Social Media based Collaborative Tangible Sports Service

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Abstract: This paper presents our development of tangible baseball supporting system based on social media technology for providing new experience of collaborative virtual cheering as future of digital media application. Especially, this paper focuses networked collaboration on virtual world. This paper introduces (1) network event synchronization method among participants in the situation of different delay network, (2) application of social network service such as twitter for in-situ information, (3) tangible integration in virtual cheering. The evaluation of our system is also shown in terms of user’s subjective feeling in several aspects such as network issue, social network service and tangibility.

Keywords: Social Media, Collaborative Sports Cheering, Tangible Sports

1. Introduction

This paper introduces our research and experiments on tangible baseball supporting system based on social media. Especially, this paper addresses three main issues. First is network delay compensation issue among network participants of 3D social space of virtual world. Second is application of mobile-based twitter service to baseball supporting for exchanging physical world’s spectators’ in-situ multimedia information and virtual world’s users’ response message. Final issue is tangible interaction for virtual cheering while providing the tangible social interaction. We use Second Life [1] as main virtual environment for our service.

For the network delay compensation of each user we periodically measure between each user and virtual world server. And then, we calculate delay force value for each user using under threshold value and send this delay force value to each user.

For the SNS service, mobile-based Twitter [2] service is used for providing in-situ information (videos, images, text and sounds) from physical world’s spectators to virtual world’s users. The
twitter user also can receive the response message from virtual world users.

And also, for tangible cheering we use Wiimote Plus device, vibration suit and woofer. For avatar control, zoom in/out, simple chatting and controlling avatar cheering animation, we develop wiimote module using wiimote library based on C++. And then for sensory effect [3] to user we use vibration suit and woofer.

We experiment our system to about 30 subjects on July 2010. This paper introduces our researches on the networked collaborative baseball cheering system. In the results section, we will show the evaluation result of our system.

To watch sports game, there are two way. First is going to stadium. Second is watching broadcasting via TV and computer. If the stadium was far from our home, we can’t go to the stadium and should watch match in our home via TV or computer. However if we watched match via TV, we only watch sports match and if we watched match via computer[4][5], we can watch sports match, exchange our opinion using online chatting and get more information using web services. However existing method don’t provide tangible cheering method and spectator’s condition of physical stadium. In our research, we suggest more realistic group cheering method based on virtual environment. And then we deal with network delay problem, tangible interaction technology and grafting social media onto virtual environment. Figure 1 shows our research motivation to develop collaborative cheering system based on virtual world.

**Figure 1. Research motivation**

### 2. Methods

#### 2.1. Design of networked collaborative cheering system

Figure 2 shows the basic concept of virtual cheering system while interfacing virtual world and physical world through the network. On virtual world, the virtual baseball stadium is provided. Each participant of cheering system has a corresponding avatar on the virtual world. Especially, each user can share the 3D virtual space in which the baseball match and 3D avatar cheering
action are shown. Figure 3 shows our implementation of virtual baseball stadium in Second Life server.

![Figure 2. Virtual cheering system](image)

2.2. **Network event synchronization**

In the baseball stadium, most collaborative cheering is important doing simultaneously.
So, we intend to develop simultaneous virtual cheering system. Each user has different delay value between each user's computer and Second Life server.

For the synchronization of user events, network event server and client are developed. The main idea is as follows;
- Measure the network delay between the Second Life server and each client
- According to the network delay, network event server manages the event sending time from the client) to Second Life server.

For example, there are two clients (client A and client B) of which network delays are 10msec and 30msec, respectively. In this case, network synchronization server manages that the event will be sent to Second Life server at the different time with 20msec interval. That is, the event will be sent to client A with 20msec later after sending event to client B.

The output of the Second Life server to client is also sent based on the same manner.

Figure 4. SL server, network synch server and clients

2.3. **SNS service**

Twitter service spans physical space and web. In this implementation, we want to integrate this social network technology with virtual world. Figure 5 shows SNS based in-situ participation.
2.4. Tangible interaction technology

In our system, we use wiimote as input device for avatar control, simple chatting, zoom in/out and avatar cheering based on animation (see Figure 6). Also we implement sensory effect system [3]. The main issue is about synchronizing physical-world information and tangible devices, which can give users of virtual worlds some kind of sensory effects (vibration, sound, etc.). These sensory effects can take role of providing more interactive and immersive experience to users. This kind of sensory effect is produced from some metadata (Sensory Effect Metadata) that is embedded with multimedia source [6].

Figure 7 shows sensory effect system according to the baseball match event such as homerun, hit and so on. Here, our system provides visualization, sound and haptic effects.
3. Results

We experiment our system four times on July 2010. In our fourth experiment, we can get meaningful results.

The evaluation of our system was performed in view of network delay issue, SNS service and tangibility. Table 1, table 2 and table 3 show evaluation results. In the tables, max score is five. As you see in the tables, most users give high score to our system. Especially, users can get more realistic participation. However some users feel delay for controlling their avatar and cheering using wiimote. And then some user can not feel collaborative cheering simultaneously.

We measure also user’s RTT(Round Trip Time) for delay compensation. In our last experiment, Max RTT value is 202msec and Min RTT value is 168msec. So Max Delay-Force value is 34msec. Actually, user can not feel these small delay. However our NetEventSyncServer works normally and get all users RTT and send delay force value to each user.

Table 1. Network delay issue

<table>
<thead>
<tr>
<th>Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  When controlling avatar and cheering using wiimote, user feels the</td>
<td>3.75</td>
</tr>
<tr>
<td>delay between user action and reaction of avatar</td>
<td></td>
</tr>
<tr>
<td>2  When group cheering, collaborative cheering actions of participants</td>
<td>3.5</td>
</tr>
<tr>
<td>seem to be simultaneous</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. SNS service
### Table 3. Tangibility

<table>
<thead>
<tr>
<th>Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Twitter contents help to feel in-situ excitement</td>
<td>3.52</td>
</tr>
<tr>
<td>2 Twitter contents provide new topic of conversation</td>
<td>3.58</td>
</tr>
<tr>
<td>3 Twitter contents of classifying according to location help to understand in-situ cheering environment</td>
<td>4.90</td>
</tr>
</tbody>
</table>

### 4. Conclusions

Our tangible baseball supporting system can provide new services like networked group collaborative supporting in virtual social space, in-situ user participation using social media and new form of sports cheering. Our system can be deployed to the various kinds of consumer market while combining with IPTV, multi PC plaza in Korea, home consumer electronic system and smartphone applications as a social media service. As one of potential service, we suggest sports cheering room for several users through network. We also suggest a service using smartphone for providing more convenient sports supporting chatting and social media interaction.

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### References


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