# DWAPI-3DP of OMA and Related Technology

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2016. 06. 29

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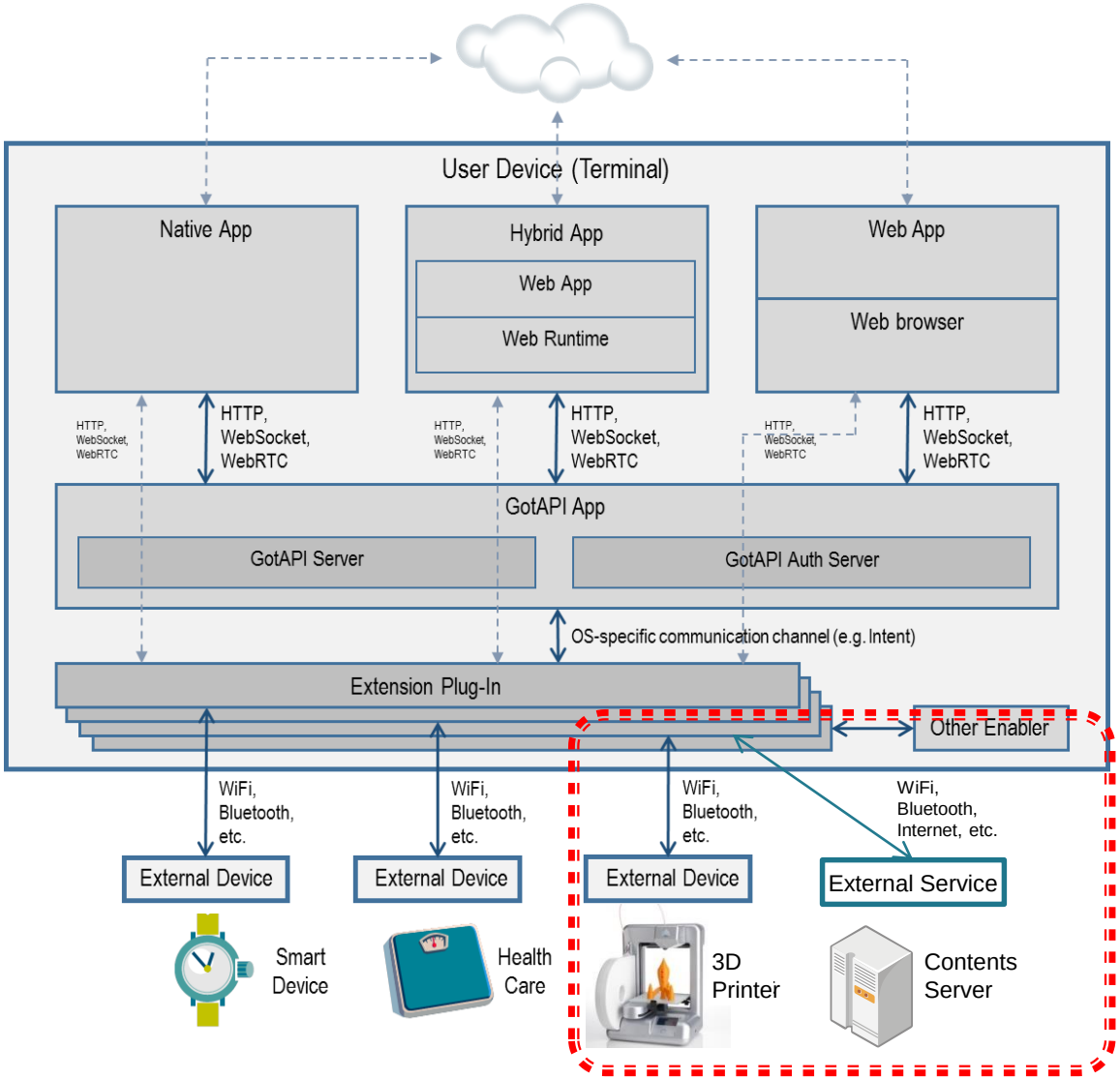
  - OMA Standard Activity
  - Presented by Prof. Han
- Part 2
  - Related 3D Printing Technology
  - Presented by Mr. Lee

