

SMASH: Synchronization Media of Athletes and Spectator through Haptic

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Figure 1: (a)Heartbeat Microphone, (b)Sport tool microphone, (c)Spectator Haptic Device

1 Overview

What could we do if we were able to feel others experience in real time. SMASH is a system that provides sports experience of a person from a remote area to spectators at the stadium and television audience in real time. For example, in sports watching, the spectator, by holding the actuator build-in device in the hand, is able to feel the heartbeat of the athlete and the tactile sensation that the player has during a game like shooting a ball, steps, or smashing a shuttle. Sports watching experience using player view point with HMD is said to be the most close to the player, but it shuts the user from other spectators. By feeling the players sensation in the palm, the spectator is able to feel the player closer while enjoying sports watching with others and share their emotions. This system used with television broadcast and at stadium should bring different stage of synchronization with the athlete depending on the situation. In 2020, with the Tokyo Olympic and Paralympic games, new system for sports watching are expected to emerge, using not only tactile information, but information system using extension of any of the human senses are expected to come out.

2 Previous work

In “heartbeat picnic: Workshop for Touching Heartbeats” [Watanabe et al. 2011] the users is able to feel his or the people around heartbeat. Its aim is to see the importance of life in a new light in a one-to-one format workshop. This system didn’t aim to share the heartbeat sound with several people. With sports watching in stadium, a lot of system to enliven sports are existing. “Free Viewpoint Video Synthesis and Presentation from Multiple Sporting Videos” [Inamoto and Saito 2005] is realizing football game watching with a Head Mounted Display(HMD). In this case the user has the feeling to be in the game only while wearing the HMD so he doesn’t need to be present in the stadium. “TECHTILE toolkit A prototyping tool for design and education of haptic media” [Minamizawa et al. 2012] is a device that reproduce and extend the tactile sensation that was recorded from any object or body through other object or body. This technology is used in “Interactive Instant Replay: Sharing Sports Experience using Visual and Haptic Sen-

sation based on the Coupled Body Motion” [Mizushima et al. 2014] permits to relive the experience of the athlete and share it. Because cables are needed for the visual and tactile feedback, it can be used only in limited places and not in large stadium.

3 System Design

We are using here “TECHTILE toolkit” technique of treating haptic information as audio signals. The system structure is, a microphone system with a microphone unit that is attached to the player’s chest with an elastic band, getting heartbeat sound signal during the play and to any other tool used during sport to get efficient tactile sensation. These two signal are sent to a diversity channel receiver that is connected to microphone amplifier and audio mixer. The signal is amplified and sent to the spectator device through a bluetooth transmitter. The following conditions are thought to be important when we consider sports watching at the stadium: two hands device, synchronization with the athlete experience and real time experience(Fig.2).

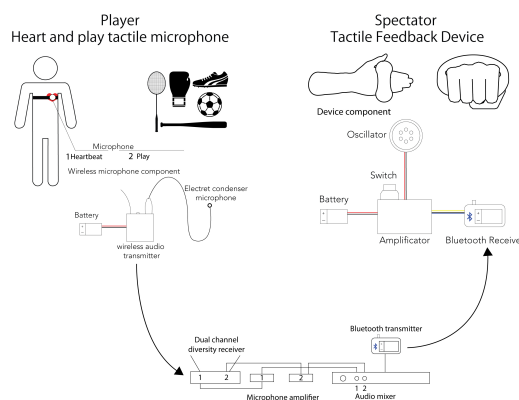


Figure 2: System Overview

The two hands device design is needed to let the spectator concentrate on the game watching. Moreover, penalty kick in football, free throw in basket ball are one of the most tense but also best scene in sports watching. During these tense scenes, not only the spectator in the stadium but people watching the game on tv screen, are doing the gesture of praying with the two hands joined. From the facts above, the device should fit when hands are joined, so that it can be hold during the game without disturbing it but also the heartbeat can be felt in real time to experience athletes feeling. Next point is play-

