The Attralucian Essays:

Exploring the Finite

First Edition

The Attralucian Essays

Interaction, Embedding, and the Cost of Representation An Alphonic Perspective on Spectral Measurement and Redshift

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Overview

This note develops a representation framework for spectral measurement grounded in interaction, temporal structure, and finite stabilisation. Building on time-series embedding and the concept of generonic symbol formation, it is proposed that spectral observations are not static properties of distant objects, but stabilised reconstructions of interaction sequences. Within this framework, redshift is reinterpreted as a transformation in embedded representational space, and distance is understood not as a direct observable, but as a measure of the cost required to stabilise an interaction into a persistent form. This cost is expressed geometrically through the radius and circumference of reconstructed trajectories, which define the boundary of an Alphonic container of representation.

On Compression as First-Class Structure

The framework developed in this note makes repeated reference to the cost of representation, expressed through interactional effort, stabilisation, and geometric structure. These ideas can be made more precise by recognising a deeper and more general condition.

All finite symbolic construction is necessarily compressive.

A system does not preserve the full structure of interaction. It stabilises it into a finite symbolic form. This stabilisation is not neutral. It is a reduction under constraint, in which extended interaction must be held within a bounded representational container.

What is referred to here as generon cost or ink may therefore be understood as the consequence of this compression. It is not an additional property imposed on the system, but a manifestation of the requirement that interaction be rendered in finite form.

Within this perspective, the reconstructed trajectory in embedded space is not merely a geometric object, but the result of compressing an extended sequence of interaction into a bounded structure. Its radius, circumference, and boundary reflect how this compression is resolved under finite constraints.

An alternative but equivalent intuition is to consider representation as a chain of discrete stabilisations—Nexils—forming a finite "tube" of interaction. Extended interaction requires a long chain. Measurement, however, yields only a short local structure. The act of representation must reconcile these, compressing the extended chain into a form that can be held within the Alphonic boundary.

This note retains the geometric formulation for clarity of analysis, while recognising that geometry itself is an expression of this underlying compression. Distance, scale, and redshift are therefore not treated as primary quantities, but as features arising from the way extended interaction is compressed into finite symbolic form.

0.1 Introduction

Spectroscopy is widely regarded as a cornerstone of modern physics and cosmology. Through the observation of spectral lines, one infers the composition, motion, and distance of distant sources. These interpretations, however, rely on layered transformations from local measurements to stabilised concepts such as wavelength, redshift, and distance.

This note proposes a shift in emphasis. Rather than treating these quantities as primary, it considers the process by which measurements are stabilised into meaningful forms. The focus is placed on interaction, temporal

structure, and the cost of representation.

0.2 Measurement as Interaction

All observations are local. A detector registers discrete interaction events arising from electromagnetic processes. These events are finite, noisy, and incomplete.

A spectral measurement is therefore not the direct observation of an object or a propagating entity, but a structured record of interaction:

$$x(t) = \text{detected signal at time } t \tag{1}$$

The concept of the photon is understood here as a symbolic construct—a generonic stabilisation of repeated interaction patterns—rather than a directly observed entity.

0.3 Spectra as Time Series

A spectrum is typically presented as intensity as a function of wavelength. In practice, it is obtained through temporal integration of interaction events. Each spectral measurement may therefore be viewed as a time series vector:

$$S(t) = [I(\lambda_1), I(\lambda_2), \ldots, I(\lambda_n)] \tag{2}$$

Successive measurements form a sequence:

$$S(t_1), S(t_2), S(t_3), \ldots \tag{3}$$

The spectral line associated with a given atomic transition is thus not a fixed quantity, but a temporally evolving signal.

0.4 Embedding and Reconstruction

Using time-delay embedding, as formalised in Takens' Theorem, the underlying dynamical structure of the interaction can be reconstructed from a single observable:

$$\mathbf{X}(t) = (x(t), x(t + \tau)) \tag{4}$$

This embedding maps the time series into a geometric trajectory in a reconstructed phase space. For coherent signals, this trajectory forms a closed or quasi-closed structure around a stable attractor.

The attractor represents the persistent structure of the interaction process, rather than a static property of an external object.

0.5 Translation and Normalisation

To compare across sources, a centering operation is applied:

$$x'(t) = x(t) - \bar{x} \tag{5}$$

This removes baseline offsets associated with absolute wavelength calibration, allowing the intrinsic structure of the interaction to be examined.