# Part 1

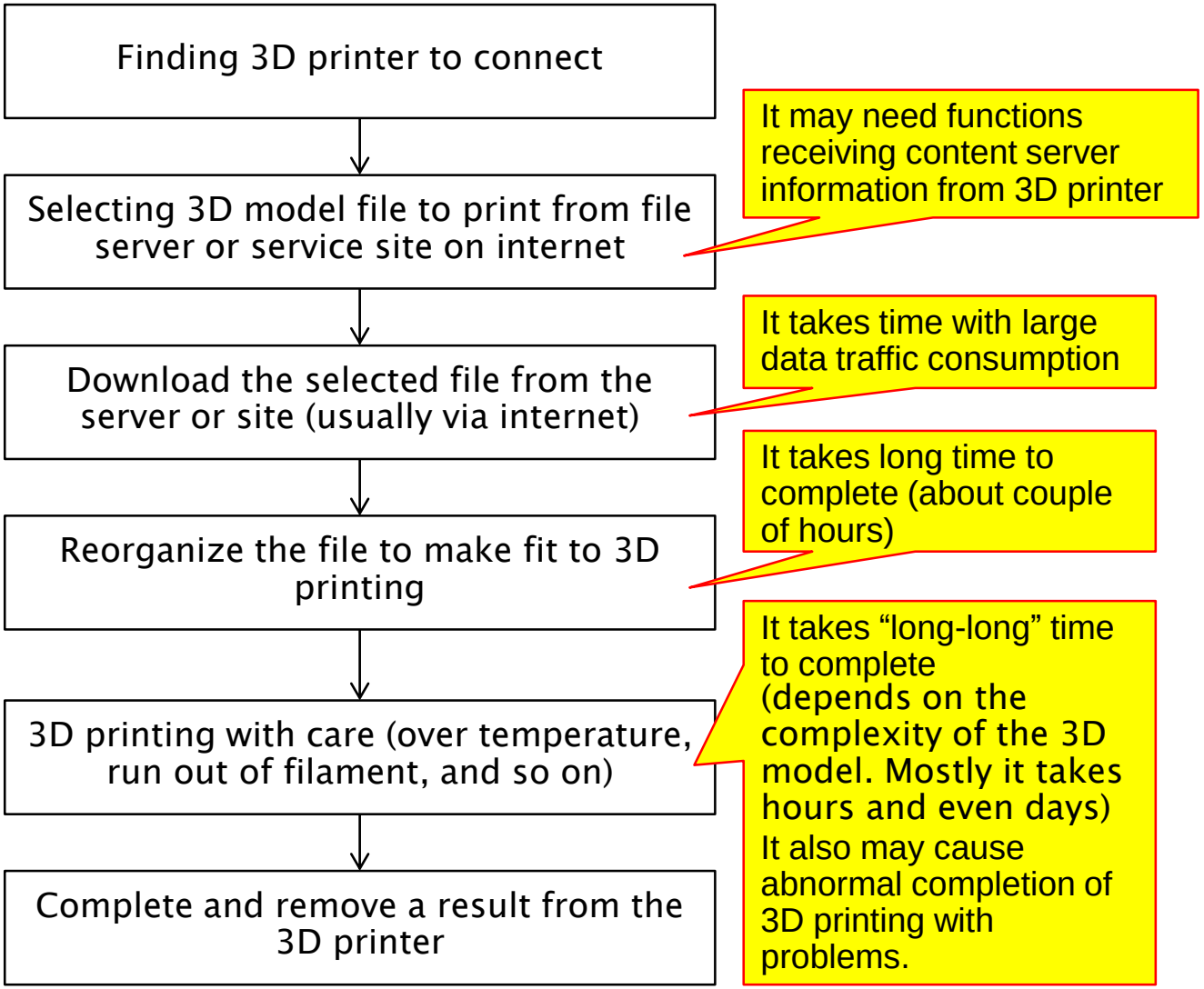
# DWAPI Standard Activity

# OMA DWAPI-3DP

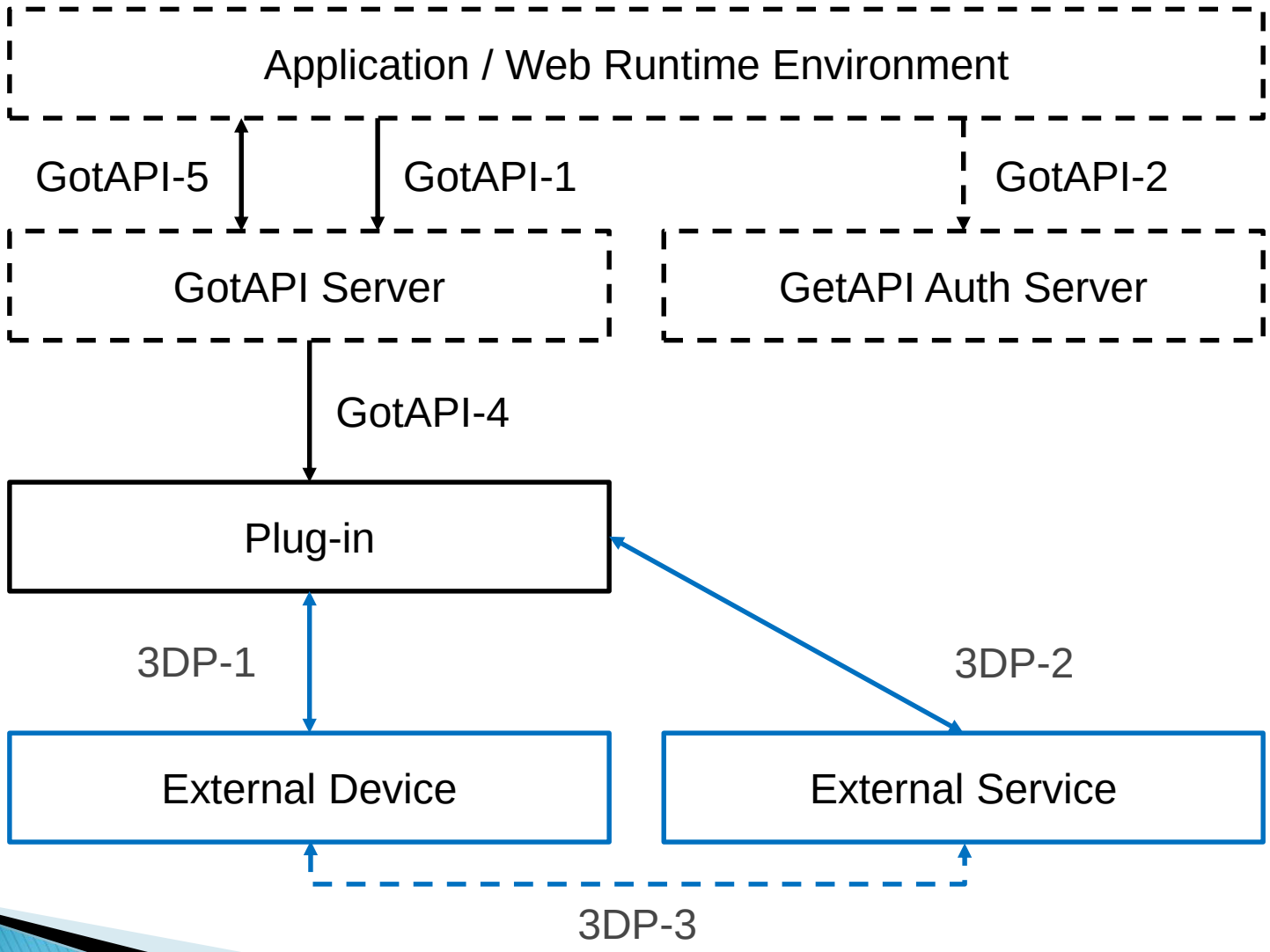
- Developed by ETRI and Hansung Univ.
- Supports 3D printers and its services
- Adds external service in GotAPI & DWAPI architecture



