사용자 상황 기반 이종 기기간 컨텐츠 공유 시스템

탕지아메이, 김바울, 김상욱
경북대학교 대학원 컴퓨터학부
e-mail:{jmtang, bwkim}@media.knu.ac.kr, kimsw@knu.ac.kr

A Contents Sharing System among Heterogeneous Devices based on Users Context

Jiamei Tang, Paul Kim, Sangwook Kim
School of Computer Science and Engineering, Kyungpook National University

Abstract

Various display devices become widespread now. Endeavoring to provide high-quality user experience, sharing contents becomes a hot issue in recent years. In this paper, a Contents Sharing System based on Users Context is proposed, which can provide pervasive contents sharing services on multiple devices with disregard for the device differences. This system supporting automatical contents sharing according to users' context, and intelligent content-fault recovery to provide an intelligent platform for users sharing service seamlessly without additional manual operations. Also we points out the problems and considerations about this proposed system which will be improved in the later research.

1. Introduction

Nowadays, one person possesses more than one display devices at the same time, such as smartphone, laptop, tablet computers, and so on. As the rapid development of advanced devices continues, people change different devices more frequently according to different occasion. However, traditional sharing pattern is far away from meeting the sharing needs of people, sharing pattern will gradually turn into distributed one-to-one, one-to-many and many-to-many paradigm [1].

Although intelligent sharing systems become a hot area in recent decades, there are still some urgent issues to be solved, like the security issue, QoS issues, heterogeneous devices compatibility, and so on. To tackle these problems, a Contents Sharing System among Heterogeneous Devices based on Users Context is proposed, which can provide users with a prevalent environment to enjoy content sharing services seamlessly. It is worthwhile to mention that this system not only supports synchronization and coherence among heterogeneous devices, but also haves the capacity to detect and recover the content-faults.

The remainder of this paper is structured as follows: In Section 2, related researches will be roughly reviewed. Section 3 gives more details about this Contents Sharing System among Heterogeneous Devices based on Users Context. After arguing the design of system, partial system based on users' location will be addressed in the section 4. Lastly, in section 5, considerations and future work are mentioned.

2. Related Work

Content sharing issue is long-standing concerned by researchers, and encourages the rapid development of diversified sharing technologies. There are several ones pursue the similar goal with ours.

Personal cloud services [2] tries to provide diversified services based on clouding computing according to different customers. And research of [3] proposes ad hoc data synchronization between devices for sharing contents without a central server. Besides these, there are numerous searches are undergoing.

However, as far as we know, there is few systems concern reliability, multiple devices, and fault recovery, and device automatically configuration comprehensively. Concerning these issue together, we propose the Contents Sharing System, which supports heterogeneous device compatibility and context-awareness to offer customers a more comfortable and humanized content sharing environment with disregard for the device differences.

3. A Contents Sharing System among Heterogeneous Devices based on Users Context

The architecture and design of this proposed Contents Sharing System are elaborated in this section.

3.1 System Environment

Contents Sharing System among Heterogeneous Devices based on Users Context supports various services to multiple devices and enables correct contents delivery with the content-fault detect and recovery mechanism.

Devices in this system will be automatically configured and based on the UPnP technology. After configuration, the descriptions of device including IP address, device specifications, etc. will be sent to server and become empowered after authenticated. Users can browse content directories and select contents to play after accessing system. When the user changes another device, system collects related contextual information and infers users' intentions, and automatically and continuously transmit the playing contents to user desired device without any manual operation. The schematic plot is revealed in Figure 1. Additionally, system is developed with the capabilities of distinguishing trusted devices to guarantee the privacy and safety of the contents. When system delivers the contents among devices, content-fault mechanism is activated to monitor the transmission process and detect content related error occurred. When there is an error occurred, the content recovery procedure will run to recovery content faults.

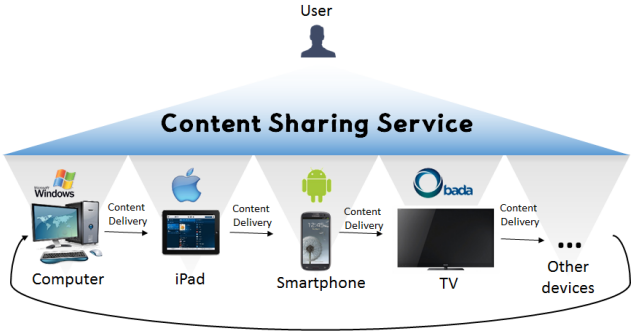

Figure 1. Schematic Plot of Content Sharing Service

3.2 System Architecture

This Contents Sharing System among Heterogeneous Devices based on Users Context is based on Client/Server structure. The architecture shown in Figure 2 below is deployed in Client and Server.

