Flumens

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Contents

Notes

1. Permanent link to the document [ru]: `https://github.com/johnthesmith/flumen/blob/main/arxiv/export/flumen_ru.pdf`
2. Permanent link to the document [en]: `https://github.com/johnthesmith/flumen/blob/main/arxiv/export/flumen_en.pdf`

1 Introduction

The article describes the concept of modeling a set of multidimensional spaces using abstract objects, aiming to describe multidimensional structures with the minimal number of basic elements, excluding traditional notions of coordinates and dimensions.

The concept is based on a single abstraction "Flumen" for modeling multidimensional spaces.

2 Definition of Flumen

1. Flumen (Latin flumen — flow) — an abstract one-way connection between two natural numbers (an oriented edge in a graph between two vertices). Importantly: a flumen, like a graph vertex, has no coordinates and does not belong to any space in the traditional sense. It is an abstraction that serves as the only building block (quantum) for creating spatial structures.

2. A flumen is denoted as $f_{a,b}$, where $a \in \mathbb{N}$ — the first number, $b \in \mathbb{N}$ — the second number.

3. A specific naming convention has been introduced to separate the perception of the Flumen as a spatial quantum from the mathematical concept of an edge in a graph.

2.1 Properties of Flumen

From the definition of flumen, the following key properties follow:

- Absence of coordinates: A flumen has no coordinates in the traditional sense; it represents only a directed union of two numbers.

- Internal orientation: The direction of a flumen matters, similar to the directed edges of graphs.

- Independence from space: A flumen is not tied to fixed spaces or geometry.

- Composition: Flumens can form sequences and structures, connecting with each other when the input or output number matches among a set of flumens.

- Quantization: A flumen is a quantum and cannot be divided without losing its properties.

Note: In subsequent works, flumens may be considered with individual weight coefficients, which will lead to changes in the presentation of the material. However, for simplicity, identical flumens are considered in this article.

2.2 Operations on Flumens

Let the set of all flumens be denoted as F, where $a, b, \dots, n \in \mathbb{N}$. Then the following operations are possible:

1. Creation of a set of flumens (C):

$$F \leftarrow F \cup C(a, b, \dots, n)$$

   Where the number of created flumens is $n - 1$, with the indices used for sequentially creating pairs. Example:

$$f_{a,b} = C(a, b)$$

   .

2. Deletion of a set of flumens (D):

$$F \leftarrow F \setminus D(a, b, \dots, n)$$

   In this case, $n - 1$ flumens will be removed if they are present in the set.

Both operations allow a set of argument groups and perform actions on the set of flumens. Example:

$$F[f_{a,b}, f_{b,c}, f_{a,c}] = C[(a, b, c), (a, c)]$$

.

3 Observers

The definitions of Internal and External observers are not part of the concept, but they facilitate the understanding of the material further.

3.1 Internal Observer

The internal observer perceives space through interaction with flumens. All characteristics, such as coordinates and directions, are limited by the relations within the model. The internal observer is unaware of external viewpoints. For the internal observer, a flumen is a quantum of space. The perception of the properties of space by the internal observer in the flumen model depends on the completeness of the available information.

Figure 1: Internal observer

3.2 External Observer

The external observer perceives the model as a whole, without the limitations of coordinates and internal laws. They evaluate the structure of the system as a set of flumens, without binding to its internal rules. For the external observer, a flumen is a pair of natural numbers. The external observer may, but is not required to, interpret configurations of flumens as spaces.

Figure 2: External observer

4 One-Dimensional Bounded Unidirectional Space

1. We create the first flumen $F[f_{a,b}] = C(a, b)$, which forms a space bounded by a single quantum. For the internal observer, the space is zero-dimensional, existing only within the flumen, and beyond it there is nothing.

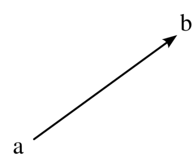

Figure 3: First flumen

Important: The images should not be perceived as coordinate spaces with points and connections.

2. We add the second flumen $f_{c,d} = C(c, d)$, which creates its own independent space, not related to $f_{a,b}$. These spaces have no mutual arrangement or distance between them.

