

# Hand Gesture Tracking on Augmented Reality Application using Manomotion



<sup>1</sup>Nova Eka Diana, <sup>1</sup>Novian G Bujana, <sup>1</sup>Muhamad Nuh, <sup>1</sup>Muhammad Reza Aditya, <sup>1</sup>Nurmaya, <sup>1</sup>Umami Azizah Rachmawati  
nova.diana@yarsi.ac.id, noviangelang@gmail.com, muhamadnuh54@gmail.com, rezaditya28@gmail.com

<sup>1</sup> Informatics Department, Faculty of Information Technology, Universitas YARSI, Indonesia



## ABSTRACT

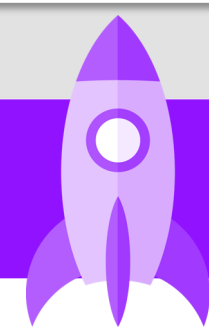


Augmented Reality (AR) interfaces typically include the overlay of virtual imagery onto the real world. The intent is to mingle reality and virtuality seamlessly. There were still few systems that provided user to interact with and modify the AR contents even though various approaches have tried to advance the AR display technologies and tracking techniques. Even for basic interaction tasks such as manipulation, annotating, copying, and deleting virtual objects. The Manomotion SDK is a framework for detecting and analyzing user hand gestures in real-time using only the RGB camera commonly embedded on smartphones. Hand Tracking and Gesture analysis are the main features of this SDK with hand calibration as the required step to do first. The primary process of hand tracking is a clear segmentation that converted RGB images to binaries using the dominant background color as a reference. The user can either automatically or manually select the most dominant background color. Background with many colors will lengthen the running time to track the user's hand. The experiments revealed that the neutral and orange background took around 1,5 seconds to track with the high smoothing quality. However, selecting a red or blue color as the background spent about five seconds to track with the reduced quality. The next important step was Gesture Analysis to detect three foremost gesticulations, namely Grab, Pinch, and Point. This study utilized the Manomotion technology to present these two senses: hand tracking and gesture analysis, to provide additional information on the interaction intent by understanding what the user is doing with his/her hands.



## BACKGROUND

Augmented Reality has gained a great popularity in the recent years, especially for mobile-based AR applications. However, there was still AR apps that utilized the hand gestures approach to interact with AR virtual objects. Manomotion SDK is the first framework that relies on a smartphone's RGB camera to detect hands and can be used for interaction with many types of application model, particularly for the mobile-based AR apps. This study aims to evaluate the features, processes, and performance of the manomotion framework for an ARCore-based android application.



## RESEARCH PURPOSES



Evaluate the performance of various scene backgrounds toward the calibration in term of response time and detected hand features



Evaluate the accuracy of the develop-ARCore app to recognize 3DOF gestures (grab, pinch, point) and its performance during the grabbing interaction with the virtual object on the AR scene



## PROCESS DAN FEATURES

### HAND TRACKING



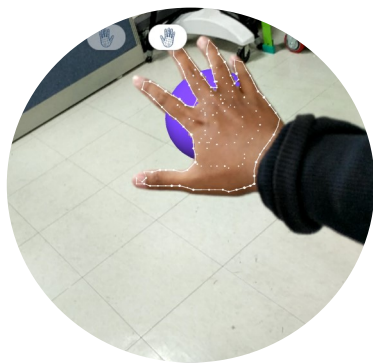
Determine several parts of the hand: the entire hand, fingertips, and palm center.

### DEPTH ESTIMATION



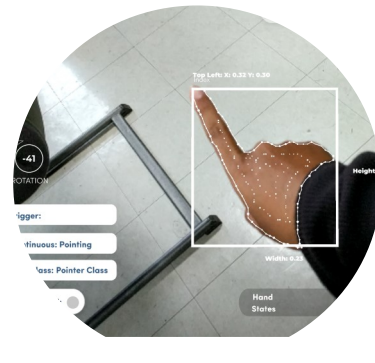
Finding the distance between camera and the previously calibrated hand

### LAYERING



The aim was to occlude the virtual object, in order to increase the user experience.

### GESTURE RECOGNITION



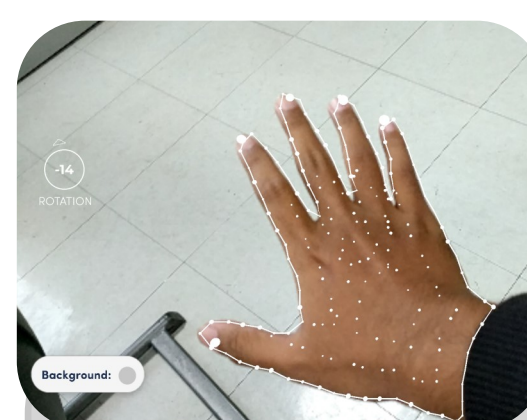
Detecting 3-main family gestures: Grab, Pinch, and Point.



