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Technical Note

Differentiations of Nonlinear Functions Related to States in Magic(n), Cosmology and the Poincare Conjecture

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Abstract

Results for area differentiations and potential differentiations are related to concepts in cosmology and to magic(n). The shapes of a sphere and other geometries will be discussed for 3 and higher dimensions, and the Poincare conjecture is interpreted to fit into this scheme. The novelty of this research note is to relate fundamental concepts and findings of today in order to calibrate their symbolism and mathematics.

Keywords: Gravity Potential; Time Differentiation; Magic(n); Cosmology; Expansion; Rotation; Shell; Bubble; Formations; Amoebas; Rays; Torsion Instability; Sun Light; Night Sky.

1. Introduction

Everything in the real world is not objective, and many parts are neither documented nor revealed linguistically. A method to reach understanding, or control, is to solve Boundary Value Problems (BVP) or, by other means, perform computer simulations. The boundary is often a surface, and recent developments in nano-technology as well as measurements rely on surface methodologies. Solving BVP in Engineering Physics involves introducing variables denoted by degrees of freedom (d.o.f.). These are not always related to materialisations in space, and a detailed reduction may lead to, e.g., fractal concepts and boundary layers [1, 2].

Here, a fundamental shape, observed in e.g. river flows, will be analysed and related to general spatial concepts in higher dimensions. The shape is an (isotropic) extension of a material point in terms of an area measure. An area relates to a multiplicative split, meaning that a scalar (e.g. energy) may materialise on a surface shell and then be subdivided into two properties. That is the basis of thermodynamics, e.g. canonical transformations. However, recent tutorials also pin-point entalpi, embracing the surrounding energy [3] (hereby tacitly invoking the cloud and e.g. solar heat power in an optimistic fashion).

In addition, since a function of an area in the denominator is derived, functions of the gravity potentials are also scrutinized. The innovation is to start with simplified fundamental concepts and relate them to the state of the art in science and technology. An assumption for higher dimensions is magic(n) [4]. This reduces space and leaves certain hyperspaces, which can materialize into shapes. A materialisation-cohomology for magic(n) in a flow [5] is a stream line, such that the largest eigen value is the main velocity and the pairs are distributed matter with whirls perpendicular to the time-line-stream.

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Past and present formulations of cosmology contain properties with the dimension of a shell-area, c.f. [6, 7]. Materialised shells are present in shapes and densified bodies (in 2, 3 and higher dimensions) and in the present paper, we will use the area measure x^2 as the point of departure, to derive differential equations exemplified;

- By formations and propulsion of amoebas and rays;
- With interpretations of cosmology.

For Newtonian gravity interactions, the Horizontal Dumbbell is a benchmark within higher order stability modeling [8], and quoted in [9], to derive a Vertical ditto counterpart. Here, $1/r$ will be differentiated and interpreted as a function.

2. Research Method

Functional relations are obtained from differentiation of an area, together with additional assumptions. With $A = x^2$;

$$A_{tt} = 2(ax + v^2) \quad (1)$$

where the notations $v = x_t$ and $a = x_{tt}$ are used for velocity and acceleration.

In general, twice time-differentiation of any nonlinear function will result in two terms, where one is quadratic as in Equation 1, when the function f , is $f(x) = x^2$. Here, we will analyse the area differentiation when in the denominator and assume $f(A)$. Also, a function with a coordinate r in the denominator, is considered.

$$\text{Proposition 1. } (F/A)_{tt} = ((A_t/A)^2 - A_{tt}/A)F/A \quad (2)$$

where F is a constant force and A is an area.

$$\text{Proposition 2. } (1/r)_{tt} = ((r_t/r)^2 - r_{tt}/r)/r \quad (3)$$

3. Functional Applications

Proposal. Magic(3) may be related to shapes and states with its two decompositions;

Pressure 5 and +-10, and Eigenvalues 15 and +-5.

