iVo : Interactive Voting for the Olympics

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Abstract

This paper describes the creation of an interactive audience voting system, iVo. The device is intended for diving and gymnastics events during the 2004 Summer Olympics in Athens, Greece. iVo is adaptable and can be incorporated into a wider range of sports and events. Industrial Design and Interaction Design methodologies were combined allowing us to create an iterative process which guided us through the project. This unique mixture of techniques allowed us to explore both the interface and usability, as well as form and ergonomics of this device. Through the application of this methodology, we created an interactive voting system that is innovative and realistic for implementation during the 2004 Olympics.

Categories & Subject Descriptors: H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems

General Terms: Design, Documentation, Human Factors

Keywords: Audience, Design Methodology, Ergonomics, Industrial Design, Interaction Design, Interactive, Interface, Olympics Usability, Voting.

INTRODUCTION

The iVo system is designed to allow Olympic audience members to cast a vote for the gymnastic Olympians' performance. Allowing audience members to vote gives them a chance to participate in the games; they can ultimately compare their reactions with that of the official judges.

After initial research, concept development and concept evaluation steps were completed and a final solution was developed. Multiple forms of research were utilized, including printed media, internet research, observational research and contextual inquiries, affinity diagrams, personas and scenarios, and user experiments. These techniques were exploited in order to obtain greater knowledge of group dynamics and judged Olympic events. After understanding users and the context of the problem, conceptual iteration began. Rapid hand-drawn ideation sketches were used to translate concepts into a two dimensional format. For the tangible voting device, three-dimensional form studies were created in order to establish an ergonomically appropriate form. Industrial design issues were considered in order to achieve realistic implementation for the 2004 Athens Summer Olympics.

iVo builds on intuitive user responses, and allows audience members to participate in judging the event they just witnessed. iVo is a handheld device that is given in lieu of a traditional event ticket. Each iVo has a unique identification number encoded into a radio frequency transmitter. At the door, the radio frequency transmitter sends the unique id number to a receiver system that reads the identification number and checks it with a database to determine if the user has purchased seats for the event. Included on the iVo are simple graphical instructions that explain how the voting works. The pictorial instructions are universal so that all attendees will understand the voting process regardless of their native language and their country of origin. The audience member watches an athlete compete in an event; once the athlete has finished, the audience can vote using active input that mimics natural reactions of cheering or frustration.

RESEARCH

Affinity diagrams [3] were used first to develop a research direction or focus. Using the bottom up approach for creating the initial affinities led to the creation of specific categories of research. From these categories several were chosen to elaborate on and explore more thoroughly. Some of these categories included Olympic tradition, judging, facilities, media, and society. A more defined focus enabled the group to conduct more specific research pertaining to the areas of concentration.

Initial research also helped to provide an understanding of the traditions and uniqueness innate to the Olympics Games' rich history. Every four years the Olympic assume a new unique style, color scheme, graphic design, architecture, and overall look. This was illustrated in several books that showed torches, posters and architecture from past Olympic Games and also by proposals for future Olympics.

In order to understand the traditions and technicalities involved with Olympic events we used electronic and printed media and abstracted these traditions into lists. By focusing our attention on the rules and regulations regarding the diving and gymnastic events, we were able to gain greater insight into the judging processes involved. More aspects of diving and gymnastics were examined; we focused on the structure of the organizations involved, qualifications for the judges, and what the judges look for when viewing an event.

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To understand how the events happen in real life, a college level swimming and diving event would be the perfect opportunity to conduct a contextual inquiry [1,2,4,5]. During the event the audience was observed reacting to good and bad dives. While not experts in judging, the audience was able to intuitively determine which dives were better and which were worse. The members of the audience expressed their opinions about the dives with enthusiasm for good dives and silence for poorly performed dives. The audience consisted of a broad demographic ranging from the competitors' classmates to their young siblings and grandparents. Audience participation at the diving event was sparse; during the first few dives the audience was showing moderate participation, but participation faded off to a very low level. Local divers got cheers of encouragement from the stands but most of the time the audience was very subdued. By observing both successful and unsuccessful dives, an interesting conclusion was made: people are far more animated when it comes to transmitting positive feedback and far less so with negative feedback. In one instance when a diver "back flopped", the audience was silent. During the swimming portion of the event the audience was observed standing up, cheering loudly, and waving fists in the air when they saw a close race. Several times during the swimming events, the noise level was incredibly loud. Another interesting observation was that the cheering became contagious in nature; when one person began to cheer loudly , other audience members affirmed that it was ok to be loud and expressive by joining in. Soon the entire audience was cheering for the athletes and having a good time. By giving audience members a means of voting that encourages participation, the excitement and fun witnessed with the swimming could be transferred to diving.

