**Multi-Touch Everywhere!**

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**ABSTRACT**

We present a portable device that enables users to turn any flat surface into a multi-touch controller for music and other media applications. The device is playable either with the hands, mallets or sticks. We also present a software editor for configuring the surface and creating control interfaces using a library of control elements, such as buttons, sliders, and pads.

**Keywords**  
Computer Vision, Multi-touch Interaction, Musical Interfaces.

1. **INTRODUCTION**

Multi-touch interaction on large screens and surfaces became very popular in the last few years. However, the technique usually involves a dedicated table embedding a rear-projection screen or a hardware device that covers all the interactive area. Such setups are better suited for a fixed installation and are not very practical for transporting to different venues. We present here a portable device that enables users to turn existing surfaces, like tables and walls, into multi-touch interfaces. The device consists of a bar with an array of infrared lasers, and a high-speed camera watching for fingers or other objects intersecting the light plane [1]. In addition to touch positions, the device is also measuring the intensity of impacts, thanks to vibration sensors embedded in the bar. The device was initially designed as a musical controller, in conjunction with a software editor for creating control interfaces using a library of control elements, such as buttons, sliders, and pads. For this reason, it features low-latency tracking, which makes it equally suitable as a percussion controller. However, it can also be used as an input device for other media applications, such as games, graphics or educational tools. The system is currently being expanded with the recognition of visually tagged cards, resulting in the unique ability of triggering actions by touching the cards.

2. **SYSTEM OVERVIEW**

Figure 1 gives an overview of the setup. The hardware system is comprised of an infrared camera running at 100 fps, placed above a bar containing four infrared lasers fitted with line generators and vibration sensors for detecting the contact energy. The bar is thus creating a thin plane of light above the surface, providing an interactive area of approximately 80 x 60 cm. The camera and laser bar connect to an electronic controller featuring several functions, such as the amplification and processing of sensor signals, the power management of lasers, and the mix of camera data and contact energy data via an internal USB hub, so that only one cable is then necessary to connect to the computer.

To get a visual feedback, users can either print an interface and fix it on the table, project an image, or use a generic mat with additional visual feedback provided by the computer screen sitting next to the setup. In this case, control elements displayed by the software editor are aligned to the same grid as the one drawn on the mat. In practice, experiments have shown that the grid on the play mat is giving sufficient information to establish a clear correlation between the screen and the surface, allowing users to select and activate the desired control widgets in a single step.

3. **USER EXPERIENCE**

For the demo presented at Siggraph 2009, audience will be able to make music on a playful manner, using the device with accompanying software and play pad. Control layouts and sounds will be chosen so that non musicians can also enjoy using it.

4. **ACKNOWLEDGMENTS**

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5. **REFERENCES**