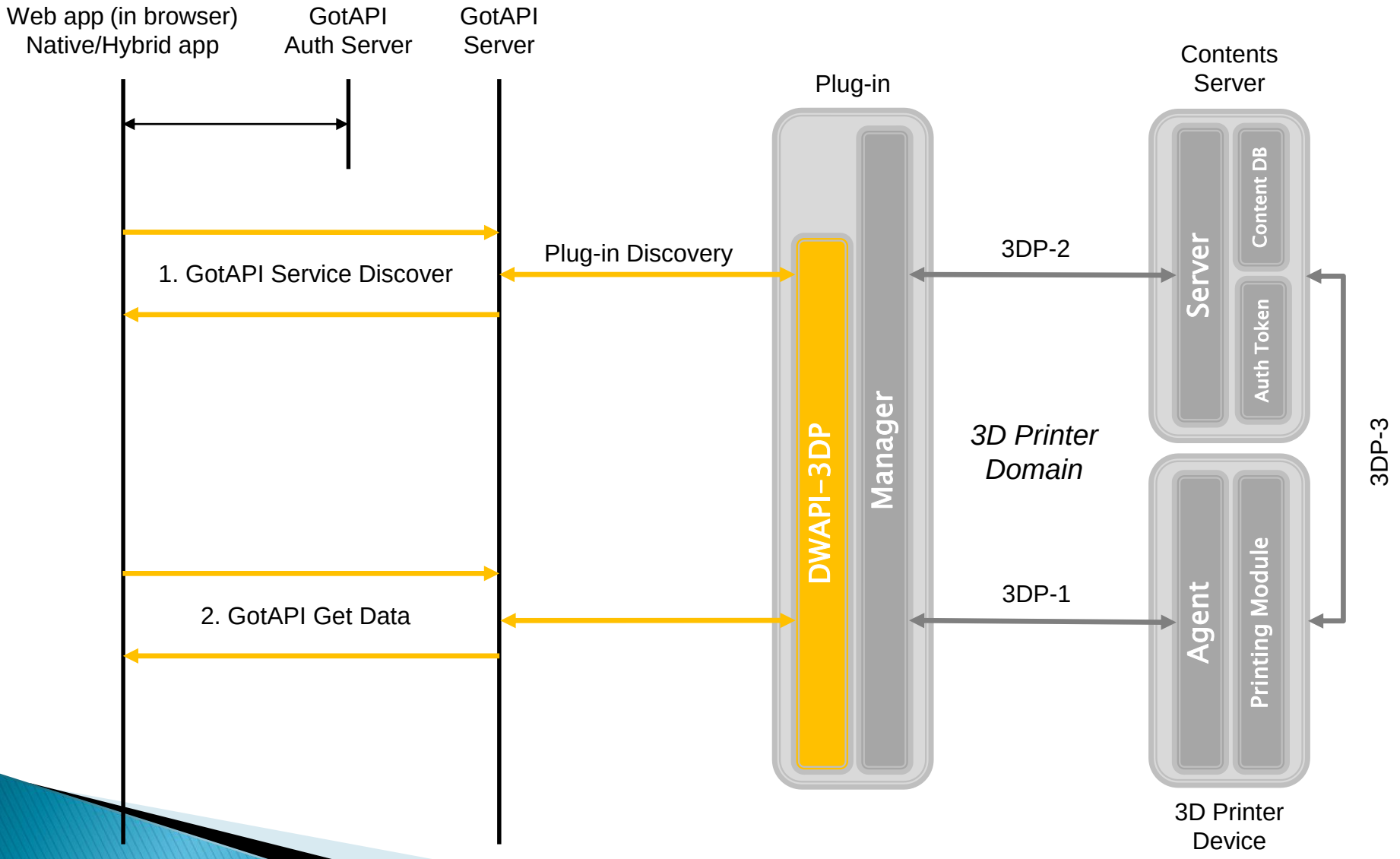
# 3DP Service Flow Overview



# Architectural Diagram



# DWAPI-3DP Basic Data Flows



# DWAPI-3DP Specification

**DWAPI Common**

- Service Discovery API
- One-shot Messaging API
- Asynchronous Messaging API

**DWAPI-3DP Specific**

- Service Connecting API
- Authentication API
- 3D Printing Command API

- Supports Remote Operation of 3DP
- Provides Secured Domain between 3DP and 3D contents service

# Future Plan

- Specification will be completed in early 2017
