

# Modular Artificial Bird Nest Interactive Installation: A Practice in Urban Interactive Landscape

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**Abstract:** *As urban renewal increasingly focuses on the quality of micro-spaces and public participation, landscape installations that integrate playful interaction and ecological care have become a valuable endeavor. This study centers on the design exploration of a "Modular Artificial Bird Nest Interactive Installation," aiming to introduce lightweight interactive nodes into urban public spaces. The installation utilizes connectable hexagonal modules and can be adapted for different bird species by replacing front panels. Its core innovation lies in constructing a three-tier interactive system: an environmental sensing layer collects data inside the nest via sensors; a behavioral sensing layer provides immediate feedback by triggering bird calls; and a virtual interaction layer employs an online platform to facilitate continuous observation logging and community sharing. This design seeks to transform avian activities into a perceptible and engaging experience for residents. Furthermore, the research integrates the concepts of the "Playable City" and "Biophilic Design" to explore the installation's potential applications in everyday settings like community gardens and school campuses. This practice primarily offers a concrete and detailed design methodology for urban interactive landscapes. It aspires that such small-scale interventions can stimulate public awareness of surrounding natural life, thereby infusing the urban environment with greater vitality and interactive enjoyment.*

**Keywords:** Interactive Landscape, Artificial Bird Nest, Modular Design, Urban Installation, Public Participation.

## 1. Introduction

As urban micro-renewal places growing emphasis on the quality of life in public spaces and human experience, landscape design is evolving from static observation towards dynamic interaction. Consequently, urban interactive landscapes, centered on digital technology and public participation, have emerged. These practices emphasize creating more attractive and memorable place experiences through bidirectional feedback between people and their environment [1]. In the post-pandemic era, public attention has converged on physical and mental health, community resilience, and the natural environment [2], giving rise to projects like Shanghai's Changning District "Habitat Gardens," which focus on creating micro-scale community habitat networks as a form of urban interactive landscape [3].

It is within this context that this study proposes the Modular Artificial Bird Nest Interactive Installation. Its objectives are twofold: first, to utilize modular design to provide standardized nesting units for specific urban birds (e.g., Spotted Dove, White Wagtail, Red-tailed Shrike); and second, to construct a lightweight interactive system integrating "Environmental Sensing – Behavioral Triggering – Virtual Community," thereby transforming the often-hidden nesting behaviors of birds into perceivable, participatory, and contributable public events for community residents.

This study posits that through such small yet refined interventions, fragmented and underutilized urban spaces (e.g., community corners, street-side green patches) can be transformed. They may not only serve as shelters for birds but also become interactive nodes that connect residents with nature and foster neighborhood observation and communication. The installation aims to explore a possibility: whether urban interactive landscapes can enhance public

cognition of and emotional connection to local ecology in a manner that is lightweight, user-friendly, and imbued with care for living beings, thus practically integrating ecological symbiosis and social interaction on a micro-scale.

## 2. Research Object – The Modular Artificial Bird Nest Interactive Installation

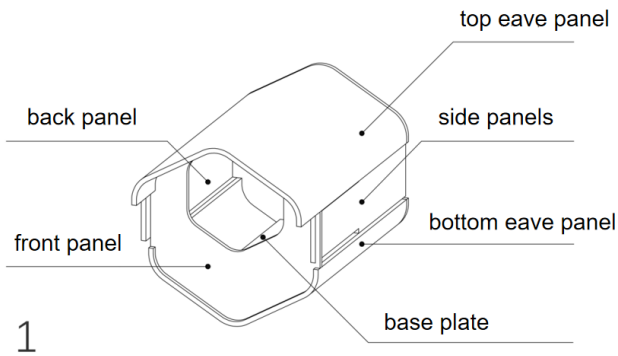
The design core of this study is a modular artificial bird nest installation characterized by both adaptability and interactivity. It aims to provide a scientifically considered nesting space for urban birds such as Spotted Doves, Red-tailed Shrikes, and White Wagtails, which prefer open vistas, while simultaneously constructing a community interface that connects people to the dynamic lives of birds through integrated sensing, feedback, and participation modules.

### 2.1 Installation Form and Assembly Method

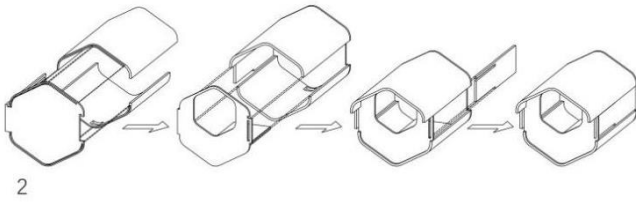
The individual nest unit approximates a hollow hexagonal prism, assembled from five core components via an interlocking system (Figure 1). The front panel is a regular hexagonal panel featuring a smaller central hexagonal entrance. Its dimensions, particularly the entrance size and interior depth, are the key variables for adapting to different bird species. Replacing front panels with different specifications modifies the nest chamber to accommodate birds ranging from White Wagtails to Spotted Doves. The back panel serves as the unit's structural skeleton and primary load-bearing element. It is integrally formed with the left side panel, enhancing strength and providing the main mounting base. The side panels comprise the integrally formed left panel and a separate, interlockable right panel, which define the unit's uniform width and provide essential activity depth.

