Mathematics

what is the difference between a point and a vector?

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1. Definition

Point: the point is a relative concept, the point is compared with other forms of contrast can be ignored.

Properties of point

1.There's no part of it.

2.The two ends of a line segment is a point.

In geometry, topology and mathematical branches of, a space point used to describe a particular object of a given space, in space are similar in size, area, length, or other higher dimensional analogues. A point is a zero dimensional object. Which is the most simple geometrical concepts, usually as geometry, physics, the most basic part of vector graphics and other fields. Point into line, line into the surface and surface into a body, (points to move into the line, the line moving into the surface, surface adult), visible, is geometry in the most basic components.[Courant, Richard and H. Robbins 1996]

vector :In mathematics, the geometric vector (also known as the Euclidean vector, usually referred to as the vector, vector), has magnitude and direction of the geometric objects, image of said for the line with the arrow, arrow: size of the vector represents the direction of, the length of lines: on behalf of the vector. A vector can have a variety of notation, such as written in bold letters (a, B, u, V), or in letters on the top with a small arrow - >, or in letters and wavy line ~. If the starting point (A) and the end point (B) of a given vector, the vector can be denoted as AB (and added to the top). The space is provided with a rectangular coordinate system, and the vector can be expressed in a number of forms, for example, the Oxy plane (2,3) is a vector. [Monastyrsky, Michael 2001]

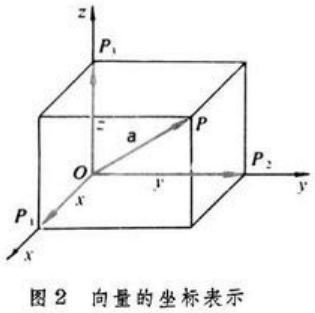

图 2　向量的坐标表示

figure 1: Vector coordinate representation

figure 1: the figure show:

1. in the plane rectangular coordinate system, respectively, and the X axis, Y axis direction of the same two units vector J, I as a group of the base. A is an arbitrary vector in the plane rectangular coordinate system, and the vector OP=a is the starting point of the coordinate origin O. The basic theorem of plane vector is known, there are only one pair of real numbers (x, y), making the a= vector OP=xi+yj, so the real number on (x, y) is called the vector a coordinates, denoted as a= (x, y). This is the coordinate representation of vector a. Among them (x, y) is the coordinates of point P. Vector OP is called the position vector of the point P.

2 .in the three-dimensional coordinate system, respectively, and the X axis, Y axis, Z axis direction of the same 3 units vector J, I, K as a

group of the base. If a is any vector in this coordinate system, the vector OP=a is the starting point of the coordinate origin O. By the basic theory of space, there are only a set of real numbers (x, y, z), making the a= vector OP=xi+yj+zk, so the real number on (x, y, z) is called the vector a coordinates, denoted as a= (x, y, Z). This is the coordinate representation of vector a. Among them (x, y, z), that is, point P coordinates. Vector OP is called the position vector of the point P.

2.Overview

Points and vectors are not the same thing. Given two points in 3D space, we can make a vector from the first point to the second. And, given a vector and a point, we can start at the point and "follow" the vector to get another point.

There is a nice fact, however: the points in 3D space (or R n , more generally) are in a very nice correspondence with the vectors that start at the point $(0,0,0)$. Essentially, the idea is that we can represent the vector with its ending point, and no information is lost. This is sometimes called putting the vector in "standard position".

For a course like vector calculus, it is important to keep a good distinction between points and vectors. Points correspond to vectors that start at the origin, but we may need vectors that start at other points.

For example, given three points A B and C in 3D space, we may want to find the equation of the plane that spans them, If we just knew the normal vector

$n^{\rightarrow}$ of the plane, we could write the equation directly

as $n^{\rightarrow}\cdot(x,y,z)=n^{\rightarrow}$ So we need to find that normal

$n^{\rightarrow}$ .To do that, we compute the cross product of the vectors $AB\rightarrow$ and $AC\rightarrow$. If we computed the cross product of A and C instead (pretending they are vectors in standard position), we could not get the right normal vector.

For example, if A=(1,0,0) B=(0,1,0) B=(0,1,0) ,and C=(0,0,1) the normal vector of the corresponding plane would not be parallel to any coordinate axis. But if we take any two of A B , and C and compute a cross product, we will get a vector parallel to one of the coordinate axes. [Sevryuk, Mikhail B 2006]

3.Conclusion

The point is relative to the origin of the coordinates, and the vector is relative to the starting point, in other words, the point of the coordinates of the starting point is the origin of the vector coordinates.

References

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Sevryuk, Mikhail B. (January 2006). "Book Reviews" (PDF). Bulletin of the American Mathematical Society 43 (1): 101–109. doi:10.1090/S0273-0979-05-01069-4. Retrieved June 24, 2006.