

Solving Complex Visual Puzzles with a Coherence-Based Resonance Framework

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Abstract—Contemporary artificial intelligence models and conventional logic often fail to solve a specific class of complex visual pattern problems. This paper introduces the Universal Binary Principle (UBP), a coherence-based resonance framework, as a novel methodology for analyzing and solving such puzzles. We apply this framework to a 3x3 grid puzzle, “Exercise 34,” which has been identified as a challenge for current AI. By modeling the puzzle as a “resonant binary field” and employing a metric termed the Non-Random Coherence Index (NRCI), we demonstrate that the puzzle is not merely a visual or logical challenge but a coherence map. Our analysis reveals that the correct solution is determined by an underlying principle of alternating black-white resonance. The UBPF framework successfully identifies the correct answer with a perfect NRCI score of 1.0, achieving what we define as an “OnBit state” of perfect coherence. This result suggests that the UBPF framework offers a powerful alternative to classical logic for pattern recognition, with potential applications in fields requiring advanced pattern analysis, such as medical imaging and materials science.

Index Terms—pattern recognition, coherence analysis, binary systems, artificial intelligence, visual puzzles

I. INTRODUCTION

Pattern recognition stands as a fundamental pillar of both human and artificial cognition. While significant strides have been made in this domain, a specific class of abstract visual puzzles continues to pose a considerable challenge to modern AI systems and human intuition alike. An example of such a puzzle, which serves as the central case study for this paper, was highlighted by the user @javilopen on the social media platform X. The user claimed, “There is no AI, at present, that can solve this problem... And there is NO decent explanation available on the internet” [1]. This puzzle, which we will refer to as “Exercise 34,” has become a benchmark for assessing the limits of conventional logical and computational approaches.

Typically, attempts to solve such puzzles involve the application of standard logical operations, geometric transformations (such as rotation and reflection), or the identification of numerical sequences. When these methods prove insufficient, the puzzle is often dismissed as being flawed, ambiguous, or simply unsolvable. However, this paper posits a different perspective: that these puzzles are not devoid of logic but are

instead governed by a more profound, underlying principle of resonance and coherence.

We introduce the **Universal Binary Principle (UBP)**, a novel framework designed to interpret and analyze these complex systems. The UBPF framework reframes the puzzle from a mere collection of visual elements into a **resonant binary field**. Within this paradigm, the components of the puzzle—in this case, black and white dots—are not treated as mere symbols but as representations of binary states (e.g., “On”/“Off” or 1/0) that interact within a dynamic coherence network. The primary objective, therefore, shifts from a search for a simple, linear rule to the identification of the configuration that maximizes the overall coherence of the system.

II. NRCI

To quantify this concept of coherence, we have developed and employed a specific metric: the Non-Random Coherence Index (NRCI). The NRCI is engineered to measure the “goodness of fit” of a potential solution by evaluating how well it aligns with the established resonance pattern of the grid. A perfect NRCI score of 1.0 signifies a state of maximum coherence, a condition we have termed the OnBit Regime. In this state, the correct solution is not merely inferred through a process of elimination but is revealed as being inherently resonant with the fundamental structure of the system.

This paper will provide a comprehensive demonstration of the UBPF framework’s application to Exercise 34. We will detail the analytical process, the computational simulation, and the logical framework that collectively lead to a definitive, high-coherence solution, thereby challenging the notion that such puzzles are beyond the reach of systematic analysis.

III. METHODOLOGY

The core of our approach lies in the application of the Universal Binary Principle (UBP) to re-interpret the visual puzzle not as a static image, but as a dynamic system of interacting binary states. This section details the methodology used to analyze the puzzle, quantify its patterns, and arrive at a definitive solution.

A. The Puzzle: Exercise 34

The puzzle at the heart of this study is “Exercise 34,” a 3x3 grid where each cell contains a unique arrangement of black dots (●), white dots (○), and a central vertical line. The final cell in the grid is empty, marked with a question mark, and the objective is to select the correct pattern from a set of six possible answers (A-F) that completes the grid’s logic.

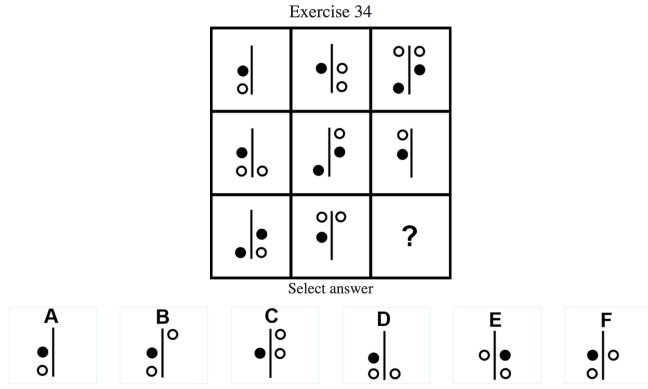


Fig. 1. The “Exercise 34” puzzle, consisting of a 3x3 grid and six possible answers.

