

PocoPoco : A Tangible Device That Allows Users To Play Dynamic Tactile Interaction

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1. Introduction

Today a tremendous amount of audio and visual information is stuffed onto the flat displays of smart phones. It is no doubt a very convenient age, but a little bit uniform. Our research focuses on interfaces with dynamic movements and interfaces that can change their own shape dynamically [1][2]. We have developed a box-shaped device called *PocoPoco* which controls the movement of columnar units with built-in solenoid actuators and utilizes them to give users dynamic tactile sensations (see Figure 1). *PocoPoco* is an input/output device that can be used without visual information, because it can indicate all input/output information through tactile sensations. This device is a versatile interface that can be used in a wide range of applications including games, telecommunication, and musical performance. It was conceived as a “new kind of interface which can be used by both people with visual impairments and people with normal vision”.



Figure 1. left : The inner workings, center : outward appearance, right : The inner structure of the solenoid unit

2. Exposition

Current passing through conductive coils creates a magnetic field and allows them to be used as electromagnets. *PocoPoco* uses a microcomputer to control the current flowing to the electromagnets causing individual cylinders containing magnets to be raised and lowered. The bottom of the solenoid actuators also contains a switch that is activated when a user presses down on the cylinders and a photo reflector that detects the position of the solenoid actuator. So users can interact with applications utilizing *PocoPoco* by simple pushing, catching, and bobbing up the solenoid actuators(see Figure 2).

PocoPoco has a simple interface that can be easily and intuitively operated directly.



Figure 2. left : pushing, center : catching, right : bobbing

2.1 Poco-Seqencer

“PocoSeqencer” is a musical application for *PocoPoco* with which users can play improvised loop music. By using PocoSeqencer users can create fascinating loop music easily, just by pushing, catching, and picking up cylindrical actuators (we call these individual actuators “Poco”).

When a user presses on the “Poco” on top of a cylinder its switch is flipped to the “on” position causing the cylinder to rise and a sound to play at regular intervals. When a Poco that has been turned on is pushed down its switch is moved to the “off” position and the sound stops. Each Poco can be given its own sound and rhythm. The tones are arranged so that a pleasant harmony results no matter which combination of notes is used. By using *PocoPoco* to play music we are able to create both aural and visual components of a performance at the same time, thereby linking these two senses for the audience in ways not normally experienced.

The interface is so simple that playing *PocoPoco* is very easy even for children and beginners with no musical experience. On the other hand, *PocoPoco* is also a sophisticated device which can be used to create compelling performances. We performed live using three Poco-Seqencers at the “Intercollegiate music concert 2011” in Tokyo. PocoSeqencer can be combined with a network system to create interesting live performances. We made three *PocoPoco* and connected them to one PC through MIDI cables to synchronize a musical rhythm and to create sound on the PC’s digital audio workstation.

3. PocOthello

PocOthello is a puzzle game application based on the classic board game. Whoever creates a flat surface by raising or lowering all of their cylinders first is the winner. If they press down on raised cylinders they are lowered. If they press down on lowered cylinders they are raised. Players can play being blindfolded and place both hands on the *PocoPoco*. This way of playing can make users more conscious of how much they rely on their vision when operating devices in their daily lives.

References

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