In view of this, it is natural to assume that the area is connected to a more smeared state with a distributed pressure. Examples of this may be;

- When a part of a spherical shell releases and becomes an organism at sea, or a sole cloud.
- A process striving towards more isotropy e.g. by filling entire R^3 instead of planes and lines.

Expressions where the acceleration and r -coordinate enters e.g. (3), are assumed to be more connected to

- A motion along a line
- A uniaxial state or shape

Next, an application for a bubble with interior pressure is outlined.

In Equation 2, F/A may be interpreted as a pressure acting on a bubble, or part of a bubble, with a given time dependency, e.g. a harmonic from an acoustic medium. Then, Equation 2 is a differential equation for the area measure.

For Equation 3, the acceleration of the bubble shell is assumed to be equated:

Proposition 3. $\rho r_{tt} = [p]/l$, where ρ is density, a is acceleration, l is a length and $[p] = p_i - p_o$ is 'the jump in pressure', i.e. difference between inside and outside pressure.

Terms of the kind $(r_t/r)^2$ and jumps, are present equating spaces in cosmology, c.f. [6, 7].

4. Examples in Physical Space

4.1. Formation and Propulsion of Rays in Sea

The formation of an Amoeba, Figure 1 and also Rays, Figure 2, may be thought of as release of part of an area for a shell. Also, in the Sea, it is subjected to pressure and a one-dimensional motion consistent with magic(3) and magic(4). In the differential Equation 2, A_t is a flow, and A_{tt} may be interpreted as the Dirac distribution, since A has a boundary in the flow.



Figure 1. Ameba

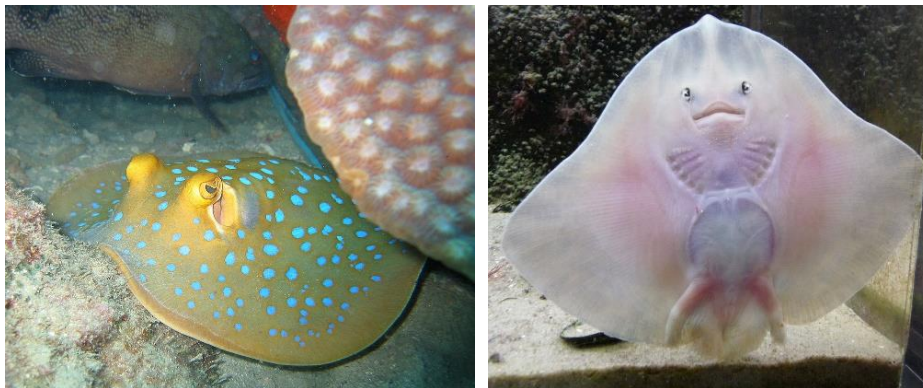


Figure 2. Rays of two types

4.2. Torsion Instability

A wire in torsion snaps/buckles into a direction perpendicular to the first. A model with states of magic(3), is a configuration with the inline compressed direction related to the largest eigenvalue and the pair to torsion. With more torsion, the pressure increases also interior between the laps of the wire, i.e. becomes more isotropic. If magic(3) rules, the description with pressure and a pair gives the latter as an in-plane torsion in a direction perpendicular to the first.

5. Higher Dimensions

5.1. Cosmology

Concepts in cosmology were briefly addressed in Section 3 above, and more general and abstract, it concerns e.g. 4-dimensional space, not necessarily the same as a physical space. Here, we assume a physical space R^4 , as an extrapolation of R^3 , in order to discuss magic(n), in relation to cosmology [6], and the Poincare' conjecture.

Magic(4), was found to reduce into 3-dimensions at diagonalisation. An interpretation of the fourth dimension may be time t and a velocity v in one direction, for example in a radial expansion/compression, and then vt has the same dimensionality (i.e. length), as the spatial coordinates. The scenario also applies with time or length balanced by a Minkowski Space [10].

