Capstone Design(1)

Proposal

Subjects : Capstone Design(1)
Prof. : Sang Oh Park
Team Name : TriStar
Members : 20165729 Park SangWoo
20161344 Heo JeongWoo
20161090 Lee ChaeMin

1. Project Title

3D room reconstrunction unsing smartphone's RGB-D camera.

2. Introduction & Motivation

If we need to move to another area, find room what I want is very difficult. Because you need time to travel between regions, and if you don't have room to stay, you have to look around every room in a day. In this case, it's hard to look around all the properties in the neighborhood in a day and choose the room you want. So, we find the room we want through application like '직방', '다방' etc. But we cannot see photo or 360 surround view about room all the time. Even if you've seen the room through the photos or 360 surround view, it's hard to estimate the size of the room. So even if the room looked good in the photos, you can be very disappointed when you see it in person.

Next, I don not know if the furniture I want will fit into the room with just photos or 360-surround view. So only the tape measure can be taken and compared to the size of the room.

Finally, because of COVID-19, it's hard to go out comfortably and meet many people.

While we were looking for efforts to solve these problems, we can find 'VR Modelhouse'. "VR Modelhouse" is a way to see the existing model house through VR, and it is a realistic way to see the room provided by apartment construction companies to prevent people from flocking to the model house. But this is for only recently built apartments are available, and no individual buildings such as old apartments or studio villas are provided.

We thought it would be nice if this technology could become universal in an accessible way. In the case of VR model house, experts make 3D models, but we are going to make them through mobile phone video. So, existing tenants can share one 3D model by simply taking a video through an application. Those who visit the room can check the 3D model of the room on their smartphone without a separate device. Also you can see rooms if you want to use vr device such as 'Google Cardboard', 'Samsung GearVR'. And you cam

make your avatar using your height and weight. So you can feel like you're really in room.

3. Development & Implementation Contents

- Scanning room using RGB-D Camera on smartphone
  RGB-D camera is consist of RGB sensor and depth sensor. Using depth sensor you can get a distance between object and camera. So we can reconstruct a place using depth only. But for accuracy, we get RGB value from RGB sensor. For this, we need to get RGB and Depth value simultaneously and we need to implement this application. We can use some smartphones what have a depth sensor like S20+, S20Ultra, S10+, Note10+, Ipad pro 4^{th}.

- 3D reconstruct a place using depth & RGB value
  Based on the RGB and depth values previously obtained, we need to reconstruct a place. For this we will using 'Unity 3D' because of application. In this step we need to study Unity 3D, so implementation is likely to take a long time.

- UI for control avatar & furniture
  If user don not want to use VR device, we need to show 3D place on smartphone screen.

- Recognize direction & walk using Smartphone's sensor
  If user use a VR device, user cannot control avatar through touch. So we need to recognize direction and walk. And the space in which users use this application is very limited, so this application necessary recognize user's walk in place

- Furniture arrangement using Hand Tracking

If user use a VR device, user cannot control a furniture through touch. But, additional device is inefficient. So we tracking a hand and using hand as controller.

4. Goal

There are three key functions that this application provides.

1. Scannig a room and reconstruct to 3D model using only smartphone camera
2. Look around room using VR device or using a screen touch
3. Furniture arrangement

5. Project Schedules

	September				October				November				December		
Development Contents	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16
Content Acquisition & Data Survey								Midterm Demonstration and Presentation					Final Demonstration and Presentation		
Study android api for camera															
Implementing 3D reconstruction using unity															
Implementing RGB-D camera scanning															
Implementing application UI															
Implementing Hand tracking															
Implementing Sensor tracking															
Preparing Midterm Demonstration and Presentation															
Test and Debugging															
Preparing Final Demonstration and Presentation															
Writing manuals and reports															

1. Heo Jeong woo

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2. Lee Chae min

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3. Park Sang woo

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