

STUDY OF VECTOR CALCULUS

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ABSTRACT

A basic investigation of the establishments of standard vector math is proposed. The methodological premise

of the examination is the solidarity of formal rationale and of levelheaded rationalizations.

It is demonstrated that the vector math is off base hypothesis on the grounds that: (1) it did not depend on a right methodological premise – the solidarity of formal rationale and of sound persuasions; (2) it doesn't contain the right meanings of "development", "heading" and "vector"; (3) it doesn't contemplate the components of physical amounts (i.e., number names, name numbers, solid numbers), describing the idea of "physical vector", and, consequently, it has no normal logical importance; (4) activities on "physical vectors" and the vector analytics recommendations identifying with the "physical vectors" are in opposition to formal rationale. A scalar field relates a scalar incentive to each point in a space. The scalar may either be a scientific number or a physical amount. Instances of scalar fields in applications incorporate the temperature conveyance all through space, the weight appropriation in a liquid, and turn zero quantum fields, for example, the Higgs field. These fields are the subject of scalar field hypothesis.

Keywords: arithmetic, vector math, geometry, material science, designing, reasoning of science

INTRODUCTION

As is outstanding, the numerical formalism of vector analytics is broadly and effectively utilized in common sciences [1-7]. Nonetheless, this does not imply that the issue of legitimacy of vector math is currently totally fathomed, or that the establishments of vector analytics are not needing formal-sensible investigation. In my view, standard vector math can't be considered as supreme truth if there is no formal-coherent substantiation of this analytics. As of late, there has emerged a need for basic investigation of the establishments of vector math. In any case, there are no works dedicated the investigation of vector math inside the structure of the solidarity of formal rationale and of levelheaded persuasions. The motivation behind the present work is to propose the right examination of the establishments of vector math. The investigation is completed inside the system of the right methodological premise: the solidarity of formal rationale and of reasonable arguments. Is a part of science worried about separation and mix of vector fields, essentially in 3-dimensional Euclidean space $\{\displaystyle \mathbb{R}^3\}$. The expression "vector analytics" is in some cases utilized as an equivalent word for the more extensive subject of multivariable math, which incorporates vector math just as fractional separation and numerous mix.

ANALYSIS OF THE CONCEPTS OF "Course" AND "VECTOR"

As is notable, in science, material science, and designing, a vector (or Euclidean vector, or geometric vector, or spatial vector) is called quantitative attributes which has a numerical esteem, yet in addition the course [7, 9]. As it were, vector is a line section with an unequivocal course (or graphically is a bolt), interfacing an underlying point with a terminal point. I.e., vector is a geometric item that has extent (or length) and heading and can be added to different vectors as indicated by vector polynomial math. Physical instances of vector amounts are material point dislodging, speed and quickening of a material point, just as a power. Along these lines, investigation of the idea of "vector" is beyond the realm of imagination without the meanings of ideas of "development" and "course".

Development is an adjustment when all is said in done, any communication of material items. Class of "development" is a logical idea that mirrors the most widely recognized and fundamental property of marvels (forms), the most well-known and basic relations and associations in actuality. Development is a property of issue. As per the persuasive guideline of the solidarity of issue and development, the development does not exist without material articles. In any case, the development is certifiably not a material item. The development is showed as the solidarity of alternate extremes: changeableness and dependability, congruity and brokenness. Concretization of the development is the principle types of development: mechanical, physical (warm, electromagnetic, gravitational, nuclear, and atomic), synthetic, organic, enlightening, and social ones.

Change as a procedure can be of two kinds: a subjective change and quantitative change. The subjective change (for example a difference in subjective determinacy) is considered by rationalistic rationale and common sciences. The quantitative change (for example a difference in quantitative determinacy) inside the cutoff points of certain subjective determinacy is examined by formal rationale and science. The quantitative change can be contemplated just inside a reference framework which contains a clock as segment part.

A clock (i.e., a gadget containing a working clock system, moving the bolt and the fixed dial) decides the time and time describes the clock. Time is a solid idea since it communicates the property of the clock component (clock process). Time t is an all inclusive variable (with the component of "second"), a data premise that is utilized to put arranged by data about occasions and procedures on the planet. Time t is characterized by the accompanying scientific articulation [10]: $t_n = n$ where $n = 0, 1, 2, \dots$; is rudimentary (unit) term which can be made as little as wanted. Solid numbers (name numbers) t_n have one and the equivalent subjective determinacy (i.e., measurement of "time"). The arrangement of numbers t_n shapes an arranged grouping. An individual from the arrangement is known as a snapshot of time. Numerical estimations of amount t_n is changed because of clock system which consistently changes numerical estimations of the amount n .