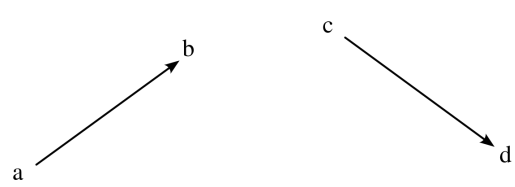

Figure 4: Two unrelated flumens

3. We add the flumen $f_{b,c} = C(b, c)$. Now, all three flumens merge into a single one-dimensional space, bounded by three quanta. For the internal observer, relative coordinates can be established. For example, if the flumen $f_{b,c}$ is set as the origin, then $f_{c,d}$ will have a coordinate of $+1$. However, since the flumens are unidirectional, $f_{a,b}$ does not exist for $f_{b,c}$, and its coordinates remain undefined.

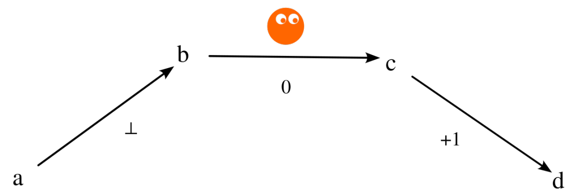

Figure 5: One-dimensional space of three flumens

5 One-Dimensional Bidirectional Space

1. To convert the space into a bidirectional one, it is enough to add the flumens:

$$[f_{d,c}, f_{c,b}, f_{b,a}] = C(d, c, b, a)$$

For convenience, pairs such as $f_{a,b}$ and $f_{b,a}$ are represented as a single line with two arrows.

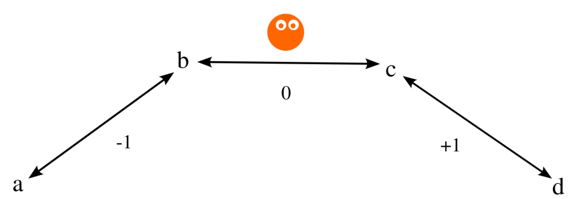

Figure 6: One-dimensional bidirectional space of three flumens

2. The flumens create additional directions within the existing one-dimensional space. As a result, the internal observer will perceive the space as bidirectional, sensing movement in both directions, rather than just in one direction as before.

3. Now, the observer from $f_{b,c}$ and $f_{c,b}$ can operate with both negative and positive coordinates, depending on their own formal rules. Thus, $f_{a,b}$ will have a coordinate of -1, while $f_{c,d}$ will have a coordinate of +1.

6 Two-Dimensional Space

1. Let's recreate the flumens $[f_{a,b}, f_{b,c}, f_{c,d}, f_{d,e}, f_{b,d}] = C[(a, b, c, d, e), (a, c)]$;

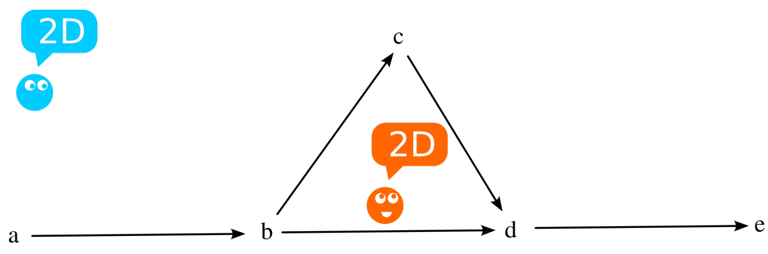

Figure 7: Two-dimensional space

2. For the internal observer, there are two paths from $f_{a,b}$ to $f_{d,e}$ with different numbers of flumens (three and four). This is impossible in one-dimensional space, but is allowed in two-dimensional space, which the internal observer can recognize. The external observer perceives only the collection of flumens. They are not required to interpret the structure as two-dimensional, but they may choose to view it as such, based on the internal properties of the model.

3. The two-dimensional space can be expanded by adding new flumens.

7 Spaces of Mixed Dimensions

1. Let's add the flumens $f_{e,f} = C(e, f)$ to the previous set.

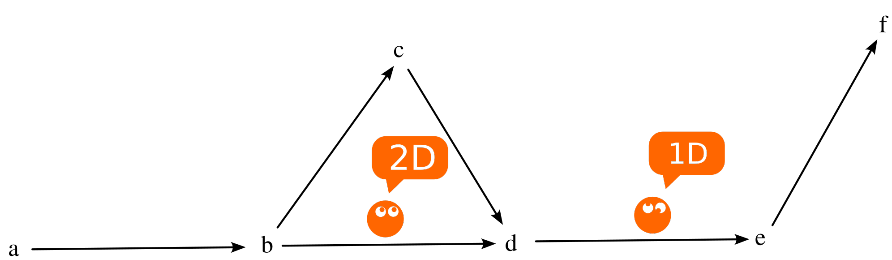

Figure 8: One-dimensional and two-dimensional space

2. For the internal observer, the action within $f_{b,c}, f_{c,d}, f_{b,d}$ remains two-dimensional, but $f_{d,e}, f_{e,f}$ is perceived as one-dimensional, as there is a

single path in that section.

