

Flirting Charts: Expressive Motion Design in Information Visualization Inspired by Animal Courtship Performances

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ABSTRACT

Animal courtship performances use vivid color shifts, rhythmic motion, and spatial choreography to capture attention. We code video footage of animal courtship performances for form and pattern motions and transitions, to extract design inspirations for information visualization (InfoVis).

Index Terms: Biomimicry, information visualization, motion design, courtship performance.

1 INTRODUCTION

Biomimicry, the practice of emulating nature's forms, processes, and systems, has emerged as a rich source of design inspiration, such as architecture, product design, and materials engineering, offering novel strategies for expression, interaction, and engagement. In InfoVis, there is growing interest in emotionally engaging, narrative, and expressive motion designs (e.g., [5, 9]), yet the potential of biomimicry remains underexplored.

Natural systems, particularly those shaped by evolutionary pressures for communication, offer valuable aesthetic and functional models. Animal courtship displays, for example, are evolutionarily honed performances designed to captivate attention, convey intent, and evoke emotion—qualities that closely align with the goals of expressive, narrative, and affective visualizations. These displays rely on visual form and color, and are particularly expressed through their motion, the dynamic choreography of color transitions, shape transformations, and spatial movement over time [6]. Here, we use “motion design” to refer specifically to the animation and transition of visual elements within a fixed visualization frame, distinct from “visualization in motion” [10], where the entire visualization moves in space because it is anchored to a moving real-world referent. This emphasis on motion design offers a compelling, underutilized perspective for rethinking animation and transition strategies in InfoVis.

Recent design research has begun to explore biomimicry in visual design and InfoVis. Projects like Fireflies draw from the swarming behavior of fireflies and plant phyllotaxis to create dynamic and aesthetically rich representations of survey data [1]. Eggermont et al. [3] demonstrate how biomimicry in InfoVis education stimulates conceptual innovation and helps students derive expressive layouts and interactions from natural systems like flocking or branching. These approaches reflect a shift toward more expressive and affective visualization practices, where nature's communicative behaviors become potential functional blueprints for data representation and visual cues for interaction design.

In this work, we explore the potential of animal courtship performances as inspiration for motion-centered design in InfoVis. We focus particularly on how motion, such as the flow of color, transitions of form, and expressive bodily movements, can inform the

design of visual transitions, animations, and interactions. Drawing from the courtship performances of the Peacock Spider, Birds-of-Paradise, and Cuttlefish, we coded their visual displays to extract motion-based inspirations. We then discuss how these natural behaviors can inspire expressive and emotionally resonant approaches to visualization.

2 DATA AND METHOD

To explore how animal courtship performances can inspire expressive InfoVis, we conducted a qualitative coding of video-recorded courtship displays from three species: Peacock Spider, Bird-of-Paradise (i.e., *Parotia sefilata*), and Cuttlefish (i.e., *Sepia plangon*). These species were selected to exemplify the richness, diversity, and visual distinctiveness of their courtship performances, which feature elaborate use of movement, coloration, spatial choreography, and performative intent.

Data Source: We sourced high-quality video footage of animal courtship from publicly available wildlife documentaries and scientific archives, including YouTube channels such as BBC Earth's *Planet Earth*¹, *Blue Planet II*² and Netflix's *Our Planet*³. We used keyword searches combining species names with “courtship” and “mating display” to gather multiple angles and instances of each behavior for detailed observation.

To enrich our analysis and guide our coding framework, we also examined ethological literature on multimodal courtship signals and behavioral structure, particularly studies in courtship ethology that emphasize the modularity and structured choreography of animal displays. For instance, Scholes' study of birds-of-paradise details a structure of courtship behavior, described as modular sub-units such as the “stand,” “bow,” and “waggle” phases, each made of repeatable elements (e.g., wing flicks, head dips, and body shakes) [8]. Similarly, dynamic signaling strategies observed in cuttlefish's courtship [7], and the visual ethogram of Peacock Spider [4], informed our qualitative coding of motions.

Qualitative Coding: Animal courtship displays often unfold across multiple structured phases (e.g., *Parotia wahnesi* [8]). Rather than coding the entire sequence of each display, we selected segments that emphasize expressive motion, particularly transitions in form, color, and movement, and explored their potential implications for InfoVis design. Two coders independently coded the videos to extract graphics-relevant features, drawing from the semiology of graphics in visual encoding [2], followed by collaborative sessions to refine the codes and discuss their design implications. (*Example video footage can be found in the supporting document*)

Our coding focused on body geometry and posture, such as symmetry, gesture, shape modulation, and motion transition among these. We paid special attention to transitions in form and color, which offer rich potential for animated and interactive visual design. Performances were coded primarily from the *female's viewpoint* to capture how visual and motion cues are presented to the intended audience, with additional angles used to understand movement mechanics and inform structural analysis.

