tamable looper: Creature-like Expressions and Interactions by Movement and Deformation of Clusters of Sphere Magnets

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Figure 1: *tamable looper*

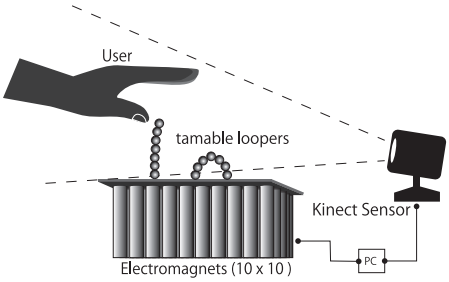

Figure 2: *System Design*

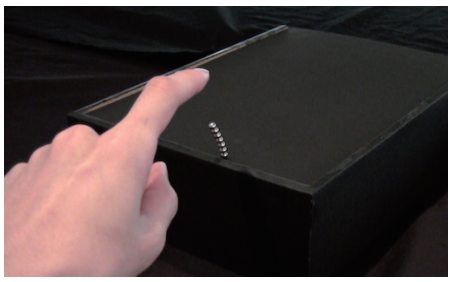

Figure 3: *Interaction*

1 Introduction

Researches using unique materials to move or deform objects are now popular. There are generally two approaches to accomplish this achievement. By implanting actuators, such as bio-metals, directly into the object is a common solution. In this way, actuators can disturb the materials behaviors or characteristics and ruin some performances. On the other hand, researches that enable to move or deform objects without implanting any actuators directly into the material also have been accomplished. In this approach, magnetic force is appropriate and useful for moving or deforming objects.

Previous researches such as the Actuated Workbench [Pangro et al. 2002], use magnetic force to move objects on a workbench surface. ZeroN [Lee et al. 2011] can levitate and move objects in a three dimensional space. Moreover, ferrofluid is a popular material and artworks such as Protrude, Flow [Kodama et al. 2001] have been accomplished. Our system, tamable looper (see Figure 1), enables not only to move and deform shapes of multiple objects but to control postures and ways of how it moves. Furthermore, interactions and engaging creature-like expressions are included, which can inspire users to interact naturally. The system is consisted of electromagnets and clusters of sphere shaped neodymium magnets.

2 tamable looper

The tamable looper proposes two technical innovations as follows.

Firstly, we managed a peculiar algorithm, controlling electromagnets to move and deform the clusters of the sphere shaped magnets (the looper, see Figure 2). This enables our system to represent flexible and cubic expressions. The system consists of 100 electromagnets arranged in a 10 x 10 grid, which are independently controllable and designed to drive bi-directionally. Utilizing the magnetic force and direction driven from the electromagnets, attraction and repulsion occur to the looper and the patterns of the force generates various actions. The force of attraction and repulsion occurred from the electromagnets are switched rapidly and the algorithm to express such actions is essential and delicate.

Secondly, we propose to urge users to interact naturally, by implanting creature-like movements, imitating a looper . We use the Microsoft kinect device to capture and analyze the user's gestures. According to the gesture represented, the looper will act relatively(see Figure3). No additional devices are required, thus the manipulation is intuitive and simple.

3 Applications and Future Works

The tamable looper provides various actions such as moving like a looper, standing up, wheeling, flipping and jumping. Each action is linked to the user's interactions and is capable to manipulate with intuitive gestures. Combinations of actions mentioned above are practical to develop unique applications. The system can be utilized as a tabletop miniature theater. Since the system does not recommend to have a flat or parallel surface, depending on how we arrange the electromagnets, the looper may move on a bumpy, sphere or round surface. Actions changes depending on relations of the positions between the creatures or gestures responded from the user. Engaging and charming behavior will certainly entertain users and have potentiality to be an enjoyable creature.

In the future, tamable looper can be utilized as a substantial interactive display, by designing images with plural loopers. Establishing algorithms to control plural loopers at the same time and to avoid interfering each other are necessary. Furthermore, we plan to model a developed device on larger scale and to provide any attained information by patterns and actions produced by plurally located loopers. Therefore, we plan to update for the increase of interaction techniques and moving and deforming patterns.

References

PANGRO, G., MAYNES-AMINZADE, D., AND ISHII, H. 2002. The Actuated Workbench: Computer-Controlled Actuation in Tabletop Tangible Interfaces. In *Proceedings of UIST*, ACM, 181–190.

LEE, J., POST, R., AND ISHII, H. 2011. ZeroN: Mid-Air Tangible Interface Enabled by Computer Controlled Magnetic Levitaition. In *Proceedings of UIST 2011*, ACM, 327–336.

KODAMA, S., AND TAKENO, M. 2001. Protrude, Flow. In *SIGGRAPH 2001 Art Gallery*, ACM.

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