In view of this reduction, a decomposition with pressure in R^4 implies the R^3 -sphere in that space. For all diagonalisations, the largest eigenvalue is in the direction $(1, 1, \dots, 1)$. That corresponds to finite rotations with angles $\pi/4$. For the even n , magic(n) has a representation in a hyper-space, $n - 1$.

Remark. Time differentiations, due to rotations, is derived from orthogonal transformations Q , and the resulting motion creates a path, such that the remaining space is of dimensionality 3-1. The velocity is given by $v = (w \ x) r$, where $(w \ x)$ is the skew matrix $Q_t Q^T$ and r is the location vector.

Structure Conjecture. The intersection between a plane and a sphere in R^n , is the plane itself but limited by the bounding curve on the sphere.

Structure Corollary. Returning to the eigen-value direction and keeping the R^3 -sphere, gives the smaller hole 'window' (of hitherto undetermined size), as an intersection of a plane perpendicular to $(1,1,1)$ and the sphere.

Decomposition into shells. For magic(5), the decomposition into pressure and \pm states is not unique. An adaption to the 3-dimensional case, is two pressure states, one for each \pm , and that may be visualised as two shells of spheres.

The orientation of the plane in the pressure state is orthogonal to the other $+$ -plane, i.e. spanned by the vector $(1,1,1)$ and one orthogonal to $(1,1,1)$, namely that of the $-$ -term in the $+-5$ decomposition.

5.2. The Poincare' Conjecture

Poincare's conjecture from an engineering and physical point of view, concerns the sphere in R^n , if there is a hyper-space on that sphere which corresponds to a curve on a sphere in R^3 . Direct extrapolation from R^3 makes such curve-constructions, quite readily. However, in engineering and physics, several d.o.f. are considered, but not all spatial multi-dimensions are well-known, and then the question is how space fits. In fractal geometry, dimensions are non-integer and other dimensions are implied to exist. The Poincare conjecture is a way to imagine how bodies would appear if there were multi-dimensions. Instead of extrapolating R^3 , the states from $\text{magic}(n)$ may be considered instead. Then, results differ from the Poincare conjecture since $\text{magic}(4)$ reduces to 3D when diagonalised. In an extrapolation (cohomology), $\text{magic}(n)$ for larger n represents the energies in a spatial distributed formation, e.g. leafs of a tree, such that the multi-dimensions become several points in space; a mini-superspace [7], and not larger higher dimensions.

6. Concluding Remarks

The framework above was used in several ways, e.g.:

- To illustrate multi-dimensions somewhat related to d.o.f, and the methods used to describe complex states in computer modeling;
- To extrapolate with $\text{magic}(n)$ as a complement and alternative to the multi-dimensional R^n -sphere and the Poincare conjecture.

Parts of cosmology concern the shape of spaces in the universe, and a question is the structure of higher dimensions and if there are windows and/or subspaces present for us to see. Here, we outlined the presence of such windows, with the concepts in Section 5.1 as the point of departure. Since the components in $\text{magic}(n)$ are numbers, the actual location and sizes may be specified in more detail with additional analysis and visualisation.

In differential geometry and curvilinear coordinates [10], area measures become more diverse, e.g. in Figure 3 and in fact materialised under a horse hoof.

