

# AR Pottery Wheel-Throwing by Attaching Omnidirectional Cameras to the Center of a User's Palm

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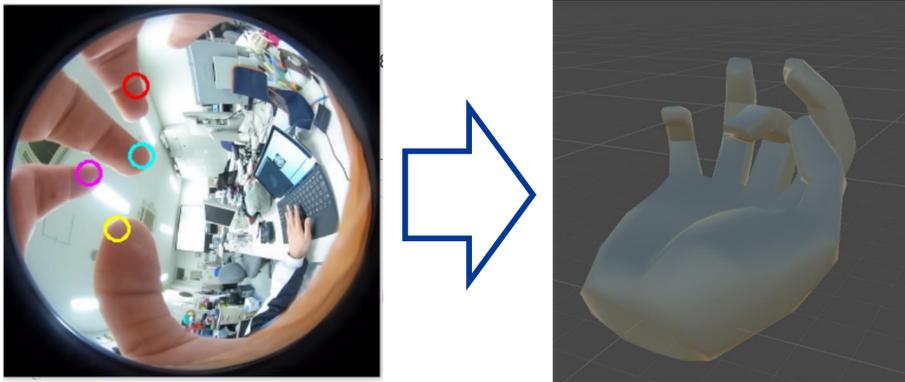
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## Introduction

We present our system for AR pottery wheel-throwing employing an HMD and omnidirectional cameras each of which is attached to the center of a user's palm. The omnidirectional camera enable the user's finger postures and the three-dimensional relative position and orientation between the user's hands and virtual clay model on the wheel to be estimated. Our system detects a marker on the desk and the wheel is set on its coordinate system along with the finger posture estimation in real time. The system then simulates the collision between the virtual clay model and the left/right hand model based on the above information. Pottery wheel-throwing is reproduced in Unity software environment by deforming the clay model by contact with hand models in this simulation.

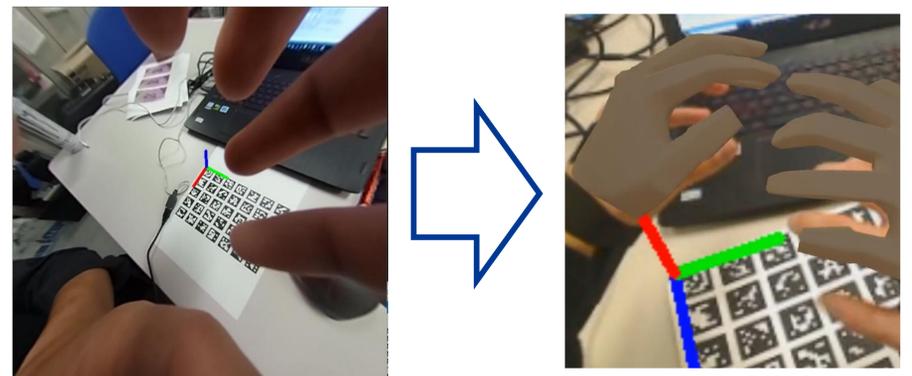
## System Implementations

### Finger Postures Reconstruction



Our system can estimate the finger postures by detecting the fingertips on each image and referring to the following preset information: the positional relationship between the camera and the user's fingers/fingertips, the length between the finger joints, and the interdependencies between the finger joints.

### ArUco Marker Tracking



Our system detects the ArUco marker on the desk and hand models are set on its coordinate system. The ArUco marker which consists of multiple AR markers can be detected easily because it only requires a single part of the unified marker to be detected.

### Clay Model Deforming

The clay model made by particle system on the wheel and the hand models are generated in the virtual space of Unity for simulating the collision between the clay model on the wheel and the left/right hand model which is adjusted based on the marker coordinate system. Our system deforms parts of the mesh that constitutes the clay surface adjusted by the particles movement by the collision. Pottery wheel-throwing is reproduced by reflecting the deformation of the clay model on the wheel and the user can see the change on the HMD



YouTube URL:

<https://youtu.be/8bCTJNTc1e4>

Reference

- Maruyama, Y., Kono, Y. 2018. Estimating Finger Postures by Attaching Omnidirectional Camera in the Center of a User's Palm. AVI '18, No.72.
- doxygen. 2016. Detection of ArUco Markers. Retrieved Sept. 18, 2018, [https://docs.opencv.org/3.2.0/d5/dae/tutorial\\_aruco\\_detection.html](https://docs.opencv.org/3.2.0/d5/dae/tutorial_aruco_detection.html).