At the diving event, a contextual interview was conducted with one of the diving coaches who also assumed the role as a official judge for the diving competition. Throughout the diving event the results from both judges were rather similar. However, in two of these instances, the results varied greatly between the officials. This reinforced the notion that even experienced judges often have a difficult time assigning a numerical value to the dive.

Based on these observations we considered that numerical scoring would be arbitrary to the majority of the audience members. A more simplified choice of positive and negative would be more appropriate.

DESIGN CRITERIA

A set of design criteria was first formed in order to guide concept development:

- The device must be affordable (under $500,000 USD. per total project)
- The interaction with the device would requires active gestures for input (no standard widgets, no buttons)
- The system should be easily adaptable for multiple games
- The solution should translate cross culturally (no text, simple diagrams)
- The system should allow for two simple choices (of positive or negative)
- The system should be usable for a wide age range
- The solution should ultimately provides a high level of entertainment
- The system should offer the user a quality souvenir as a tangible memory of their Olympic experience.
- The design will offer visual feedback to the user (instant gratification)
- The design offers audience members a visual representation of the total audience vote.
- The solution will communicate information to a larger system that shows a cumulative audience vote, and will provide incentive for the audience to use
- The system judges the Olympians performance instead of the judges decisions.

FIRST GENERATION CONCEPT DEVELOPMENT

Rapid hand-drawn ideation sketching provided a communicative tool that allowed us to share ideas with group members. Approximately one hundred concepts were visualized in two-dimensional media.

FIRST GENERATION CONCEPT EVALUATION

First generation two dimensional concepts were compared to the design criteria and judged. The solution that fit best was to give audience members individual devices that used intuitive gestures to vote without detracting from natural reaction to the events. The form of the handheld device mimicked the Olympic torch. This device would use wireless technology to communicate with a centralized infrastructure that would visually display them. Through the use of existing video screens, results would be displayed to the audience members. It was decided only positive and negative votes would be used because the amounts of technical information Olympic judges require was simply too much for the audience members. Through contextual inquiry it was learned that audiences can rely on basic knowledge of the sport and will vote relatively accurately. The device itself includes colored lights in order to create a visual compelling abstraction of the audience vote.

SECOND GENERATION CONCEPT DEVELOPMENT

Three-dimensional models of the handheld device were constructed to determine form, scale, and test ergonomics. Seven of these models were made in various sizes and levels of abstractions of the Athens 2004 Olympic torch.

An experiment was conducted during this phase to determine which form of gesture input best complimented intuitive audience response to positive and negative emotions. In the

experiment people where given a simplified foam model of the device and given a scenario where they are at a sporting event, and just saw a performance they liked. They were asked to make a gesture with the model that best represented their emotions. Out of fifteen users examined, all but one raised the model in the air and shook it back and forth in a cheering motion. Next the same users were told they just saw an event that they did not like. They were asked to make a gesture to convey that response. Results were nearly evenly divided between a stabbing motion using the device as in place of a knife, throwing the device at the athletes, and breaking the device in half.

SECOND GENERATION CONCEPT EVALUATION

The three dimensional torch-inspired models were evaluated next for ergonomics and usability. After evaluating the models the decision was made that an abstraction of the torch was not necessary. Ergonomics and usability were more important than focusing specifically on making the device "Olympic torch inspired" for souvenir purposes.

Evaluating the experiment was simple; the best gesture based activates would be to shake the device back and forth for a positive vote. For negative input, throwing was ruled out due to the fact that innocent bystanders might be hurt and the audience could only vote negatively once and not be able to keep or reuse their iVo. Stabbing was also quickly ruled out due to the violent associations and similarities to the positive vote gesture. Breaking was the best choice for a gesture based input. To solve the problem of the device being literally broken and destroyed, it was decided that the iVo would be made of a flexible material that would allow for bending in half to simulate a break while surviving to vote again. Forming the iVo from a flexible material also gives a tactile and ergonomic feel that encourages holding.

THIRD GENERATION CONCEPT DEVELOPMENT

More Rapid ideations and five more sketch models were developed to explore various forms that would be ergonomic and usable while encouraging the audience to keep iVo as an Olympic souvenir.

FINAL DESIGN

iVo is an interactive system that allows a live audience to vote on the Olympic events of gymnastics and diving. To the user, iVo is the handheld device that they receive in place of a ticket when they buy their seats. From a technical perspective, iVo is the entire system: the hand held device, radio frequency transmitters and receivers, a computer to count and control the voting, existing lighting system, and the existing video display screen.