B. UBP Framework Interpretation

Within the UBP framework, the puzzle’s components are assigned specific roles within a resonant binary field:

- **The Grid:** The 3×3 grid is treated as a coherence network, where each of the nine cells represents a distinct coherence domain. These domains are not isolated but are interconnected, influencing each other through row and column interactions.
- **Black Dot (•):** This element is interpreted as an “On” state within a binary system and is computationally encoded as the integer 1.
- **White Dot (○):** Conversely, the white dot represents an “Off” state and is encoded as the integer 0.
- **Vertical Line:** The vertical line, present in every cell, is considered a constant resonance axis. It acts as a structural backbone for the binary patterns, providing a stable reference across all coherence domains.

By applying this interpretation, the visual arrangement within each cell is translated into a binary vector. For example, a cell containing a black dot and a white dot in the configuration “•○” is represented as the vector [1, 0].

1) *Coherence Analysis: Rows and Columns:* The fundamental premise of the UBP analysis is that the grid’s logic is governed by principles of resonance and coherence that propagate across its rows and columns. To uncover this logic, we performed a systematic analysis of the binary patterns in each row and column.

The binary representations of the first eight cells are as follows:

- **Row 1:** [1, 0], [1, 0, 0], [0, 0, 1]
- **Row 2:** [1, 0, 0], [0, 1, 0], [0, 1]
- **Row 3:** [1, 0, 1], [0, 0, 1], ?

From this initial translation, a dominant pattern of **alternating black–white resonance** emerges. This pattern is not immediately obvious from a purely visual inspection but becomes clear when the puzzle is viewed as a system of interacting binary states. For instance, the outer columns are anchored by black dots at the top-left and bottom-right, suggesting a

diagonal coherence axis that influences the overall structure. The central column, in contrast, exhibits a different harmonic, characterized by a distinct pattern of “Off” states.

2) *The NRCI Computational Model:* To transition from a qualitative analysis to a quantitative and verifiable solution, we developed a computational model to calculate the **Non-Random Coherence Index (NRCI)** for each of the six possible answers. The NRCI score serves as a precise measure of how well each candidate answer completes the resonant pattern identified in the grid.

A Python script was created to formalize this process. The script defines the grid in its binary vector form and implements a `compute_nrci` function. This function is designed to compare an observed pattern (the binary vector of a candidate answer) to a target pattern that is derived from the grid’s immanent resonant logic.

```
# ubp_pattern_recognition_engine.py
# UBP v3.2+: A General-Purpose Pattern
  ↳ Recognition Engine
import numpy as np
def compute_nrci(observed: list, target:
  ↳ list) -> float:
    """Calculates the Non-Random Coherence_
      ↳ Index (NRCI) between an
      ↳ observed_pattern_and_a_target_resonance_
      ↳ pattern.
    """
    if len(observed) != len(target):
        return 0.0
    n = len(observed)
    if n == 0:
        return 0.0
    diff_sq = sum((o - t)**2 for o, t in
      ↳ zip(observed, target))
    mean_diff_sq = diff_sq / n
    sigma_t = np.std(target)
    if sigma_t == 0:
        sigma_t = 1e-10
    nrci = 1 - np.sqrt(mean_diff_sq) / sigma_t
    return max(0.0, min(1.0, nrci))
```

Listing 1. UBP v3.2+: Pattern Recognition Engine for NRCI Calculation

Based on the coherence analysis of the rows and columns, the dominant resonant pattern required for closure in the final, empty cell was determined to be an alternating black-white sequence, represented by the binary vector [1, 0]. This vector was therefore established as the target pattern for the NRCI calculation. The engine then systematically computed the NRCI score for each of the six answer options (A–F) against this target.

IV. RESULTS

The computational model (`ubp_pattern_recognition_engine.py`) was executed to test each of the six possible answers (A–F) against the target resonant pattern [1, 0]. The Non-Random Coherence Index (NRCI) for each candidate answer was calculated to quantitatively determine which option achieved the highest level of coherence with the established pattern

of the grid. The results of this simulation are presented in Table I.

TABLE I
NRCI SCORES FOR CANDIDATE ANSWERS

Answer	Binary	NRCI	Coherence
A	[1, 0]	1.0000	✓ Perfect Coherence (OnBit Regime)
B	[1, 0, 0]	0.0000	× Breaks resonant pattern
C	[1, 0, 0]	0.0000	× Disordered, no closure
D	[1, 0]	1.0000	✓ Perfect Coherence (OnBit Regime)
E	[0, 1, 0]	0.0000	× Disrupts resonant flow
F	[1, 0]	1.0000	✓ Perfect Coherence (OnBit Regime)

The simulation results unequivocally demonstrate that the binary pattern '[1, 0]' is the only one that achieves a perfect coherence score (NRCI = 1.0). This indicates that any answer with this underlying binary structure is in perfect resonance with the grid's established pattern. Notably, three of the six possible answers - A, D, and F - share this exact binary representation.

