

# Multi-touch Display System for AR Card Game

Sang Heon Han<sup>1</sup>, Chang Ok Yun<sup>2</sup>, Tae Soo Yun<sup>3</sup> and Dong Hoon Lee<sup>3</sup>

**Abstract.** We propose FTIR (Frustrated Total Internal Reflection) based on the multi-touch display system for playing the AR (Augmented Reality) card game. Existing card games request simple input in the form of a button to interact with a user and to show information that varies with the information or the position of the card. In order to overcome the limitation of these interactions, we present a tangible user interface by applying the multi-touch screen system which can input the pattern of the various forms. In this way we can offer more interaction and higher engagement for a user.

## 1 Multi-touch Display System

In this paper, our system has three modules as shown in Figure 1. The first module is invisible marker tracking, and the second module is FTIR based on multi-touch tracking. The third module is SAR (Spatial Augmented Reality) display.

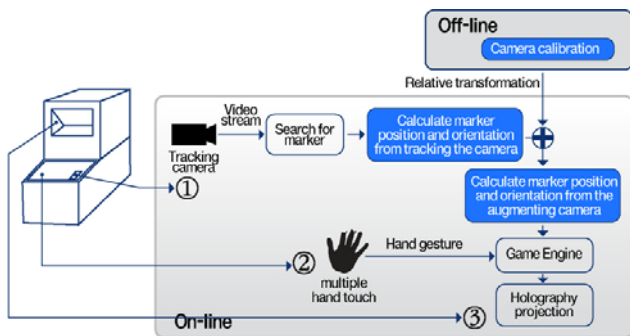


Figure 1. System Flow

Firstly, we present FTIR[1] based on the multi-touch screen that is made with the table top form for a tangible user interface (Figure 2). FTIR method is based on optical total internal reflection within an interactive surface. After the light of the infrared LED causes a reflection in the acryl inside, the infrared light escapes and is reflected at the finger's point of contact due to its higher refractive index. An infrared-sensitive camera at the back of the pane can clearly see these reflections. Secondly, we present the module for recognizing the card above a screen (Figure 3). Then after the infrared reflective sheet applying the specific pattern of a shape is plated to the card (Figure 4), by

using the DI (Diffuse Illumination) method, the information of the card is recognized.

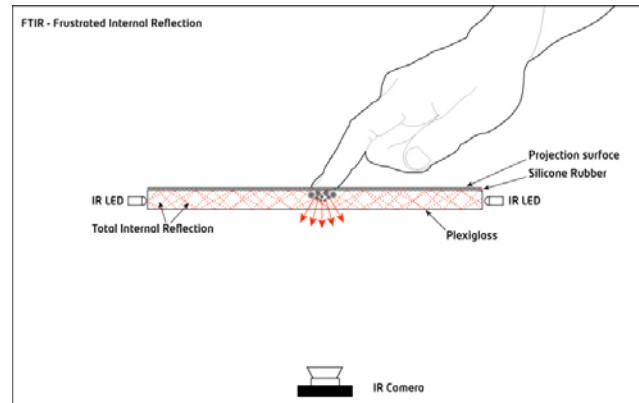


Figure 2. FTIR : Frustrated Total Internal Reflection

At this time, we utilize the infrared camera that we used inside the multi-touch system. With this method, there are almost no additional expenses for the infrared ray card recognition or the hardware configuration.

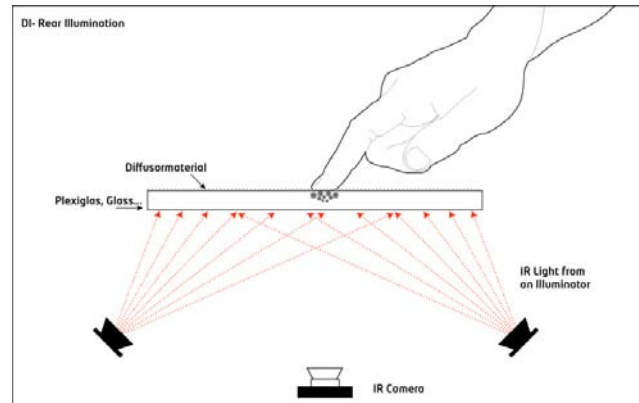


Figure 3. DI : Diffuse Illumination



Figure 4. Simple pattern for card recognition.

<sup>1</sup> Dept of Visual Contents, Graduate School, Dongseo University, Busan, Korea. Email : alpha815@gmail.com.

<sup>2</sup> Dept of Visual Contents, Graduate School of Design&IT, Dongseo University, Busan, Korea. Email: coyun@hanmail.net.

<sup>3</sup> Dept of Digital Contents, Dongseo University, Busan, Korea. {tsyun, dh1}@dongseo.ac.kr.

Finally, in order to provide not only the expansion of an interface but also the visually high captivation for a user, we apply the SAR[2] method for a viewer looking at the stereoscopic image in the monoscopic image (Figure 5). Then in the multi-touch screen area, by using various interfaces, the image showing on the image output unit enhances the interaction between the contents and the viewer.

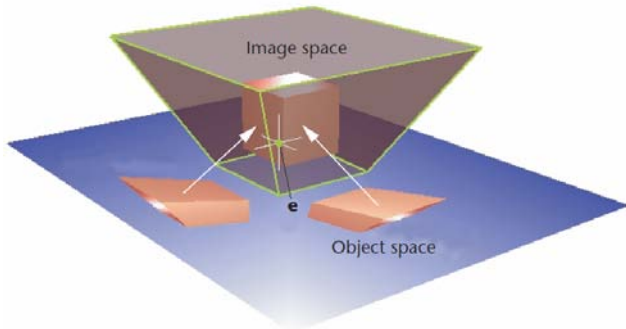


Figure 5. Virtual Showcase for SAR

## 2 Conclusion & Future Work

We proposed a multi-touch screen system for playing the AR card game. Our system can be applied to various interactive contents. In this paper, our system is limited due to 'large size' with the projector base. And we don't need a FTIR method; because of DI method is possible to detect both finger point and card. Therefore, we plan to develop the multi-touch display of the LCD base to further advance this system, and to alternate system for totally DI method.



Figure 6. Playing AR Card Game

## ACKNOWLEDGMENT

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## REFERENCES

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- [2] Bimber, O., Frohlich, B., Schmalstieg, D., and Encarnacao, L.M., "The virtual showcase", IEEE Computer Graphics & Applications, vol. 21, no.6, pp. 48-55, 2001.