveled "as the crow flies"? Answer: 5 miles. Let's look at this a bit closer.

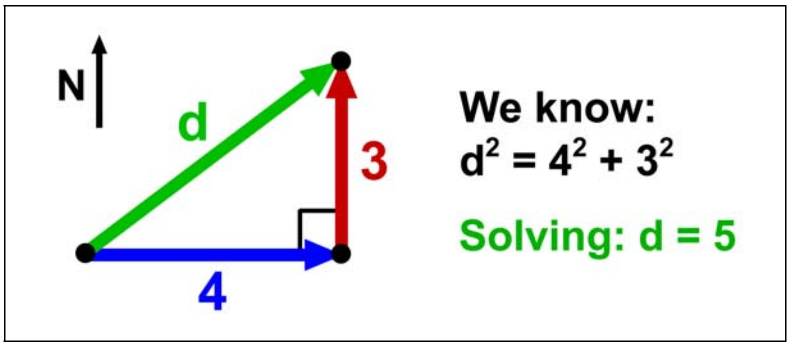

Figure 1

From our basic trigonometry lesson, we know that whenever we have a triangle with a square corner (a "right" triangle), the long side squared is the sum of the short sides squared. Because the short sides are 4 and 3, the long side squared is 25. Hence, d is 5, and its direction is that of the green arrow. This demonstrates how vector "arrows" are added.

Note that Figure 1 is a "clean" example because we're adding two vectors joined at a right angle. The figure below is just as meaningful and correct. If you move as shown by the blue arrow, and then the red arrow, the result is the green arrow. However, because the motion lacks a right angle, it isn't as easy to solve for the Result.

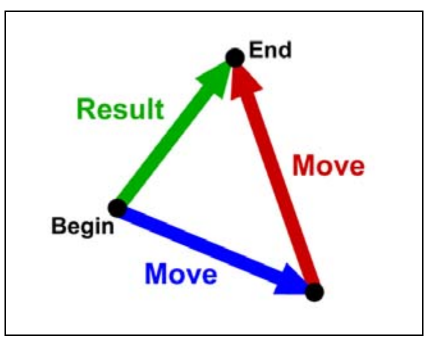

Figure 2

In Director, we generally know the LocH and LocV of various points. Conveniently, the points lie on a rectangular grid, so diagonal distances between two points (d in Figure 1) can always be calculated simply from the horizontal and vertical distances. That is,

1.1

$$d^2 = (LocH_1 - LocH_2)^2 + (LocV_1 - LocV_2)^2$$

Where the subscripts 1 and 2 refer to the first and second point. Taking the square root then gives us d.

Note that in the examples above, our vector is referring to displacement, or distance moved. Equally valid are vectors that refer to velocity. For example, if I am standing still, then I am correct to say that I am moving 2200 feet/sec to the west while simultaneously moving 2200 feet/sec east. The two cancel each other, and the effect is that I am not moving.

Similarly, Figure 1 can be redrawn to refer to velocities, rather than distances. If you are moving 4 feet/sec to the west, and simultaneously 3 feet/sec to the north, then you are *actually* moving 5 feet per second in the direction of the green arrow.

Wow! This vector stuff is easy, isn't it?