3. This approach allows describing spaces with sections of different dimensions, while maintaining the internal consistency of the model.

8 Three-dimensional space and other dimensions

1. Let's create the flumens as follows:

$$F = C[(a, b, c, b, a), (a, d, c, d, a), (a, c, a), (d, b, d)]$$

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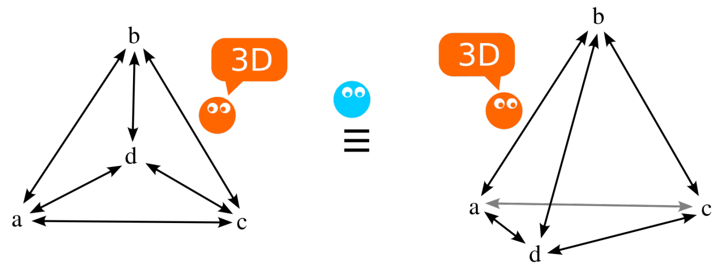

Figure 9: Three-dimensional space

2. From the perspective of the External observer, the topology of the two fragments shown above is identical. However, it is important to remember that all the flumens are identical, and each will be perceived by the Internal observer as a unit of space. When studying the space, the Internal observer will be forced to recognize the space as three-dimensional. Therefore, from their point of view, one can speak of three-dimensional coordinates.

3. For higher dimensions, such as four-dimensional space, the same reasoning applies.

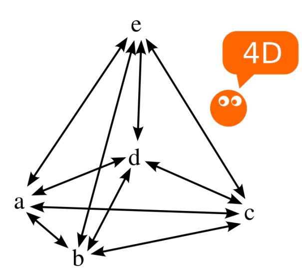

Figure 10: Four-dimensional space

9 Compact spaces

1. Let's create a two-dimensional space for the internal observer in a way different from before, for example: $F[f_{a,b}, f_{b,c}, f_{c,a}] = C(a, b, c, a)$.

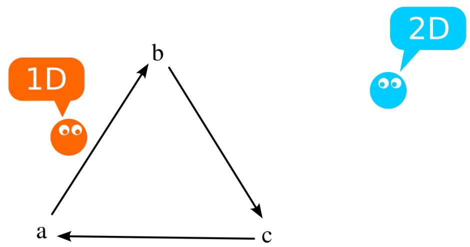

Figure 11: Compact one-way one-dimensional space

2. $f_{a,b}, f_{b,c}, f_{c,a}$ form a closed seamless one-dimensional space for the Internal observer. The Internal observer can move infinitely in one direction.

3. However, the External observer may interpret the movement from flumen to flumen as motion in a two-dimensional space.

4. In a similar way, closed spaces of any dimension and configuration can be obtained, and it is possible to speak about their closure through higher dimensions.

10 "Artifacts of Fluemen"

By artifacts, we refer to the appearance of patterns that are absent in the original data. The examples provided are just a small part of the specific consequences of applying fluemen.

10.1 "Wormholes"

1. Fluemen can form "wormholes" without the need for "curving space," since at a fundamental level, space is not described. Example:

$$F = C[(a, b, c, d, e, f), (b, c)]$$

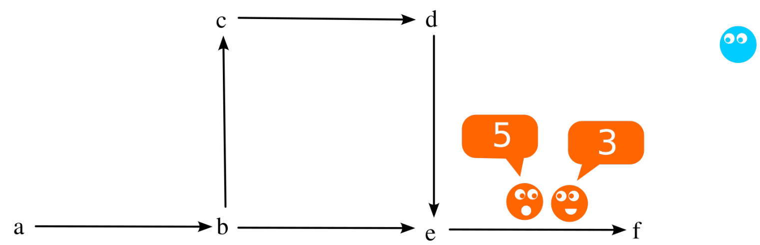

Figure 12: "Wormhole illustration"

2. The one-dimensional space, represented by fluemen $f_{a,b}, f_{b,c}, f_{c,d}, f_{d,e}, f_{e,f}$, is linear, uniform, and continuous. Its length is 5 quanta.