- DWAPI-3DP Plug-in is under development now
- It will be opened to the public and maintained via open source project

# Introduction of Hansung Univ.

- Based in Seongbuk-gu, Seoul, Korea
- 7500 students and 250 professors
- An university consists of 5 colleges and 2 graduate school.

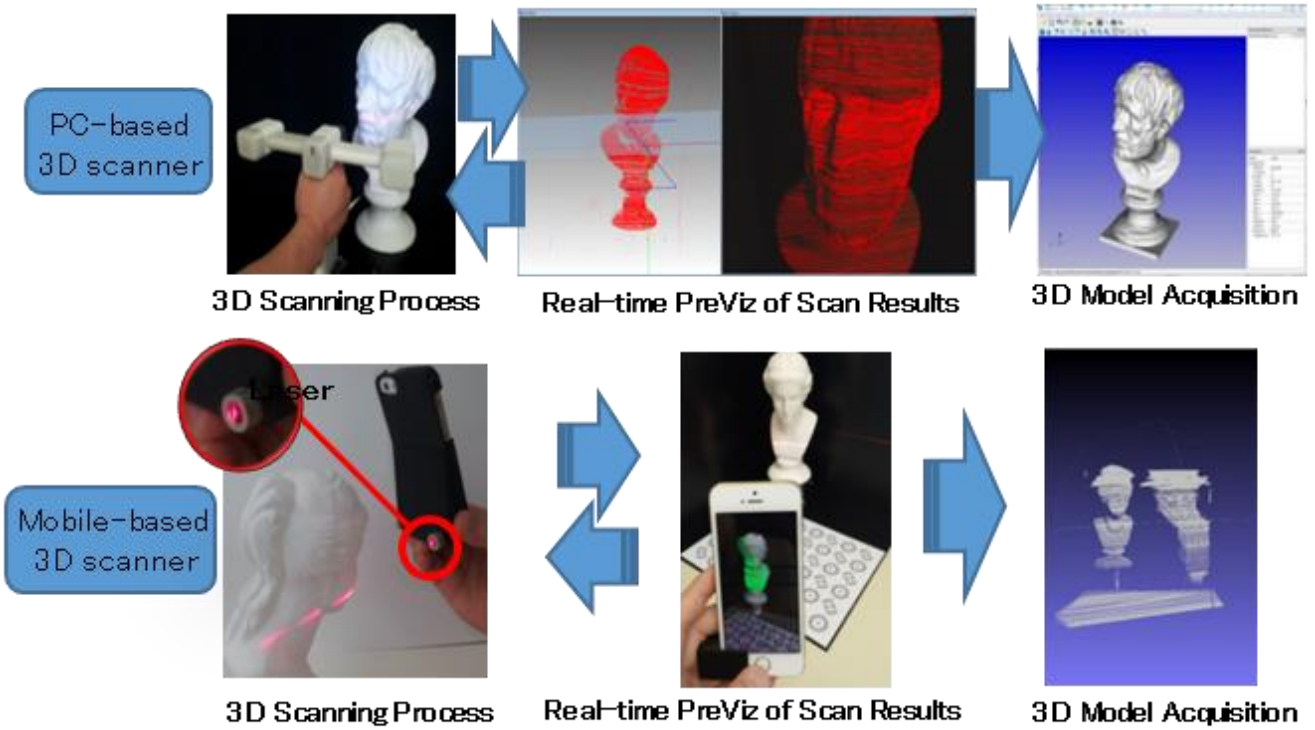
- Prof. Han, Min-gyu
  - An editor of OMA DWAPI work item and champion of OMA SNEW(Social Network Web) work item
  - Activities in OMA, oneM2M, W3C, 3GPP and TTA