The top eave and bottom eave panels interlock above and below the back panel respectively, forming the roof and floor. The top eave extends outward as an overhang for weather protection, while the bottom eave includes drainage holes to ensure interior dryness. Assembling these five components in sequence completes a single nest unit (Figure 2).

As a configurable multi-unit cluster, individual nests connect via standardized interfaces like building blocks. For horizontal arrangements, units share a common side panel to form linear arrays suitable for walls, railings, or long tree trunks (Figure 3). For vertical stacking, a dedicated bracket system fixes units in layered configurations (Figure 4), making efficient use of vertical space on building facades or landscape structures (Figure 5), thus offering birds choices at different heights.



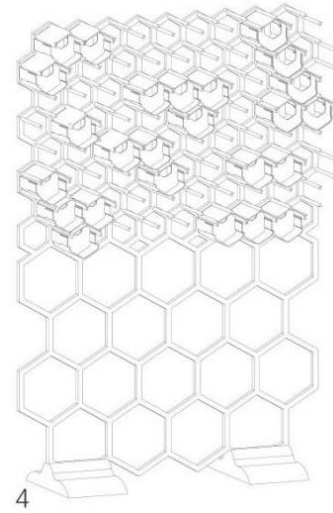
**Figure 1:** Schematic Diagram of Bird Nest Unit Components



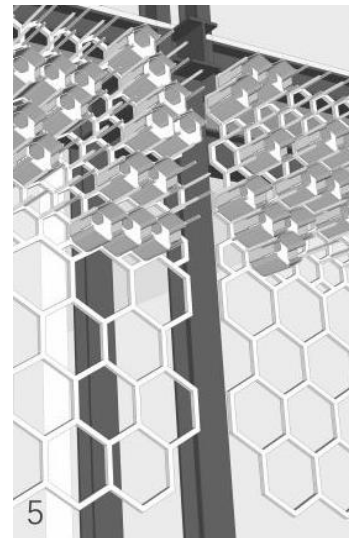
**Figure 2:** Schematic Diagram of Bird Nest Unit Assembly Steps



**Figure 3:** Schematic Diagram of Bird Nest Installed on Tree Trunk



**Figure 4:** Schematic Diagram of Bird Nest Cluster Installation Bracket



**Figure 5:** Schematic Diagram of Bird Nest Installed on Building Facade

## 2.2 Installation Guidance Based on Target Bird Species

Installation sites are recommended based on species-specific ecology. For the highly adaptable Spotted Dove, which often perches in tall residential trees or park woodlands, installations are suitable for central neighborhood trees or greenbelts between buildings at heights of 3-7 meters [4]. For the White Wagtail, a waterside species favoring riverbanks and lake shores, installations should be placed near community rain gardens, ecological revetments, or pond-side micro-greens on low shrubs or dedicated posts at 0.5-1 meter heights [5]. For the Red-tailed Shrike, which, while adaptable to urban areas like campuses, avoids high-disturbance zones for nesting, suitable locations include peripheral green spaces in renovated old neighborhoods or fence posts in community gardens, at approximately 2 meters high [6]. Units can be placed individually according to these guidelines or combined in mixed-species clusters, arranged vertically to match preferred heights, with supplemental plantings to create suitable micro-habitats.

## 2.3 Three-Layer Interactive System – A Theoretical Framework Applied

Contemporary interactive landscapes are often categorized into three types: behavior-perception (human action as input), environment-perception (environmental elements as drivers), and virtual interaction (bridging physical and digital realms) [1]. This installation's interactive system is designed accordingly across three layers.

### 2.3.1 Environmental Perception Layer: Visualizing Ecological Processes

Each nest unit can house a network of micro temperature/humidity and infrared sensors. These continuously collect internal microclimate data and detect life activity signals (bird movement, incubation). Mirroring the logic of projects like the PM2.5-sensing glass at Beijing Forestry University [7], this layer's core function is to visualize environmental change, interpreting complex ecological dynamics and bridging physical space with informational layers [1]. Its aim is to transform concealed processes like breeding and roosting into accessible data streams.

### 2.3.2 Behavioral Perception Layer: Low-Threshold Interaction for Enhanced Engagement

On the public-facing side of the nest, a waterproof touch-sensitive button or a proximity sensor can be installed. When a passerby presses the button or lingers nearby, the system triggers a pre-recorded, species-specific bird call. This layer emulates the classic "stimulus-feedback" loop seen in interactive installations like the "step-to-spray" mist in Beijing's G-PARK park [8]. It transforms a simple human action into a momentary dialogue with nature, designed to create a low-barrier, emotionally rewarding participatory moment, shifting the public from passive observers to active triggers.