When arriving at the arena a radio frequency tag inside iVo sends a signal to the receivers at the door and a computer checks the unique identification number to a database of people who bought tickets.

Once attendees are inside the event venue and seated and the events have begun, the iVo becomes the audience voting device. After each performance and while the judges are voting, the lights in the arena will dim and the video display systems and an audio message will inform the users to vote. At this point many users will already be voting by cheering and shaking their device but anyone who was unsure would be informed it was time to vote.

At this point users would either be voting positively or negatively and lights on the devices would show the users that they cast a vote. When shaken, the iVo has a kinetic powered system that charges the capacitors and causes the blue LED lights on either end to blink. If bent in half in a breaking motion the single red LED light in the center of the device lights up quickly and dims out. A quick glance of the colored lights give individuals an idea of how the audience voted. The lights not only function as a visual method of representing audience votes but they also create a visually compelling experience.

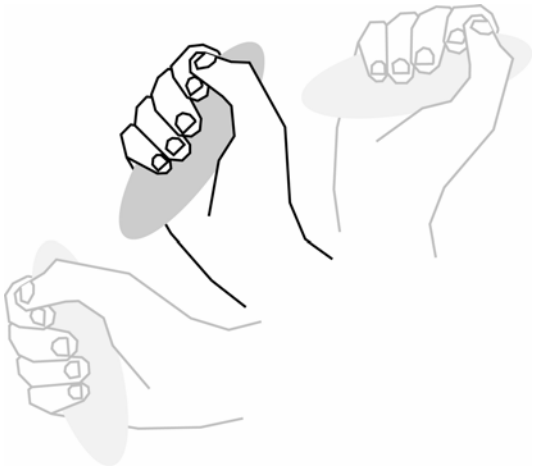

Figure 1. Positive vote (shake)

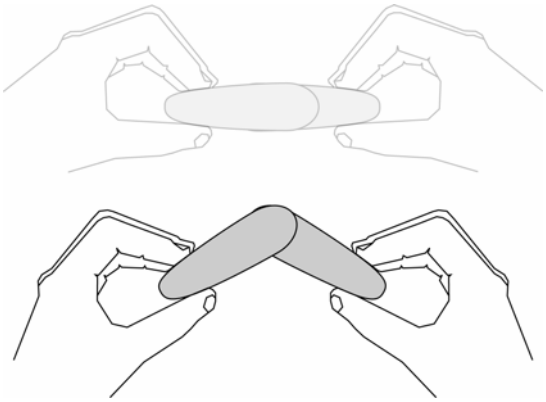

Figure 2. Negative vote (break)

When an audience member votes, a radio frequency tag embedded in the iVo sends their vote and unique identification number to omni directional radio frequency receivers positioned throughout the arena. These votes are then sent to a controlling computer that tabulates the results. Audience members can only vote once and the first vote received from each member is the vote that is counted.

During the voting the display of the video screen counts down the time. When the time is up the controlling computer takes the number of positive votes and divides by the total number of votes received. That number is then presented on the video display to the audience in a zero through ten format. For example, if 6,000 people attended an Olympic event and 5,000 people voted with 4,000 being positive and 1,000 being negative, then the computer would take the positive votes (4,000) and divide by the total number of votes (5,000) and then display that number (0.8) as 8.0 to the audience. iVo assigns a number value to the audience voting in order to allow the audience members to quickly compare their overall vote to the judges vote. Because the audience generally lacks technical knowledge needed to professionally judge, the final results will not necessarily compare to the official judges scoring. However, it does achieve the goal of interactive audience voting.

Once the Olympic Games are over, iVo is a keep-sake to the audience members. iVo will remind them of their Olympic experience for many years to come. iVo will be aesthetically restyled to match the look and feel of future Olympics.

MANUFACTURING AND ASSEMBLY

The body of the iVo will be manufactured from silicone rubber. Silicone rubber is flexible, pleasing to the touch, durable, and can be manufactured in a wide array of colors. The rubber would be mixed with an additive and cast. iVo's circuit board would be manufactured by a third party manufacturer; the circuit board includes three radio frequency transmitters and two capacitors. Standard watch batteries, and LEDs can also be bought in bulk from third party manufacturers.