# Part 2

# Technology
## From Scanning to Printing

# Modeling with Active Sensor

| | |
|---|---|
| Technology | Laser-based Handheld 3D Scanner |
| Outline | A hand-held 3D scanner system for 3D data acquisition on shape of real-world object by moving the system around object |




Laser-based Handheld 3D Scanner

## Features

- PC-based 3D scanner consists of three cameras and one line laser which can scans any size and complicated shape of a real-world object independently
- Mobile-based 3D scanner is an economical hand-held 3D scanner consisting of one iPhone and one line laser

## Application

- Scanning real-world objects for personalized 3D printout
- Scanning goods for 3D-view of on-line shopping mall
- Scanning teaching resources for smart e-learning

## Inquiry

- Chief of research: Jin-sung Choi(042-860-1157, jin1025@etri.re.kr)
- Person in charge: Jae-hean Kim(042-860-1053, gokjh@etri.re.kr)

## Terms

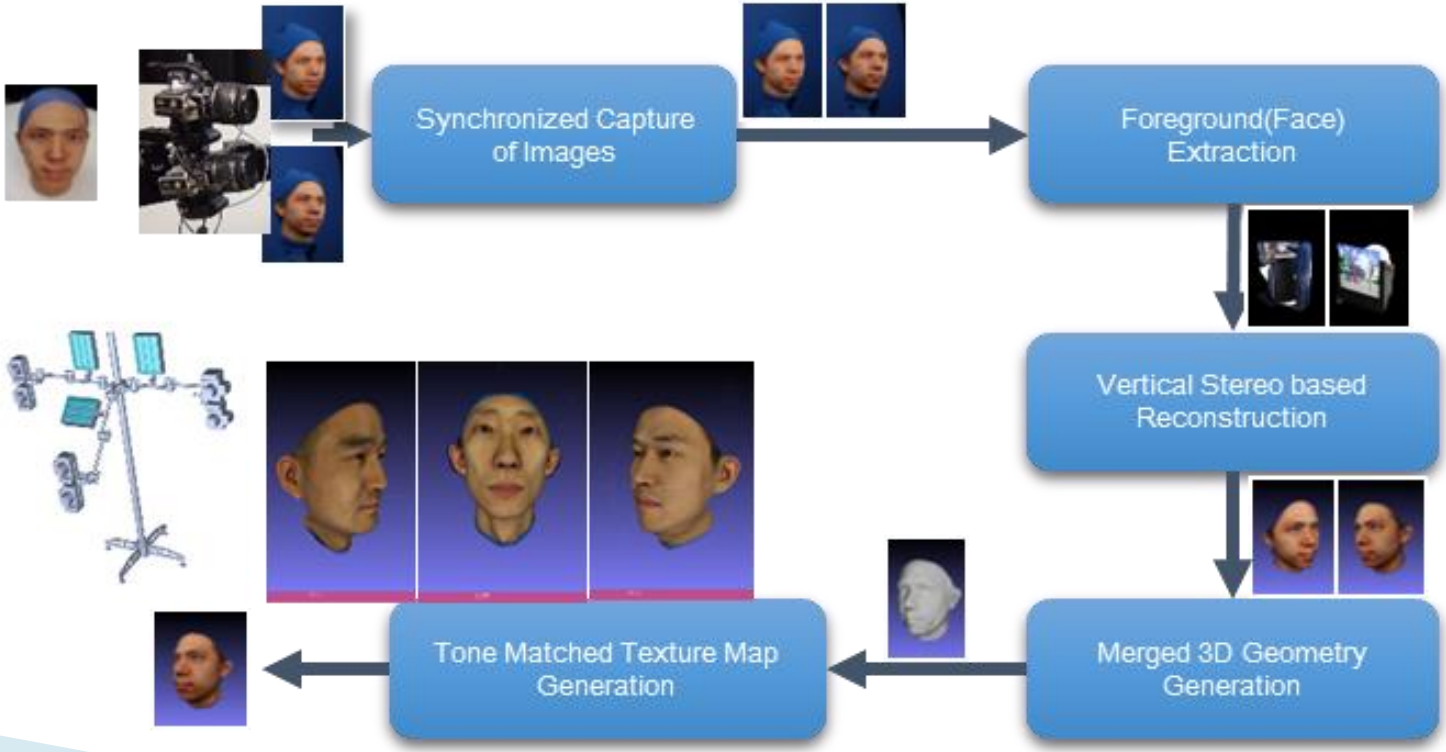
- 3D scanner: a device that analyses a real-world object or environment to collect data on its shape and constructs digital three-dimensional models of it
- 3D printer: a device that manufactures a 3D object through additive processes by laying down successive layers of material

## Researchers

- Hyun-kang, Hye-sun Kim, Yun-ji Ban, Jung-jae Yu, Dong-wan Ryoo

# Modeling with Stereo Camera

| | |
|---|---|
| 技術名称 | 医療用高品質3D顔復元システム: MEDIFACE |
| 技術概要 | 多数のステレオカメラで撮影された映像を利用して医療用高品質の3D顔を生成するシステム |