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ers experience sharing. With first person view as you are immersed in someone's feeling you are less able to have your own experience and feeling. For sports watching, by feeling the heartbeat and the sport tactile sensation, the spectator is close to the player while having his own feelings. The spectators in the stadium and the athlete but also the people watching on tv, sharing the same time and place can synchronize. To let the spectator live the athlete experience the most close to reality, it should be transmitted in real time as a sports match are all unique. By doing so the spectators in the stadium and the athlete but also the people watching on tv, sharing the same time and place can synchronize. Synchronize means here to get the same experience as the athlete you are watching so that you are able to know about the player with information that you can't usually have with other media such as television or newspaper. Sports experience with tactile and heartbeat provide you to know about athlete body information. Letting you know about their feelings and their play style more deeply(Fig.3).

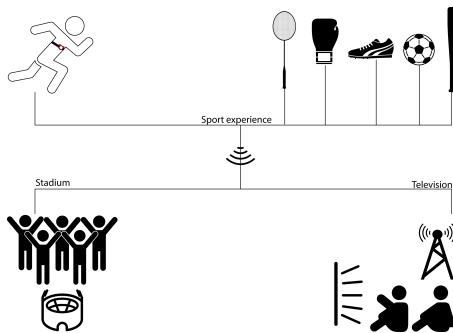


Figure 3: SMASH Concept Illustration

4 Implementation

The speaker system used by the spectator is 91*109*47(mm), shaped like a handle. The bigger part is fitting in the palm along to the fingers to give the best haptic experience with the hand. The thinner part that goes above the back of the hand is design to preserve the device from accidentally being thrown while enjoying sports watching(Fig.4). Moreover, since the amplitude of

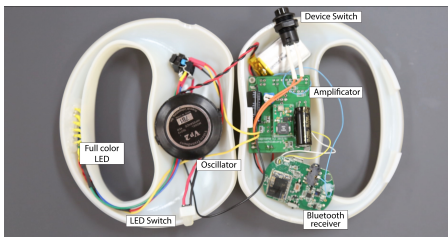


Figure 4: Spectator Haptic Device

the players heartbeat sound signal is very small, as well as the athletes tactile sensation can be very subtle, and must be accurate to have a proper experience sharing, a sound amplifier augmenting the sound received by the speaker system is needed. Therefore a sound amplifier has been specially designed for the device, permitting to amplify the tactile sensation. As this amplifier module size is 30*20(mm) we designed a device that could fit the hand and yet could contain all this module but also bluetooth receiver module, oscillator and full color LED switch system. For the design we used a 3D printed that allows us to make a double layer object with

the inside part printed in white and outside part printed in transparent(60%) and white(40%) mixed to create a milky transparent case that allows LED to shine through.

5 User Experience

We did a user test with a futsal player, wearing the heartbeat mic and one in the foot to record heartbeat and shoot tactile feedback. We could observe during this test that the player heartbeat changes while running or making a goal. To prevent the risks of disturbing the play with the mic wire we put the sound transmitter in the player pocket and hide the wire in the player's socks. Yet we observe that the mic disconnected from the jack during strenuous movement. During another user test during a futsal game, we focused on the spectator experience, by watching a game with the tactile feedback spectator device in the hands. As we put the mic in one foot and not inside the ball, the shoot tactile sensation didn't come each time the player kicks the ball, but, we observe that we could feel the presence of the player, which is about 5 meters far, in the palm. We had a comment that by feeling this presence in the palm, we could get the feeling of cheering one player individually.

6 Conclusion

By sharing the athlete experience with the audience, a sports watching where the spectators synchronize with the athlete and his experience and live it as its own is realized. In this research, we mainly focused on the audience speaker system device and how to share accurate player experience. In future work we would also implement athlete's side microphone system. The one we are using now can become the cause of interference in the game because of the cables. We will also measure the level of synchronization between athlete and spectator depending on the situation to determine in which situation this system fits the most. For example a badminton match with 2 athletes and 5 spectators watching near the field, a family or group of friend watching a soccer game in front of the TV at home, or a 10 person group public viewing.

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