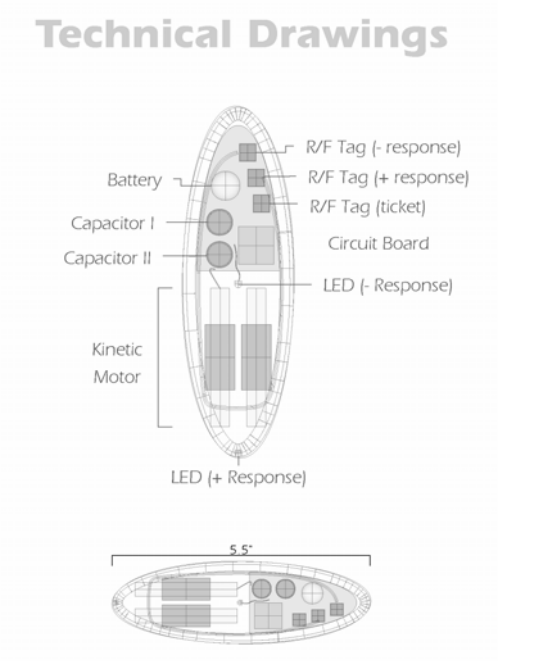

Figure 3. iVo plan view illustrating component layout.

The shared antenna for the radio frequency transmitters will be manufactured out of a thin strip of stock aluminum. The kinetic energy tubes will be composed of a tube, a magnet, and copper wire. Assembly of the parts will be done by hand. Wires will be soldered and then the components will be placed in the mold. Silicone rubber, mixed with a curing additive will be injected into the mold. Once cured, iVo is ready to be shipped.

AREAS FOR FUTURE STUDY

As with any design solution there will always be problems and areas of concern. iVo is targeted at a diverse demographic [6] of differently-abled individuals. However, some individuals may be physically incapable of using the device. Individuals with partial/total loss of control or mobility of their upper extremities will have a difficult time operating this device.

A disruption of applause would be supplemented by a visual experience of lights and unique feedback. This could enhance the Olympic experience and set it apart from all other sporting events. Audience members are still able to voice their opinions through verbal expression by means of yelling, screaming and singing.

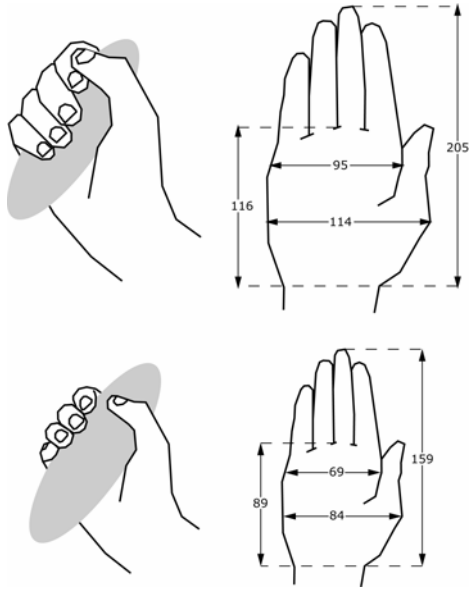

Figure 4. Anthropometric Measurements [7]

Theft or loss of the device is possible with any tangible object. iVo is roughly the same size as a cellular phone so it can easily fit inside a spectator's pocket or purse. There is a potential for modification or the inclusion of minor accessories to make iVo wearable, such as a strap, arm band, or other affixing method.

CONCLUSION

The iVo was created by using an iterative design process. iVo is an interactive system that allows Olympic audiences at diving and gymnastics events to cast real time votes on the events as they watch each of them.

REFERENCES

[1] Beyer, Hugh., Holtzblatt, Karen. Contextual Design : A Customer-Centered Approach to Systems Designs. San Francisco, Morgan Kaufman, 1997

[2] Beyer, Hugh, and Holtzblatt, Karen, Communications of the ACM, May 1995.

[3] Brassard, Michael. The Memory Jogger Plus + Featuring the Seven Management and Planning Tools. Salem, Goal/Qpc, 1996

[4] Holtzblatt, Karen, and Beyer, Hugh, Communications of the ACM, October 1993.

[5] Holtzblatt, Karen., and Jones, S. "Contextual Inquiry: A Participatory Technique for System Design." in Schuler, D., and Namioka, A. (eds.). Lawrence Earlbaum, Hillsdale, NJ. 1993: 180-193

[6] McDaniel, Stephen R. “An exploration of audience demographics, personal values, and lifestyle: influences on viewing network coverage of the 1996 summer Olympic games.” Journal of Sports Management 16-2 (2002): 117 – 131.

[7] Pheasant, Stephen. Bodyspace, Anthropometry, Ergonomics, and the Design of Work. Philadelphia: Taylor & Francis Inc, 2001