High Quality Medical 3D Face Reconstruction System(MEDIFACE) Configuration

## 技術特徴

- 手動型(Passive)方式の高品質精密顔復元
- 多数のカメラ動機映像獲得
- CPU基盤の3D顔高速復元
- トン マッチング基盤写実的テックスマップ生成
- 商用システムと類似の復元精密度(平均復元誤差距離0.3mm)

## 応用分野

- 整形, 歯科矯正の施術前シミュレーション
- 胸像製作サービス

## 問い合わせ先

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- 実務担当者: 金甲基(キム_ガプキ, 042-860-5363, kkkim@etri.re.kr)

## 用語説明

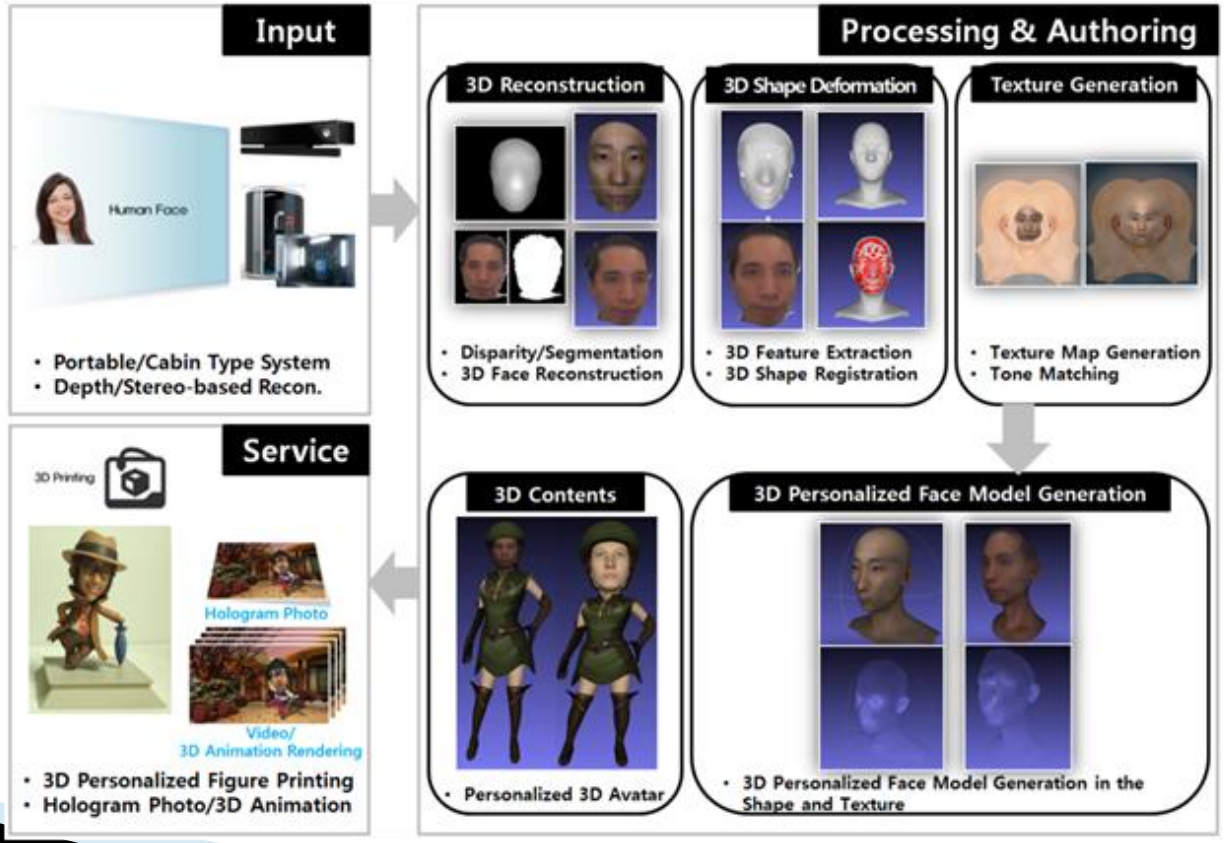
- ステレオカメラ(Stereo Camera): 二台のカメラをリーグに固定して初期キャリブレーション(Calibration)を遂行して3D情報を得ることができる装置トン
- トン マッチング(Tone Matching): 撮影された実態調査映像の顔トンでテンプレートテクスチャーマップをマッチングさせて写実的な3D固有顔モデルを生成する技法

## 参加研究者

- 尹昇旭, 黃本祐

# Modeling and (Easy) Editing

| | |
|---|---|
| Technology | Personal 3D Action Figure Modeling Tool: iFigure |
| Outline | Auto personalized 3D avatar and action figure creating system with data taken by stereo camera/depth sensor |




The Personalized 3D Figure Generation System Flowchart

## Features

- 3D facial shape reconstruction using low price stereo camera depth sensor
- Automatic separation of the figure and background
- 3D original face model creation based on feature detection and extraction
- Realistic texture mapping based on tone matching

