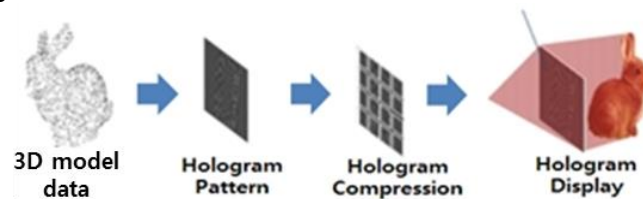# Theme : New Display

## Subject : (1) High Speed, Computer Generated Hologram Rendering & Compression / (2) 3D Haptic Interface in Hologram Display

## Introduction

(1) High speed, computer generated hologram rendering & compression

The goal of this research project is to explore novel methods for high speed computer generated hologram (CGH) rendering and compression.

A hologram pattern is generated from 3D modeling data. As a hologram system is driven with wave-front display, it requires huge data. We expect efficient computing architecture and compression method for processing of massive hologram data.



(2) 3D haptic interface in hologram display

The goal of this research project is to explore novel technologies that can give a 3D haptic feedback in a space with holographic display.

In case of the novel haptic technologies for 3D display such as hologram or other 3D display, we expect an innovative methods to go beyond the existing methods, like a beam shaped ultrasonic. In case of the 3D feedback technologies, we expect the realistic feedback to arm/hand/finger or foot/leg by pushing or pulling, when people try to command, changing direction, selection, entering, specific functions, by gesture to enjoy 3D contents such as 3D movies or 3D game.

## Scope

(1)

- Fast Computer Generated Hologram Rendering
  - Hologram pattern generation using 3D modeling data
  - High speed parallel computing architecture
- High Efficiency Hologram Compression
  - Removing redundancy of hologram fringe pattern
  - Compression using spatio-temporal correlation

(2)

Challenges that significantly advance the state-of-the-art 3D feedback technologies and/or feedback Interfaces with holographic display include:

- Methods and Devices to make a novel 3D haptic feedback with hologram or 3D display.
- Algorithm of extracting haptic feedback from scenes or events in 3D contents and synchronization.
Haptic guideline and interface technology from holographic display.

## Research questions

We are interested in the following research questions. These questions are not exhaustive but different research questions are open to discuss with research partners.

(1)
- What would be the most efficient method for processing of massive hologram data?
- What would be the strong candidate for hologram display?
- What would be the 3D model data for hologram generation?
- What would be the most promising method for hologram compression?

(2)
- What would be strong candidate technologies for making a feedback to hand or finger in a space when customer enjoys the 3D contents?
- Which would be the situation to apply haptic feedback at 3D contents, gaming or input?
- How to synchronize and extract the feedback to hologram to give realistic feedback in hologram display?

## Expected Deliverables

The following is open to discussion:

(1)
- Suggestion of new hologram data processing algorithm : Rendering and Compression
- Detailed progress reports every 3 months summarizing accomplishments.
- System Prototype.
- Patents with Samsung Electronics (if agreed)

(2)
- Suggestion of novel haptic feedback techniques in a space.
- 3D Haptic interface with Hologram.
- Detailed progress reports every 3 months summarizing accomplishments.
- Brief progress reports every 2 weeks by e-mail.
- Demo prototype 3D haptic feedback, samples, and programs.
- Patents with DMC R&D Center of Samsung Electronics (if agreed)