The mechanical type of development (specifically, the movement of a material point M) is contemplated in a reference framework which speaks to the solidarity of the arrangement of directions and clock. The arrangement of directions is an arrangement of estimating gadgets which decides the position (i.e., the arrangement of directions) of a material point

M in space. (For instance, the Cartesian arrange framework speaks to the arrangement of three associated estimating scales (drawing scales): straight lines Ox , Oy , Oz with printed solid numbers (name numbers) having the indistinguishable element of "meter"). The space of the article (for instance, geometric space, and vitality space) is the arrangement of conceivable (accessible) conditions of the material item (specifically, the arrangement of places of the material point M). Each state is described by a specific solid number (designate number) having a measurement. Development of an item in space is a procedure of change from certain states to different states, for example the procedure of progress from some solid (name) numbers to other cement (designate) numbers.

A procedure has the start (i.e., the start of the changes) and the end (i.e., the finish of the changes). The progress from the underlying state to the last state speaks to the whole of rudimentary advances and, in this way, is described by an expansion of the changes. As such, the complete change is the aggregate of basic changes. Since rudimentary change is portrayed by the solid (name) number having a measurement, the all out change has measurement too and is communicated by the accompanying numerical equation:

where $n = 0, 1, 2, 3, \dots$, is basic (single) change which has the measurement and is thought to be steady. The arrangement of designate numbers s_n shapes an arranged grouping. The numerical estimations of the name amount s_n are changed if the numerical estimations of the amount n are changed. On the off chance that the numerical estimations of the amount n are not changed with time, the procedure isn't understood.

A procedure is portrayed by the course (directivity) of progress, the rate of progress, and quickening of progress. On the off chance that the procedure isn't understood, the course (directivity), the rate, and quickening don't exist. Clarification is that the bearing (directivity), rate, and speeding up are the properties of the procedure and not the properties of the material article. In this manner, the heading of progress decides the request of the number set however an arranged number set does not decide the course. Neither unadulterated arithmetic nor connected math (i.e., the scientific formalism of the characteristic sciences) does not contain a numerical (computation) process on the grounds that the arithmetic does not speak to a PC or some other material gadget that understands the procedure of progress of the estimations of the amount s_n . Change of the values of the amount n is done by an administrator (individual). Along these lines, the right numerical formalism can not contain the ideas of "heading (directivity)" and "vector".

On the off chance that one expect that the numerical formalism contains the ideas "heading (directivity)" and "vector", at that point the equation for the amount s_n to be written in the accompanying vector structure:

where is basic (unit) vector. Be that as it may, since the numerical estimations of amount n in this recipe isn't changed with time, the procedure of progress of the numerical estimations of the amount s_n in scientific formalism isn't understood. Along these lines, this equation does not depict heading, and the scientific formalism does not contain the ideas of "course (directivity)", "vector", and "unit vector". Therefore, the "course (directivity)" and "vector" are not scientific articles (ideas). The ideas of "heading" and "vector" don't compare to any geometric article (for instance, a line section). Sign of the limit purposes of the line section and assignment of these focuses with the assistance of terms (words) "starting" ("beginning point") and "end" ("terminal point") don't characterize scientifically a geometric vector (on the grounds that the request of focuses don't characterize the heading of development). All purposes of the line portion have one and the equivalent subjective determinacy: idea of "beginning point" and idea of "terminal point" are indistinguishable ones. In this way, the expressions "starting" and "end" of the portion are not scientific meanings of the idea of "course (directivity)". A bolt is a visual (realistic) picture obviously. At the end of the day, verbal, exacting, emblematic, numerical, and graphical portrayals (show) of the start and the finish of the fragment are not a scientific meaning of the idea of "bearing (directivity)". Hence, the right numerical formalism can not and must not contain the ideas of "bearing (directivity)" and "vector". The organize framework speaks to an arrangement of three associated drawing scales: straight lines.

which can not be credited to the bearing. Likewise, straight lines Ox , Oy , Oz can not contain the unit vectors. From the perspective of formal rationale, the expressions "course (directivity)" and "vector" in arithmetic and hypothetical material science mean portrayal, for example nonexistent picture of the procedure, which is portrayed with the assistance of a bolt.