## Application

- 3D Photo booth: personalized 3D figure service with 3D printing
- Personal 3D animation service using own avatar
- Personal 3D character services through Smart phone/PC game/SNS

## Inquiry


- Chief of research: Jin-sung Choi(042-860-1157, jin1025@etri.re.kr)
- Person in charge: Seong-jae Lim(042-860-3945, sjlim@etri.re.kr)


## Terms

- Stereo camera: a equipment to obtain 3D information by fixing two cameras on league and correcting image at the beginning steps
- Tone matching: a method to create realistic 3D original face model by matching template texture map taken from real face skin tone

## Researchers


- Seung-uk Yoon, Hye-ryeong Jeon, Bon-woo Hwang

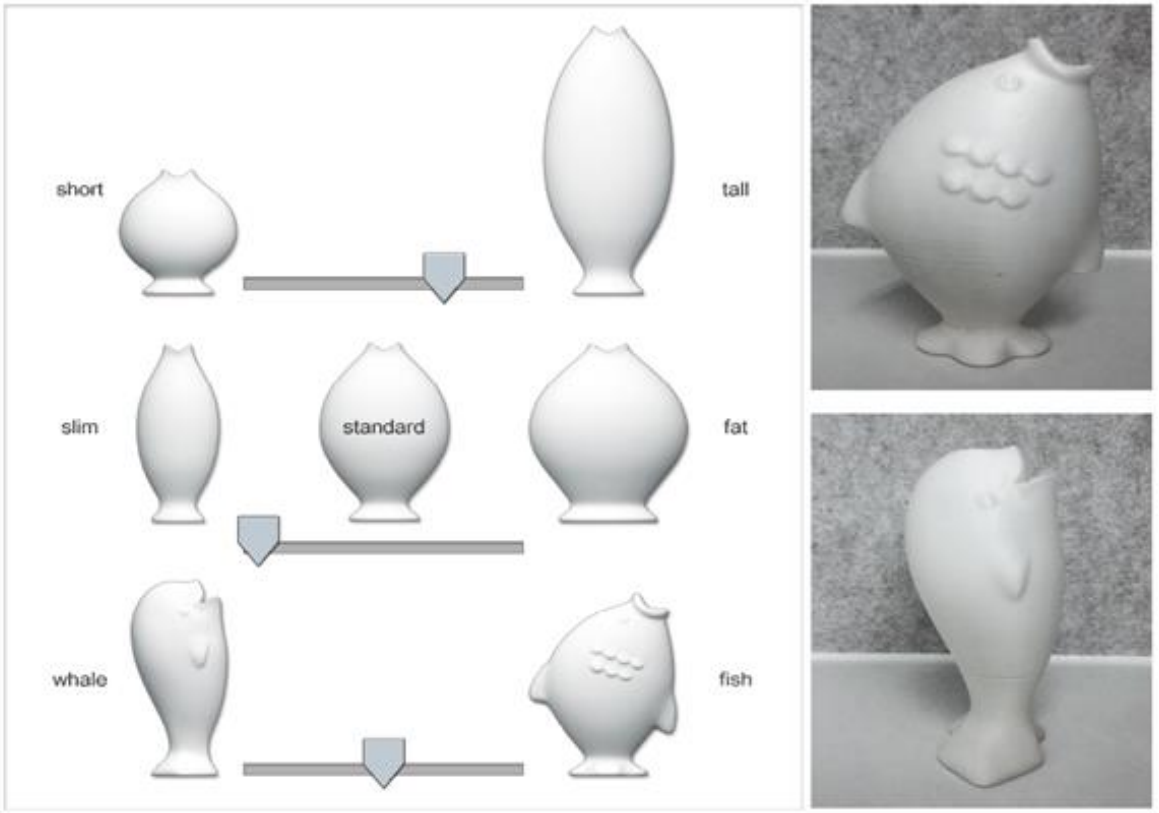
# Tool for Kids

**Technology**

3D Model Authoring Tool for Education: eMaker

**Outline**

eMaker is a content-aware 3D model authoring tool for education. A 3D printable educational item can be created and manipulated with simple user interface

