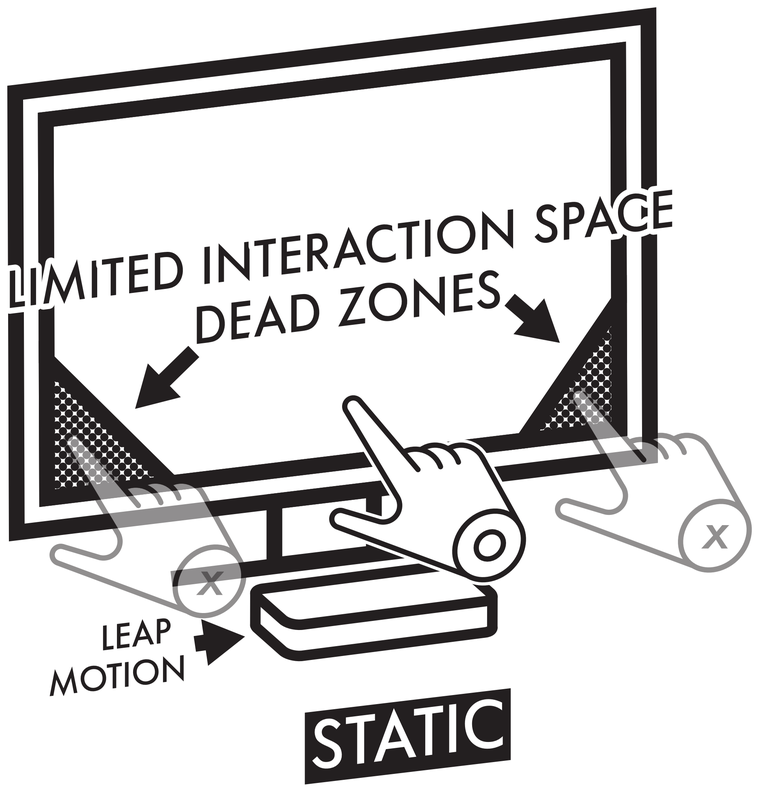
TAICHI '16
POSTER

One-dimensional Proactive Sensing for Enlarging Gesture-interaction Space

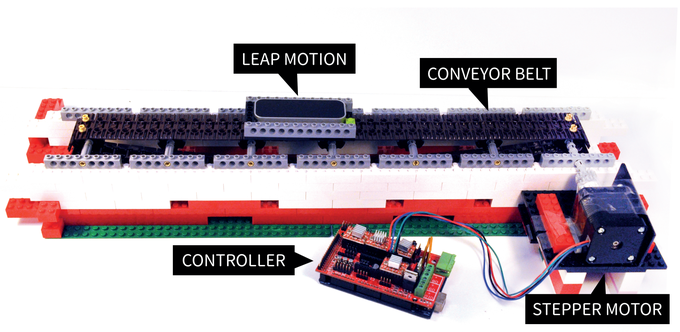
Yung-Ta Lin Jui-Chun Hsiao Yi-Chi Liao
Rong-Hao Liang Bing-Yu Chen
National Taiwan University



ABSTRACT

Leap Motion is the state-of-art commercial gesture sensing system which implements in camera-based sensing tech- nique. However, Leap Motion has its limitation on sensing area hinders user from the smooth interaction. To address this issue, we propose Shadow, a low-cost proactive sensing technique that allows sensors one-dimensionally moving and continuously repositioning to keep under the inter- acting hand. To prove our concept, we built a conveyor belt to shuttle the Leap Motion. Two studies are conducted and the results reveal significant improvement in both coverage area and accuracy.

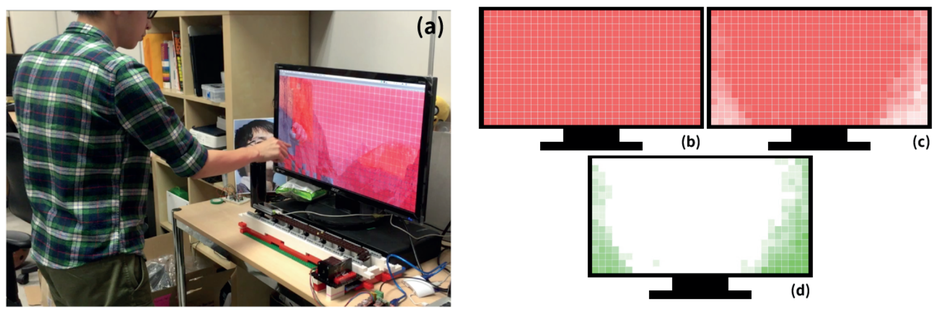
INTRO.



In-air gesture sensing plays an important role in the natural interface. Among all techniques, Leap Motion, build on the traditional camera-based solution, is considered to be the most reliable and also the off-the-shelf solution. Leap Mo- tion benefits for sensing without cumbersome wearing on hands but suffering for limited sensing area. While hands are out of the sensing area, the detection fails in two ways: the virtual hand on the screen either disappears or is shown in incorrect gesture. Hence, users need to visually track the physical hands and also the virtual hands in the screen, leads to interruption of the experiences and reduces the immersiveness. To solve this problem, adding cameras in the environments to capture gestures could be a common solution; however, it requires extra cost.

Inspired by proactive sensing [1], this paper introduces a novel and low-cost approach, Shadow, which allows the camera-based sensor to move in one-dimensional space along a LEGO conveyor belt. Studies revealed that Shadow has significantly enlarged the interaction space and en- hances the accuracies.

STUDY I

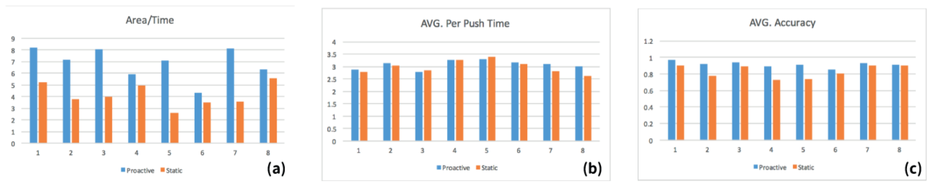


Color Filling Task: (a) User is doing color filling task. (b) The accumulated coverage area of proactive type. (c) The coverage area of static type. (d) The difference between two types. (The opacity indicates the number of accumulation.)

STUDY II

Button Pushing Task: (a) User is doing button pushing task. (b) The difference push time on two types. (c) The difference score on two types. (Greener is better, less time or more scores.)

RESULTS



(a) Study 1 - The color filling time (seconds) of each user on two types of sensing. (b) Study 2 - The average pushing time (seconds) of each user on two types of sensing. (c) Study 2 - The average accuracy (number of scored grid/number of total grids) of each user on two types of sensing.

[1] Dun-Yu Hsiao, Min Sun, Christy Ballweber, Seth Cooper, and Zoran Popovic . 2016. Proactive Sens- ing for Improving Hand Pose Estimation. In CHI.