Spatially-Aware Tangibles Using Mouse Sensors

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ABSTRACT

We demonstrate a simple technique that allows tangible objects to track their own position on a surface using an off-the-shelf optical mouse sensor. In addition to measuring the (relative) movement of the device, the sensor also allows capturing a low-resolution raw image of the surface. This makes it possible to detect the absolute position of the device via marker patterns at known positions. Knowing the absolute position may either be used to trigger actions or as a known reference point for tracking the device. This demo allows users to explore and evaluate affordances and applications of such tangibles.

CCS CONCEPTS

• **Human-centered computing** → **Interaction devices**; Mixed / augmented reality;

KEYWORDS

spatial interaction, tangible interaction, tracking, mouse

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1 BACKGROUND AND DEMO

Tangible User Interfaces (TUIs) facilitate interaction with digital data through physical objects (*tangibles*). We are currently developing an open hard-/software toolkit for tangibles that supports determining and tracking the absolute position of a device on a horizontal surface [1]. Unlike other systems, our implementation does not require external tracking infrastructure but uses the sensor from an optical mouse to determine its own location and track its movement.
As each tangible can track its own location, multiple tangibles can determine their location relative to each other via an ad-hoc wireless network. The demo allows users to evaluate the properties of our current implementation and explore applications supported by self-tracking tangibles. We present the following exemplary applications: value selection by dragging a physical slider, a magic lens for exploring large images, and two tangibles tracking each other's position (Figure 1).

Figure 1: Prototypes of a self-tracking tangible based on an *M5Stack* block and a PMW3360DM optical mouse sensor. The raw image captured by the sensor can be used for determining the absolute location while the displacement reported by the sensor firmware allows for robustly tracking the tangibles' positions.

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