### 2.3.3 Virtual Interaction Layer: Fostering a Sustained Online Community

A supporting lightweight application (e.g., a WeChat mini-program) can be developed to receive, visualize, and log data from the physical layers. Similar to North Carolina State University's virtual park platform [9], it constructs a digital twin community. Users can "adopt" a virtual nest, upload observations and photos, and collaboratively build a community bird atlas. This layer extends the installation's reach beyond physical limits, creating a persistent social network focused on avian life, aligning with the virtual interaction landscape paradigm of overlaying digital information onto physical space [1].

## 2.4 Species-Adapted Interactive Modes

The modular design allows for tailored interactions based on target species' ecology. For Spotted Doves installed at 3-7m high [4], long-term residency and breeding data from the environmental layer can generate narrative content like a "Dove Family Diary" online, while the exterior behavioral layer could feature a touch-button triggering a cooing response, reinforcing a sense of neighboring co-existence. For White Wagtails installed 0.5-1m high near water [5], interaction emphasizes scene integration: the environmental

layer could optionally connect to water quality sensors, and the behavioral layer might activate the wagtail's call as ambient sound when people approach a viewing platform, with the app offering "Waterfront Guardian" check-in tasks to link recreation with conservation awareness. For Red-tailed Shrikes installed around 2m high in quiet zones [6], to minimize disturbance, interaction is designed to be subtle, such as using a non-contact sensor to trigger a soft, brief light when the shrike returns, discreetly signaling its presence to distant observers, while collected territorial data could be visualized as a "Shrike Territory Map" in the app for enthusiast study. When deployed in combination, these units form a diverse avian community where residents can use the unified platform to compare species' rhythms and participate in varied tasks, transforming isolated nest boxes into a cohesive system that fosters deeper understanding of urban biodiversity.

## 3. Scenario Applications: Interactive Habitats Aligned with "Playable City" and "Biophilic Design"

### 3.1 Scenario One: Open-Air Citizen Science Classroom

Deployed in schoolyards, community nature zones, or ecological corridors, the installations become outdoor observation stations. Through the associated app, students and residents learn about local birds and contribute data on breeding or foraging, feeding a shared database for urban biodiversity monitoring. This aligns with the "Playable City" concept of infusing play, exploration, and social interaction into urban settings [10], transforming ecology into an engaging exploration. It also practices the "coexistence approach" in biophilic design by actively involving people in providing for and documenting non-human species, promoting "sharing with nature." [11]

### 3.2 Scenario Two: Community Mental Health Healing Garden

Integrated into parks, street greenspaces, or rehabilitation gardens, the installations serve as tranquil yet dynamic nodes. Passive observation of avian life rhythms through subtle cues can facilitate attention restoration and stress reduction, principles supported by Attention Restoration Theory (ART) and Stress Reduction Theory (SRT) [10]. Simple participatory tasks, like virtual refilling of a feeder for a digital reward, offer micro-achievements. This scenario merges the "Playable City" focus on positive feedback with biophilic design's core premise: leveraging humanity's innate affinity for life and life-like processes to promote psychological well-being [11].

### 3.3 Scenario Three: Productized Resilient Urban Micro-Infrastructure

The installation's modular, product-like nature allows for flexible, low-cost widespread deployment in dense or underserved neighborhoods. The installation process itself can be a community-building activity. Long-term operation yields valuable data on local biodiversity patterns, informing urban ecology planning. This addresses post-pandemic calls for resilience, equity, and sustainability [2], while the standardized form makes biophilic co-existence accessible

across communities [11]. The collaborative aspect of deployment and maintenance extends the "Playable City" ethos, strengthening community bonds and place attachment [10], thereby enhancing social resilience through a micro-scale intervention.

#### 4. Conclusion

Amidst an urban renewal context that prioritizes micro-space quality and participatory engagement, interactive landscapes offer a significant avenue for enriching urban experience. This study presents a concrete design exploration focused on the "Modular Artificial Bird Nest Interactive Installation."

As an attempt to connect residents with urban nature through interactive landscape, the design highlights three features: Modularity and Adaptability for flexible integration and multi-species service; Intuitive Interaction using low-threshold triggers like touch and sound to spark immediate interest and sustained observation; and Versatile Scenario Application, translating "playable" and "biophilic" ideas into tangible experiences in everyday spaces like community gardens and campuses.

This work remains a conceptual, stage-specific proposal. Its interactive efficacy, ecological impact, and long-term viability necessitate subsequent phases of prototyping, real-world deployment, and evaluation. The contribution of this research lies not in presenting a final solution, but in offering a provocative case study. It illustrates how a compact, user-friendly, and technology-enhanced design can inject a sense of tangible vitality and warmth into public space, while prompting reflection on coexisting with surrounding life. Such detailed attempts represent valuable steps toward fostering more interactive and inclusive cities.

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