Examination of the standard recommendations of vector polynomial math

The scientific idea of "vector as a rule" can not be utilized in the characteristic sciences: this idea does not bode well in the regular sciences. The idea of "vector" as utilized in the normal sciences is described by the ideas of "designate amount" and "measurement of amount". In this manner, investigation of the standard suggestions of vector variable based math must be done from this perspective. As is known, the situation of a vector in the Cartesian arranges framework $Ox y z$ is controlled by its projections. The projection of the vector on the pivot is characterized as pursues. There are vector V whose module has the measurement (for instance, the component of speed, increasing speed measurement, the element of intensity) and the pivot Ox with the name numbers which have measurement of length.

V on the axis Ox is called the quantity (module, length) $|V_x|$ of directed segment V_x located (placed, putted) on the axis Ox :

$$|V_x| = |V| \cos \alpha$$

where α is the angle between the vector V and the axis Ox . In general case, the vector V is decomposed into components under the Cartesian orthonormal basis i, j, k as follows:

$$V = |V_x| \bar{i} + |V_y| \bar{j} + |V_z| \bar{k}$$

where \bar{i} , \bar{j} , \bar{k} are the unit vectors of the Cartesian coordinate system; $|V_x|$, $|V_y|$, $|V_z|$ are the projections of the vector on the corresponding axes. The principal importance of the basis \bar{i} , \bar{j} , \bar{k} is that the linear operations on vectors under the given basis become the usual linear operations on numbers – the coordinates of these vectors. In my opinion, these standard expressions are not free from formal-logical objection. The objection is that the standard expressions are contrary to the formal-logical laws.

Really, the standard expressions assert that segment $|V_x|$ lies on the axis Ox (i.e., segment $|V_x|$ coincides with the segment of axis Ox). From the point of view of formal-logical law of identity, this implies that these segments have the same qualitative determinacy (i.e., the same sense, the same dimensions):

(qualitative determination of the vector V) =

(qualitative determination of the vector

(qualitative determination of the vector H).

In general case, however, the dimensions of the lengths of the vectors are different. Therefore, these vectors can not have a common point, and the operation of vector multiplication can not be performed (i.e., the operation of multiplication has no sense). This fact is expressed formal-logical law of absence of contradiction:

(qualitative determinacy of the vector V) \neq

(qualitative determinacy of the vector F) \neq

(qualitative determinacy of the vector H).

Consequently, the mathematical operation of the cross-product of vectors is a formal-logical error: a violation of the law of absence of contradiction.

DISCUSS THE PROBLEM

As is known, the trust in the logical strategy for research and in reasonable reasoning supplanted all different methods for perception in the twentieth century. Sane reasoning speaks to the best accomplishment of humankind. Legitimization of reasoning and of science is persuasive basic within recent memory. The advancement of objective reasoning in the 21st century prompts basic examination, reexamination, and legitimization of the for the most part acknowledged hypotheses made by the works of art of science (for instance, N. Bohr, E. Schrödinger, W. Heisenberg, A. Einstein, I. Newton, G. Leibniz, L. Euler, J. Lagrange, A. Cauchy, W.R. Hamilton, J.W. Gibbs, O. Heaviside, and so on.). Legitimization and basic investigation of science are two side pieces (segment factors) in advancement of science. Basic examination and defense of speculations depend on formal-intelligent investigation of logical ideas, of the fulfillment of ideas, of the culmination of an arrangement of ideas in light of the fact that "just the culmination prompts lucidity" (Confucius). As of late, free specialists offer thoughtfulness regarding basic investigation of hypothetical material science, arithmetic, science, and so forth (see, for instance, www.gsjournal.net). During the time spent basic investigation and of elucidation of logical hypotheses, "...we can barely depend on any of the old standards regardless of whether they are normal. The main compulsory necessity is the nonattendance of coherent logical inconsistencies." (N. Bohr). Intelligent consistency of speculations is accomplished with utilization of the formal-consistent laws. What's more, a characteristic logical elucidation of speculations depends on the utilization of sane persuasions. The arrangement of widespread (general-logical) ideas and laws – i.e., study of the general laws of advancement of the Nature, human culture, and right reasoning – is the solidarity of formal rationale and sane persuasions. This solidarity isn't just right methodological premise of science yet in addition the right methodological reason for a basic investigation of hypotheses.