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¹<https://www.bbcearth.com/shows/planet-earth>

²<https://www.bbcearth.com/shows/blue-planet-ii>

³<https://www.netflix.com/ca/title/80049832>

3 EXAMPLES

The male **Bird-of-Paradise** (i.e., *Parotia Sefilata*)’s courtship performance includes full-body extension into a conical shape, flank plume rotation, swinging head wires, and floating gestures, all performed within a fixed visual frame directed at the female observer (Fig. 1). One of its signature motions is when viewed from above, where it suddenly flashes a bright yellow patch on its neck, creating a striking contrast against its black plumage. The bird’s head wires move in a sweeping, circular motion around the dark breast shield, adding a layer of peripheral animation to the display, and the sudden burst of color effectively captures attention. Additionally, the bird features a repeated sidestep between two positions, where the male pauses to lower his flank plumes like a skirt, while rhythmically shaking his head in sync with the movement.

This combination of sudden, high-contrast color reveals and fluid, circular movements can be applied to InfoVis design by incorporating sudden, attention-grabbing flashes of color contrast and continuous peripheral animations to guide the viewer’s focus and maintain engagement.

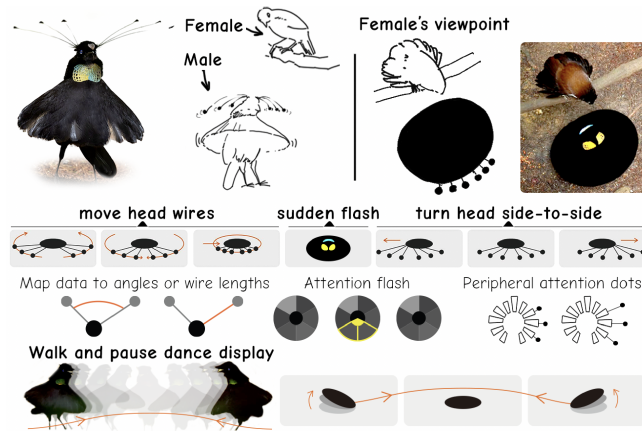


Figure 1: Example movements of male *Parotia Sefilata*’s courtship performance with coded motion elements.

The male **Peacock Spider**’s courtship performance includes a rhythmic, dance-like display combining coordinated lateral motion of his opisthosomal fan with the leg movements (Fig. 2). The performance begins as the fan flops splay out, expanding to reveal vivid patterns. Then, the fan swings side to side like a metronome, at varying speeds, often in sync with the waving of the third legs.

This coordination of motion and color change can inspire InfoVis by using synchronized animations and rhythmic transitions that highlight key data, ensuring that it attracts viewers’ attention to designated visual elements.

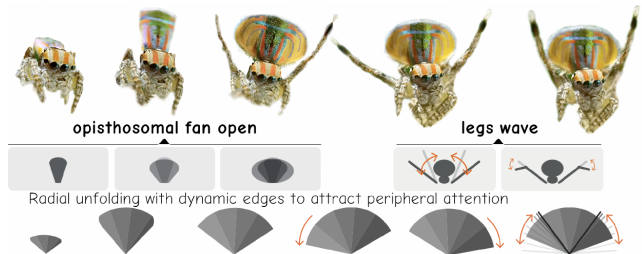


Figure 2: Example movements of male *Peacock Spider*’s courtship performance with coded motion elements.

The male **Cuttlefish** (i.e., *Sepia Plangon*)’s courtship performance is renowned for its ability to rapidly change the patterns on its skin (Fig. 3). They begin with a zebra-striped pattern, shift to a darkened uniform body, and finally transition to a pulsing dorsal mantle display during copulation attempts. Researchers have identified 32 different combinations of body patterns and signaling

components during the courtship of *Sepia plangon* [7], offering rich inspiration for the design of visual transformation.

In the context of InfoVis, this capability can inspire the use of fluid, adaptive transitions where visual elements can change patterns or textures in real-time. This approach can create immersive and responsive visualizations that adapt seamlessly to new data or interactions, much like the cuttlefish adapts to its environment.

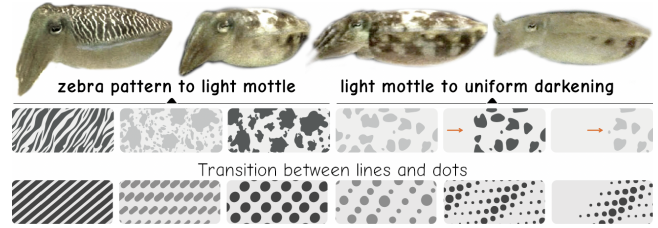


Figure 3: Example skin pattern change of male *Cuttlefish* (i.e., *Sepia Plangon*)’s courtship performance with coded motion elements.

4 OPPORTUNITIES FOR EXTENSION

This work opens several directions for future research. First, empirical studies could assess whether courtship-inspired motion designs enhance engagement, guide attention, or improve recall and emotional resonance in InfoVis. Second, these motion rhythms and temporal dynamics can be formalized into coded patterns and applied across different InfoVis contexts. Third, the motion codes offer rich inspiration for data physicalization and XR, where material choices (e.g., soft robotics, lighting, motion fabric) and spatial choreography could translate these natural performances into immersive, embodied data experiences.

5 CONCLUSION

Animal courtship performances offer rich, motion-centered inspiration for designing expressive, attention-catching transitions and interactions in InfoVis. By coding these natural behaviors, we identified motion patterns such as color shifts, form transitions, and rhythmic gestures that can inform visualization design. Our work demonstrates the potential and sets the stage for further exploration through implementation and evaluation.

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