After centering, different sources yield trajectories of similar shape but differing scale.

0.6 Redshift as Geometric Transformation

In conventional analysis, redshift is defined as a scalar shift in wavelength. Within the embedded framework, this shift manifests as a geometric transformation.

Differences in wavelength correspond to scaling of the reconstructed trajectory:

$$\mathbf{X}'(t) = \alpha \mathbf{X}(t) \tag{6}$$

Thus, redshift is reinterpreted as a radial expansion or contraction in representational space, rather than a dis-

placement of a spectral line.

0.7 The Cost of Representation (Ink)

The stabilisation of a spectral signal requires interactional effort, including:

- accumulation of detection events
- temporal integration
- noise reduction
- calibration and processing

This effort is termed the *generon cost* or *ink*:

$$C_{\text{gen}} = \text{cost of stabilising interaction into representation} \tag{7}$$

In the embedded space, this cost is expressed geometrically.

0.8 Radius and Circumference as Cost

The radius of the reconstructed trajectory reflects the scale of the signal, while the circumference represents the

total extent of stabilisation:

$$\text{Circumference} \sim 2\pi r \tag{8}$$

This circumference is interpreted as the total representational effort required to sustain the interaction as a stable form.

Thus, distance is not directly measured, but expressed as the cost of representation:

$$d \sim C_{\text{gen}} \sim \text{Circumference} \tag{9}$$

0.9 Discrete Alphonic Boundary

The reconstructed trajectory is often treated as a continuous curve. However, in practice, it is composed of discrete interaction events.

The boundary of the trajectory is therefore not continuous, but assembled from finite stabilisations:

$$\text{Circumference} \approx N \cdot \epsilon \tag{10}$$

where (N) is the number of stabilised interaction events, and $(\epsilon) represents the minimum Alphonic unit | the smallest bead of ink thr$

Each point along the trajectory corresponds to a discrete generonic act: a local stabilisation of interaction

into form. The apparent smoothness of the boundary arises from the density of these events.

This introduces a fundamental limit to representation. The Alphonic Limit defines the smallest distinguishable increment along the boundary and therefore constrains how finely a trajectory can be resolved.

Within this framework, redshift is not realised as a continuous transformation, but as a reconfiguration of discrete stabilisations. The measurable shift is therefore shaped not only by the underlying interaction, but by the finite granularity of representation itself.

0.10 The Alphon as Representational Container

The embedded trajectory defines a bounded region within which the interaction is stabilised. This region is identified as an *Alphon*.

The Alphon is a finite container of representation, within which meaning is maintained. Its boundary is traced by the reconstructed trajectory, and its size reflects the cost required to hold the interaction.

Near-field measurements correspond to small Alphons with low cost, while distant observations require larger Alphons with greater stabilisation effort.

0.11 Discussion

This framework preserves all empirical measurements while reinterpreting their organisation:

- Interaction replaces object ontology as the primary element
- Time series replace static properties
- Embedding replaces direct observation
- Geometry replaces scalar interpretation
- Cost replaces abstract distance

Redshift, in this view, is not discarded but relocated. It becomes a feature of representational geometry rather than a direct property of light.

0.12 Conclusion

Spectral measurement is not the observation of distant objects, but the stabilisation of local interactions into persistent forms. Through embedding, these forms reveal underlying dynamical structure. The effort required to sustain this structure—the generon cost—defines the scale of representation.

Distance, therefore, is not a directly measured quantity, but an emergent property of the interactional cost required to maintain a stable representation within an Al-

phonic container.

This note represents an initial synthesis. Further work is required to formalise the generon cost, test the embedding framework with empirical data, and explore its implications for cosmological interpretation.

Closing Reflection

What is taken to be distant is never directly encountered. It is held—step by step—through the accumulation of finite acts of stabilisation. Each interaction leaves a trace, and from these traces a structure emerges that we recognise as a signal, a spectrum, a source.

The boundary that defines this structure is not given in advance. It is formed through the very process of holding the interaction in place. Its scale reflects not an intrinsic separation, but the effort required to sustain coherence across successive acts.

In this light, distance is not traversed but constructed. The trajectory closes. The boundary stabilises. The representation holds—for a time. And in that holding, the cost is paid.

Note: This note represents an initial synthesis. Further work is required to formalise the generon cost, test the embedding framework with empirical data, and explore its implications for cosmological interpretation.