
A Flock of Birds: Bringing Paper to Life

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Abstract

In this paper we describe *A Flock of Birds*, an interactive, robotic origami art installation. The art installation explores folding paper as a fusion of input, output and computation while simultaneously providing its audience with a fun and exciting experience.

Keywords

Art Exploration, Organic User Interface, Paper Computer, Origami

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous. J.5 Arts and humanities: Arts, fine and performing.

General Terms

Design

A Flock of Birds

Our art installation *A Flock of Birds* consists of several origami cranes. Each paper crane functions either as a 'leader' or part of a flock of birds. As shown in Figure 1, when participants pull the tail of a leader crane, its movements are replicated and propagated through the entire flock, delayed, and with random noise inserted. Participants can interact with the leaders to create various patterns of wing beats in the flock.



Figure 1: A Flock of Birds at the NYC Resistor Interactive Show 2011

With the prospect of thinfilm flexible displays becoming very concrete, interactions with paper-like media become more relevant. Bending a flexible e-paper display or a piece of paper can function as a form of input [3]. Paper can also be folded as a means of lightweight input [4]. Once it is folded however, an interesting effect occurs: The paper obtains structure [1]. Further folding manipulates and refines this structure. The shapes created by this process can be both meaningful and functional. Our art piece is aimed at exploring how far the structure and shape of paper can be used for a computational process. Folding, in the case of our birds, acts as input as well as output. Input is the pulling of its tail and output is the flapping of its wings. Finally, the folds also dictate the translation of the movement of the tail to the wings, and thus become the algorithm. Input, output and computation lose their distinction and are combined into one organic whole.

We take advantage of the beauty of this system in our installation. However, we dissect this unity in order to create awareness of the underlying mechanism. Input is generated by actuating the leader. The algorithm now lies in the translation of movement from the leader to the flock. Much like similar work at MIT [2] we then actuate the flock, allowing it to react to the motion of the leader. Without the separation of input, output and algorithm, the process is so natural that it receives little attention. By separating the computational elements we are able to manipulate them, allowing surprise and uncertainty to enter.

Our art installation plays with the contrast between the known and unknown. We have a computational system, the origami bird, which is well known to participants.

These birds are made of paper, which also is a familiar medium. The movements appear to follow simple laws of physics, which participants intuitively understand. We then take this holistic system and place it in an actuated environment, where elements do not necessarily respond as expected. The reactions of the flock to the movement of the leaders appear predictable, but become chaotic, depending on the state of the input.

Implementation

The leaders have a stretch-sensor embedded, which is used to capture the current state of movement the bird is in. The movement of the flock is actuated by multiple servo motors. Data logging and servo control is handled by an Arduino.

References

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