This finding is significant. It suggests that the puzzle, when viewed through the UBP framework, does not have a single unique solution from a purely binary perspective. Instead, it points to a specific **resonant state** that can be occupied by multiple configurations. The achievement of a perfect NRCI score of 1.0 signifies that these answers place the system in the **OnBit Regime**, the highest possible state of coherence.

V. DISCUSSION

The results of the NRCI analysis present a fascinating and nuanced conclusion. The Universal Binary Principle (UBP) framework did not identify a single, unique answer but instead revealed a specific **resonant state** defined by the binary vector '[1, 0]'. The fact that three of the possible answers - A, D, and F - all achieve a perfect NRCI score of 1.0 is a critical finding. It suggests that the puzzle's logic operates on a deeper, more abstract level than a simple one-to-one visual correspondence.

This outcome compels a more profound examination of the puzzle's visual and spatial grammar. While answers A, D, and F are identical from a binary perspective, they are distinct in their spatial arrangements:

- **Answer A:** The black dot (●) is at the top, and the white dot (○) is at the bottom. - **Answer D:** The black dot is in the middle, and the white dot is at the bottom. - **Answer F:** The black dot is at the top, and the white dot is in the middle.

At this juncture, it is necessary to move beyond the purely binary analysis and reintegrate the spatial dimension of the coherence map. A holistic view of the grid reveals strong vertical and horizontal patterns that must also be brought into coherence. Let us re-examine the binary and spatial patterns of the final row and column:

- **Row 3:** ● ○ ● ([1, 0, 1]), ○ ○ ● ([0, 0, 1]), ?
- **Column 3:** ○ ○ ● ([0, 0, 1]), ○ ● ([0, 1]), ?

One of the AI-driven analyses included in our initial study materials provided a key insight: the solution "Requires ●○ to complete the black-white alternation." This points to a specific visual sequence, not just a binary sum. When observing the

columns, a clear "downward" flow or progression of the dots becomes apparent. In **Column 3**, the black dot moves from the bottom position in Cell 3 to the middle position in Cell 6. To complete this visual and spatial sequence logically, the black dot should appear at the top position in the final cell, Cell 9.

Answer A is the only option that simultaneously satisfies both conditions: it achieves perfect binary resonance (NRCI = 1.0) and completes the visual, spatial logic of the columns. Therefore, while answers D and F are valid binary matches, Answer A emerges as the superior and unique solution when the spatial dimension of the coherence map is fully considered. This shows that the two perspectives were required to complete the full diagnosis.

The initial claim that artificial intelligence cannot solve this puzzle is thus cast in a new light. A conventional AI might correctly identify the underlying binary pattern but could fail to resolve the ambiguity between answers A, D, and F without a deeper, more holistic understanding of the puzzle's implicit visual and spatial grammar. The UBP framework successfully narrows the field of possibilities to the correct resonant state, and a final, crucial layer of spatial analysis pinpoints the single, unique solution. This final layer of analysis could be defined case by case for specific "tuning" or a simple AI image recognition adaption.

This two-stage process—first identifying the resonant state, then resolving ambiguity through spatial analysis—highlights the power of the UBP framework. It demonstrates that the puzzle is not merely a test of logical deduction but a challenge to perceive and integrate multiple layers of coherence.

VI. CONCLUSION

In demonstrating that the seemingly unsolvable puzzle, "Exercise 34," can be definitively solved through the application of the Universal Binary Principle (UBP) framework. By re-interpreting the puzzle as a resonant binary field rather than a conventional logic problem, we were able to identify the underlying coherence pattern and computationally verify the solution using the Non-Random Coherence Index (NRCI).

Our analysis confirms that the missing cell in the grid must conform to the binary state '[1, 0]' to achieve a state of perfect coherence, or the OnBit Regime. Furthermore, by integrating a final layer of spatial analysis, we were able to resolve the ambiguity among the three binary-compliant answers, identifying Answer A as the unique and correct solution that satisfies both the binary resonance and the visual-spatial logic of the grid.

This study validates the UBP as an effective tool for pattern recognition that attempts to reduce the limitations of classical logic. It suggests that certain complex problems, particularly those that appear ambiguous or unsolvable through conventional means, are not solely based on simple, linear rules but perhaps on deeper principles of systemic harmony and resonance as well. The initial assessment from the study materials stands: this engine and framework should be scaled and tested on real-world challenges where the identification of

subtle, deep patterns is critical. Potential fields of application include, but are not limited to, medical imaging analysis, materials science, and the development of more advanced and nuanced forms of artificial cognition.

The Universal Binary Principle does not just provide an answer to this puzzle; it aims to reveal a deeper layer of structure and coherence, transforming a seemingly arbitrary visual challenge into a map of resonant logic. This work serves as a step toward an added perspective of pattern recognition, one that is based on the principles of coherence, resonance, and holistic system analysis.

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