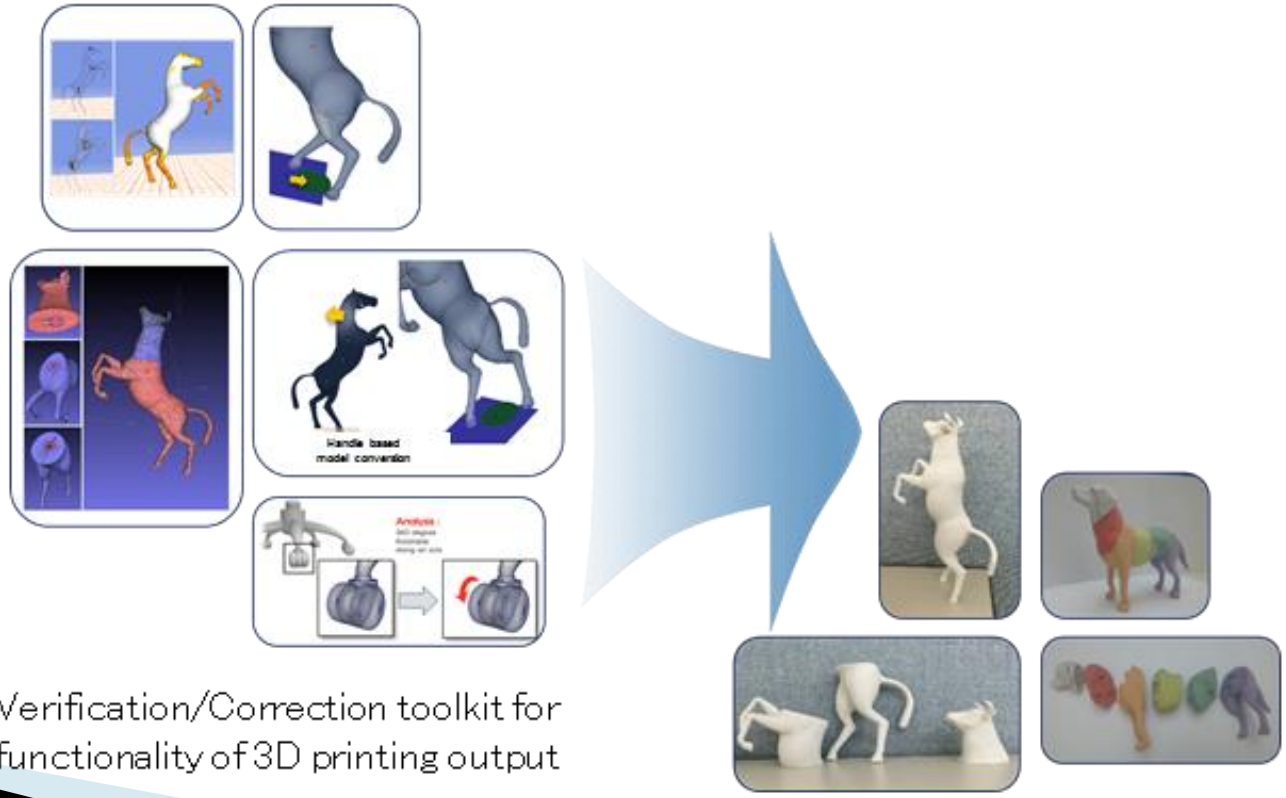



Authoring Examples of 3D Printing Models Using Slide Bars

| | |
|---|---|
| Features | • Intuitively change characteristics of shape(style, height, volume, etc) by simply adjusting sliders<br>• The item is 3D printable and sustains its functionality even after global shape deformation without any manual fixing |
| Application | • 3D printing service for educational resources in school<br>• 3D Printing Based Education Portal Service<br>• 3D Printing Events & Experience center Service |
| Inquiry | • Chief of research: Jin-sung Choi(042-860-1157, jin1025@etri.re.kr)<br>• Person in charge: Seong-jae Lim(042-860-3945, sjlim@etri.re.kr) |
| Terms | • 3D printing: a process of making 3D solid objects from a digital file3D using additive and successive layering<br>• Printing functionality: unique functional characteristics belong to the printed object model<br>ex) vase: function to put water, Scissors,: Function to cut items |
| Researchers | • Seung-uk Yoon, Hye-ryeong Jeon, Bon-woo Hwang |

# Simulation (Printability)

| | |
|---|---|
| Technology | 3D Printing Model functionality Verification/Correction Tool : Fabtory |
| Outline | Verifying/correcting the function(durability, stability, assembling, mobility) of 3D mesh model by simple operation to give 3D printed object functionality |




Verification/Correction toolkit for functionality of 3D printing output

## Features

- Durability/stability: automatic verification and handle-based 3D mesh model editing
- Assembling: editing various connecting devices and verifying/correcting printable size
- Mobility : verifying joint movement of 3D mesh model and creating joint applying characteristics of printed object

## Application

- 3D printing solution
- 3D printer manufacturer

## Inquiry

- Chief of research: Jin-sung Choi(042-860-1157, jin1025@etri.re.kr)
- Person in charge: Gap-gi Kim(042-860-5363, kkkim@etri.re.kr)

## Terms

- Function of 3D printed object: including durability, stability, assembling, mobility
  * durability: function of predicting expected weakness/damage after printing
  * stability: function of predicting center of gravity to stand stable
  * assembling: function to make output by assembling with connecting devices
  * mobility: function to make output to move joints based on joint structure of output

## Researchers

- Chang-woo Choo

# Any Questions or Comments?

Спасибо! 谢谢! 감사합니다.

Pěkně děkuji. Danke schön!  Thank you!

Merci beaucoup. Muchas gracias.

ありがとうございます。

ขอบคุณครับ. Terima kasih.

Талархлаа. Cảm ơn chị.

अतिकृतज्ञ होना Hálás vagyok.