3. Fluemen $f_{b,c}$ creates an alternative path from $f_{a,b}$ to $f_{e,f}$ with a length of 3 quanta, which can be interpreted as a "wormhole" from the perspective of the first linear path.

4. Such structures can be formed in spaces of any dimension, allowing fluemen to model complex topologies.

10.2 "Parallel Spaces"

1. Fluemen describe "parallel spaces," modeling identical or partially different realities for observers. Example:

$$F = C[(a, b, c, a, c, b, a), (d, e, f, d, f, e, d), (g, h, i, g)]$$

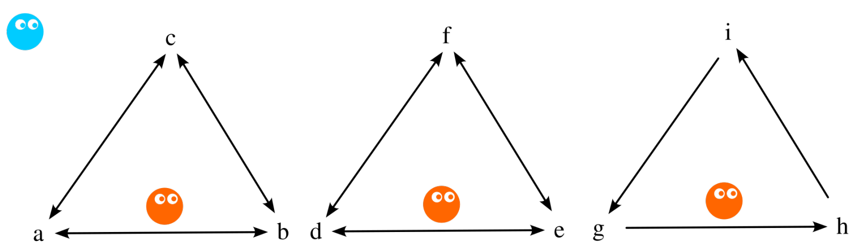

Figure 13: "Three parallel spaces"

2. Observers cannot leave their subspaces and interact with each other, while remaining in identical or nearly identical conditions.

10.3 Domains

1. The described spaces can be significantly more complex than standard uniform ones, such as Cartesian spaces. For example, the space of the Internal observer, consisting of fluemen $f_{d,h}$, $f_{h,d}$, $f_{h,i}$, $f_{i,h}$, $f_{i,d}$, $f_{d,i}$, is one-dimensional and compact. However, it is part of three domains $abcd$, $efgh$, and $ijkl$, which lie beyond the perception of the Internal observer. These domains exceed the dimensionality of the observer's space and can influence it.

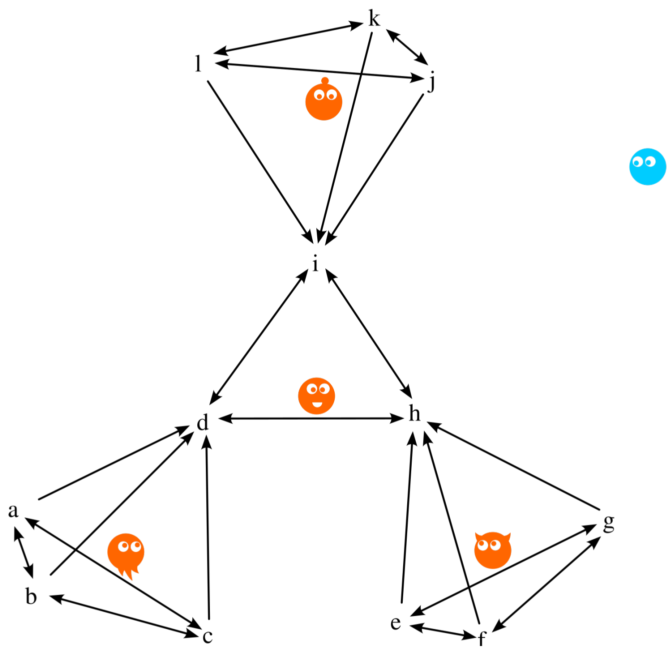

Figure 14: Domains

11 Applicability of Fluemen

In addition to the examples and artifacts discussed, fluemen can be useful for solving a number of other problems, such as:

1. Explaining the unidirectionality of time in multidimensional spaces, which can be linked to symmetry principles in physics.

2. Modeling the interconnection of multiple spaces of different dimensions, topologies, and structures, for example, using domains (branes).

3. Introducing the weight of fluemen allows its interpretation as a deviation from the constant size of quanta, which in turn will enable describing the

dependence of the curvature of space on the "energy" of its quanta in each individual region of space.

12 Summary

Fluemen offer a generalized method for modeling spaces with varying dimensions, properties, and artifacts. Through a set of pairs of natural numbers, they form the topology, configuration, and other characteristics of these spaces.

References

[1] Wiki *Directed graph* `https://en.wikipedia.org/wiki/Directed_graph`

[2] Hall, D. F. *Introduction to Graph Theory*. Prentice-Hall, 1977.

[3] Greene, B. *The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest to Understand the Ultimate Nature of Reality*. W.W. Norton & Company, 2000.