## RESULT

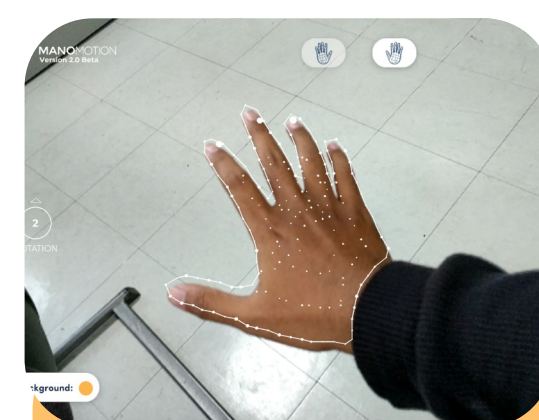


### CALIBRATION TEST



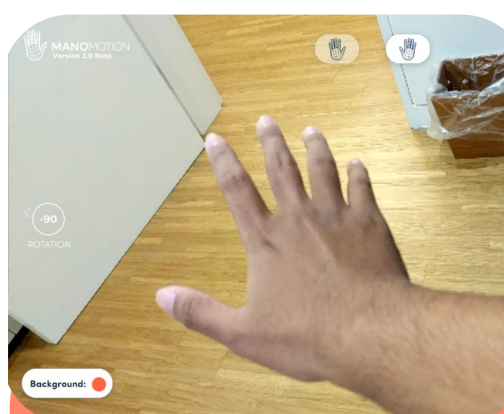
**Neutral Background**

- Calibration Success
- Took 1.5 Second
- Good performance when hands move frame per frame



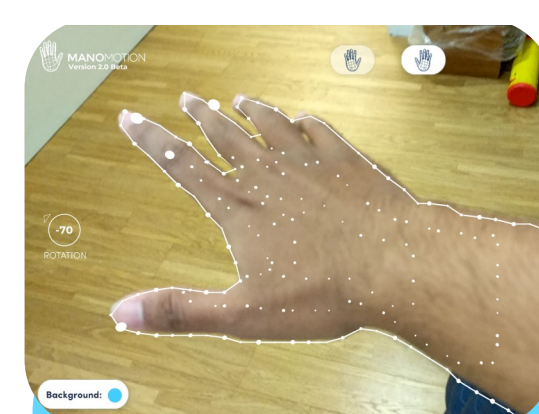
**Orange Background**

- Calibration Success
- Took 1.5 Second
- Good performance when hands move frame per frame



**Red Background**

- Calibration Failed
- Took 5 Second
- Very low performance (laggy) when hands move frame per frame

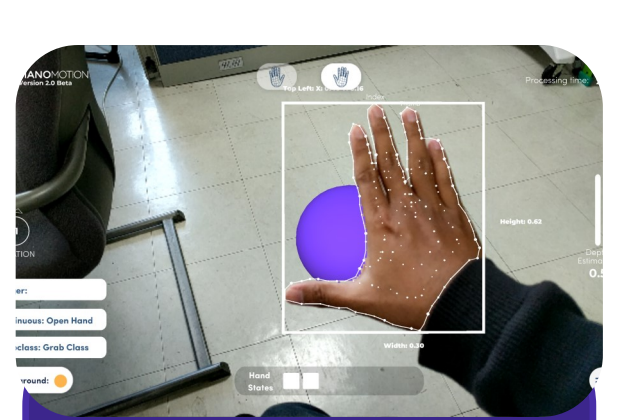


**Blue Background**

- Calibration Success
- Took 5 Second
- Low performance (lag) when hands move frame per frame

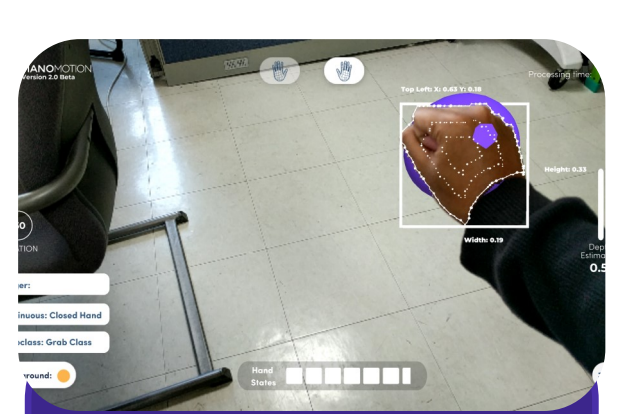


### GESTURE TEST



**Grab (Open Hand and interacting with AR Virtual Object)**

- Background Color : Orange
- Hand States : 0
- ManoClass : Grab Class
- Accurated



**Grab (Closed Hand and interacting with AR Virtual Object)**

- Background Color : Orange
- Hand States : 12
- ManoClass : Grab Class
- Accurated



## REFERENCES

- [1] Azuma, R. T. (1997). A Survey of Augmented Reality. 3011 Malibu Canyon Road, MS RL96 Malibu, CA 90265.
- [2] Trinette Wright, S. d. (2019). Leap Motion Performance in an Augmented Reality Workspace.
- [3] Shahrouz Yousefi., Farid Abedan Kondori., Haibo Li. '3D Gestural Interaction for Stereoscopic Visualization on Mobile Devices'. Computer Analysis of Images and Patterns, Part II, Page 555, 2011



## Conclusions

Manomotion technology is a good choice for having hand tracking and gesture senses in the mobile-based AR application. The experiments showed that manomotion worked better with the neutral and orange color selection as the AR scene background. The framework was also accurate in performing the grab gesture toward the virtual object in the ARCore-based application. Next, we will implement the pinch and point gestures to have a whole 3DOF objects manipulation in the AR scene.