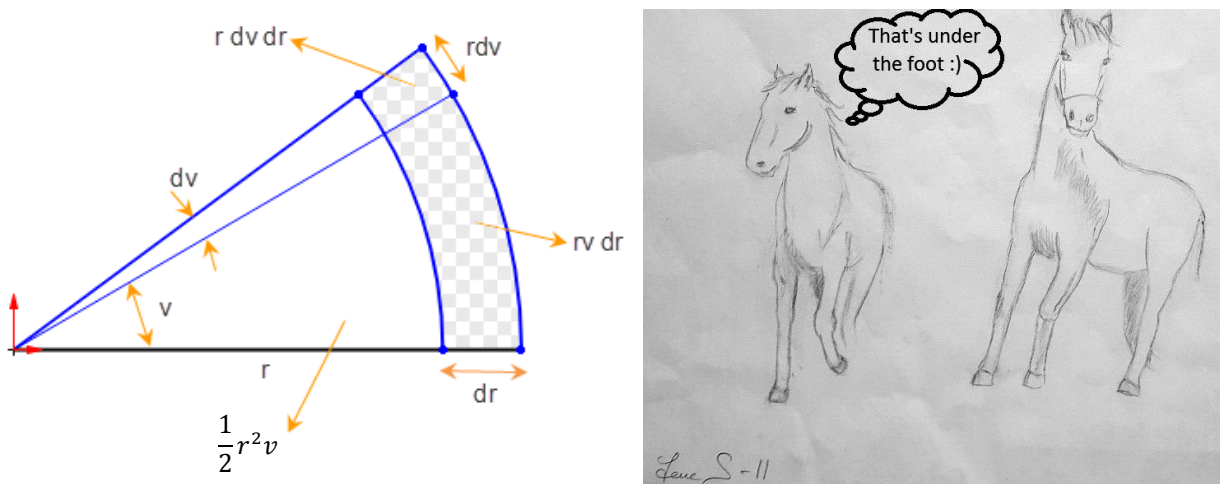


Figure 3. Differential surfaces in cylindrical coordinates. Similar finite parts are found on a Horse hoof

Finally, a cohomology for $\text{magic}(n)$ related to the Earth Ciel and the Sun will be outlined: At day time, a decomposition into a large eigenvalue corresponding to the sun beam light entering Earth is valid. The smaller pairs represent the polarisation, atmospheric responses and the processes at the Sun. At night, the remaining sunlight is curved into a more spherical shape, where isotropic pressure can act. In a decomposition, c.f. Section 4.1 and [4], the pair has larger magnitudes compared with pressure (but smaller than the largest at day-time), which may show as stars.

Since it is not easily interpreted, $\text{magic}(n)$ is a new reborn religion, with the torsion-pairs corresponding to real angles or angular velocities materialised as stars in the night, Figure 4, together with the multidimensional pressure. Thus, the constraint of $\text{magic}(n)$ curves the sky ciel, such that our Earth matter participates in smoothing and spreading "dark" light. Is there a gain from a reduction into $\text{magic}(n)$, and does it manifest elsewhere, such as in rare events?

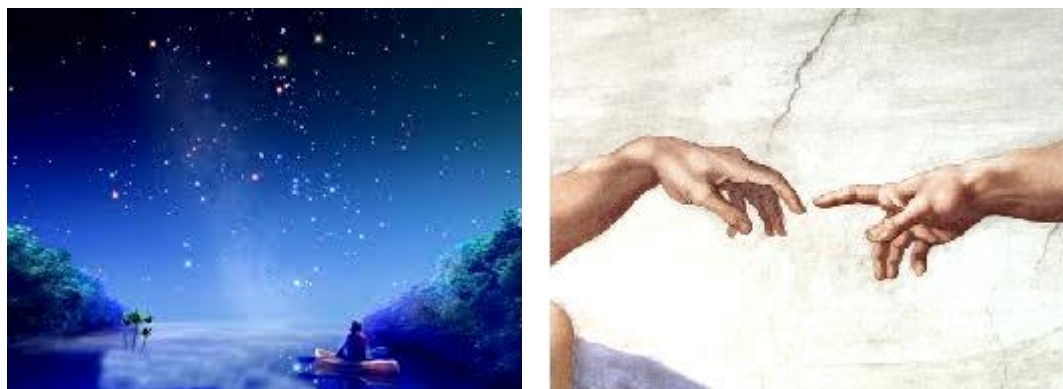


Figure 4. Night Sky Ciel and a decorated ceiling illustrating curved shapes

7. Declarations

7.1. Data Availability Statement

Data sharing is not applicable to this article.

7.2. Funding

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7.3. Institutional Review Board Statement

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7.4. Informed Consent Statement

Not applicable.

7.5. Declaration of Competing Interest

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the author.

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