The root of vector analytics is firmly identified with the requirements of mechanics and material science: movement, the ideas of procedure, speed, quickening, uprooting, power, and vector were brought into arithmetic in the 17-eighteenth hundreds of years. The advanced importance of "vector" speaks to speculation of its past (obsolete) which means in stargazing, where, in eighteenth century, a vector is called a fanciful straight line portion interfacing the planet to the middle (center) of the movement. At present, vector analytics is a part of arithmetic in which one examination the properties of activities on vectors. However, the scientific formalism does not contain movement, numerical procedure. A scientific procedure is completed just in PCs. (This is the reason nonstop arithmetic must be supplanted by discrete science – PC math).

In explicit logical issue, one thinks about the amounts of the different nature. These amounts have distinctive measurements: length, region, volume, weight, temperature, speed, quality, and so forth.). In the event that one chooses a (characterize, unequivocal, named) decided unit, at that point each estimation of the amount must be communicated by name number. In any case, arithmetic does not think about the particular amounts: the scientific suggestions and laws are defined, abstracting from the particular idea of the amounts, mulling over just their numerical qualities. In accordance with this, science thinks about the amount when all is said in done, the vector as a rule, etc, ignoring the regular logical significance of the amount.

Unique numerical recommendations, hypotheses, and models can not be tried and utilized in the regular sciences. From the perspective of formal rationale and of balanced arguments, so as to test and utilize numerical recommendations, hypotheses, and models by and by, it is important to characterize the common logical (down to earth) which means of scientific ideas (articles) and relations, i.e., to consider not an "amount all in all", a "number by and large", "vector as a rule", however to think about the nature (i.e., measurements) of amounts (length, region, volume, weight, temperature, speed, increasing speed, dislodging, constrain, and so forth.). Starting here of view, the standard vector analytics does not have a characteristic logical significance on the grounds that the standard vector math depends on the idea of "vector when all is said in done". Elucidation of normal logical importance of idea of "vector" and a consistent examination of activities on the "physical vectors" demonstrate that the standard suggestions of vector analytics, identifying with the "physical vectors", are in opposition to formal rationale.

There are two feelings about the presence of coherent blunders in commonly acknowledged speculations (for instance, in material science and arithmetic). The primary feeling is that, in spite of the fact that a hypothesis (for instance, the exceptional hypothesis of relativity) contains sensible mistakes, "it functions admirably" (Gerard 't Hooft). The second sentiment is that the arrangement of four crucial formal-sensible laws is deficient and lacking for a panchreston (i.e., for complete clarification) and scientific depiction of the real world. Fundamentally, these conclusions are indistinguishable. Be that as it may, as I would see it, these perspectives are not free from protest. The protest is as per the following. On the off chance that one will find extra formal rationale laws, at that point the total arrangement of laws ought not be opposing: the four fundamental laws will hold its place and significance in another, total framework (as it were, the four essential laws won't be disproved). For this situation, the speculations that are mistaken in "inadequate" sensible framework will likewise be incorrect in the "total" legitimate framework. What's more, the speculations that contain consistent mistakes are false basically. In any case, the accompanying inquiries will dependably stay open: Why gadgets that depend on false logical speculations (thoughts) work? For what reason do the bogus logical speculations add to the improvement of humanity? Where is the point of confinement of improvement dependent on false hypotheses? What is the threat of improvement dependent on false speculations? What are the substance and fate of advancement?

CONCLUSION

In this manner, the formal-legitimate and argumentative investigation of the establishments of vector analytics prompts the accompanying primary outcomes: the standard vector math is erroneous hypothesis in light of the fact that

- (a) It did not depend on the right methodological premise: the solidarity of formal rationale and of objective logic;
- (b) It does not contain the right meanings of ideas of "development", "heading", and "vector";
- (c) It does not contemplate the components of physical amounts (i.e., number names, name numbers, solid numbers), describing the idea of "physical vector", and, hence, it has no characteristic logical importance;
- (d) Operations on "physical vectors" and the hypothetical recommendations of the standard vector math, identifying with the "physical vectors", are in opposition to formal rationale.

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