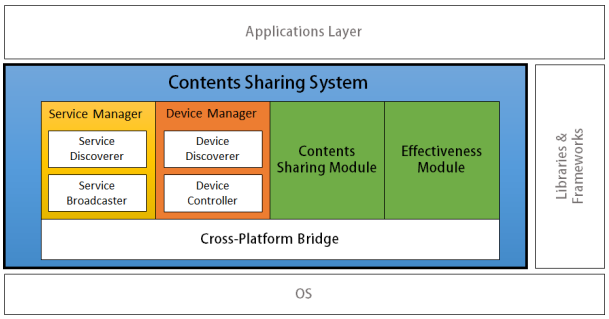

Figure 2. Architecture of Contents Sharing System

This system is composed of Service Manager, Device Manager, Content Sharing Module, and Effectiveness Module. Service Manager containing service discoverer and service broadcaster is in charge of discovering new added services and notifying them to users. Device Discoverer and Device Controller make up Device Manager and work on automatically device configurations based on UPnP Protocol. Contents Sharing Module, as its name implies, deals with all the operations about contents sharing service including sharing synchronization and coherence. The Effectiveness Module assists Content Sharing Module to improve user experience as it can detect and recovery faults while sharing contents. Cross-Platform Bridge is used in OS compatibility.

4. Partial System Development based on User Location

This is just the beginning of our research. At the present stage, a video sharing service based on users' location was developed.

There are 3 clients (one paid, one computer and one TV) and 1 media server in current system. Additionally, 3 distance sensors are deployed to indicate users' location. Therefore, based on the results of sensors, location analysis algorithm can decide active device and the media server delivers video streaming to the active device. The overview of this developed system is shown in Figure 3.

Specifically, two parameters, basic priority and potential priority, are used to infer users' location. Basic priority is used to measure wether a user is one device or not. Potential priority deals with the result of distance decision. Based on these two parameters, system can recognize the active device. If current active device is not the same one

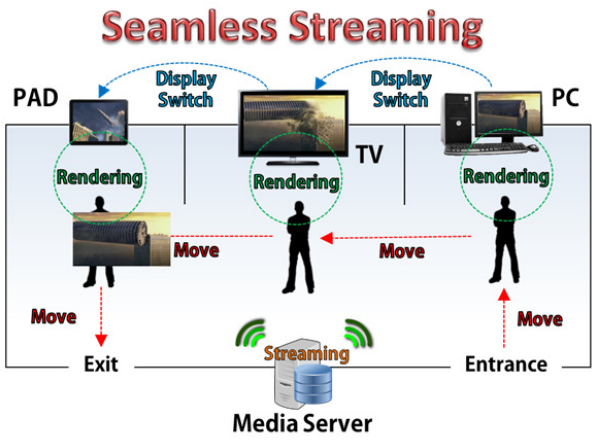

Figure 3. Overview of Developed System

as with current connected device, the Device Transition Process will run, which works for automatically content sharing service by recording content breakpoint, stoping current content streaming and starting to delivery content streaming to the active device from the last breakpoint. The details about mentioned Device Transition Process is shown as follows.

```
Input: curDevice = current connected device,
       actDevice = active device,
       streaming = streaming of current playing content
       breakpoint = the last streaming location record
Begin:

   If ( curDevice != actDevice)
   {
         streaming.pause();
         breakpoint = streaming.location();
         streaming.ReleaseTarget();

         actDevice.connect();
         streaming.setTarget(actDevice);
         streaming.setPosition(breakpoint);
         streaming.start();

   }

End
```

Figure 4. Device Transition Process

5. Considerations and Future Work

However, there is just the beginning of our research, there still have some respects should be improved in the near further:

- Sometimes, there may be two seconds synchronization delay in current system. In the future, the more research will be done in streaming control protocol.
- At this stage, we just introduce the location information by using distance sensors. We will consider much contextual information like users' emotion, users' social relationship to realize more intelligent service
- Current system is just suitable for indoor environment. Service outdoor will be taken into consideration in the future.
- At present, developed system is just for one person. We will add more technologies to tell several users, such as pattern recognition, face recognition, etc, and provide service to more than one user at the same time.

The content-fault recovery mechanism are under constructed. Moreover, more innovations will be added to this proposed system.

Acknowledgement

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