



Niemeyer to produce a short story about “distributed organs”, and an animated movie. In the movie, animated organs became an element of a musical composition. In many cases, the animation curves drove the sound synthesis, so that the sounds exactly matched the dimensions and movements of the organs. In many cases, the composer produced sound curves which in turn controlled the movement of the organs (see <http://art.berkeley/organum>).

The game Organum Playtest expands these relations as players interact with CG models of human voice organs. In this Playtest, the premise is that the players are a soundwave traveling from the bottom of the lung to the tip of the tongue. The players engage with the much larger, virtual body by traveling through it, as was imagined by Duchamp [3] earlier. Because they use their voice to travel through the virtual voice organs, they produce an uncanny registration between their own, real bodies and the virtual body. This relation increases the authenticity of the individual player, the team of players, and of the virtual body. By creating a game experiment which exposes the interactions and relationships between players with each other, with the abstract data of the virtual body, and with an audience, the Organum team seeks to understand the role of the individual voice as it relates to a group that aims to collaborate to achieve common goals.



Fig. 2. Three players performing Organum at New Langton Arts, San Francisco (Photo: Monica Lam)

#### 4. GAME DESCRIPTION

Three players control their trajectory through a 3D thematic virtual model of the human voice tract. The volume and direction of each player’s voice control one of three parameters of a first-person point-of-view position and motion. The three parameters are rotation about the y-axis (left-right), rotation about the x-axis (up-down) and thrust in the z-axis (forward-stop). Microphones provide the data for each of these controls. The left-right player sings into one of two microphones positioned to his/her left and to his/her right. The point of view changes as a function of which microphone receives the louder signal. Likewise, the up-down player sings into two microphones placed above and below the player, and the point of view changes as a function of which microphone receives the louder signal. The forward-stop player stands between the two other players, and sings into one microphone. The speed of the forward motion is a function of the volume this microphone registers. In early versions of the game, the artist/researcher team attempted to use pitch as a variable to control up-down angles. This approach was not very

successful as most players do not have sufficient pitch control and as pitch detection was rather unstable for most voices.

Players can make any noise they would like to control their axis. During four public playtest exhibits and numerous other sessions players made a wide variety of sounds, ranging from speaking, singing, chanting, and shouting, to whispering, whistling, humming, and imitating animal or carnivalesque noises.

The game environment is projected onto a screen as a ringed path (akin to a trachea) through three levels of organs. The challenge of the game is to traverse these levels without disturbing the host body. To do so, players must remain inside the trachea and avoid hitting its walls. The first level represents the lungs. It allows players to learn the basic movements through a series of simple turns and long straight-aways. The second level represents the guts and other internal organs and is more difficult than the first as it requires more coordination. The last level is the longest, and requires more stamina and energy than the previous two, but also provides player teams with an opportunity to show off their cooperation and singing skills to spectators. In all levels, players find pathogens scattered in the trachea. Destroying these pathogens increases the health of the virtual body and the players’ score.

Organum Playtest displays the score as three spheres in the focus of the POV. Each colored sphere grows based on one variable: one grows as players collide with pathogens, another grows with speed, and the final grows with ring boundary collisions. While this display provides a sense of “good and bad”, this non-numeric score allows players to determine what type of game they like to play. Some players prefer to play a long, precise game, while others prefer to proceed through the path as quickly as possible, leaving pathogens behind and colliding frequently. At the end of each level, each team member is provided with a printed scorecard that charts the collective achievement.

In addition to the navigation, the organic environment and the score, the game offers an ample soundscape to encourage performers to sing. As one player observes, the sounds act as instructions for the game but also as an element which attracts crowds: Art Critic John Davis writes:

*Certain sounds emanate from the game, serving as positive or negative reinforcement cues to help players navigate the virtual terrain.*

*These sounds are projected through the same speakers as the player’s voices. For example, when players eliminate a pathogen, a soft positive squeak sound is emitted, or when players successfully navigate a membrane coil, a high-pitched encouraging “boing” sound is heard. Conversely, when a membrane wall is crashed into, or players get stuck in a jam, a deeper, less pleasant “boing” indicates a wrong move. These sounds offer the only cue for urging players to continue moving forward.*

*The game gets lively when you have to collaborate with strangers, transcending the accepted social space to achieve a virtual one. Players become partners in a kind of improvisational performance art, as the crowd of curious onlookers balks nervously at the strange sounds emerging from people staring at 3-D images. As a bonus, while players become more comfortable with the ways their voices control movement, going beyond simple “left, left, left, right, right, right,” they begin to develop a kind of music, and really start to play the game; they are strangers overcoming a visual puzzle, inventing and reinventing a temporal language that in turn has a visible and immediate effect. [2]*

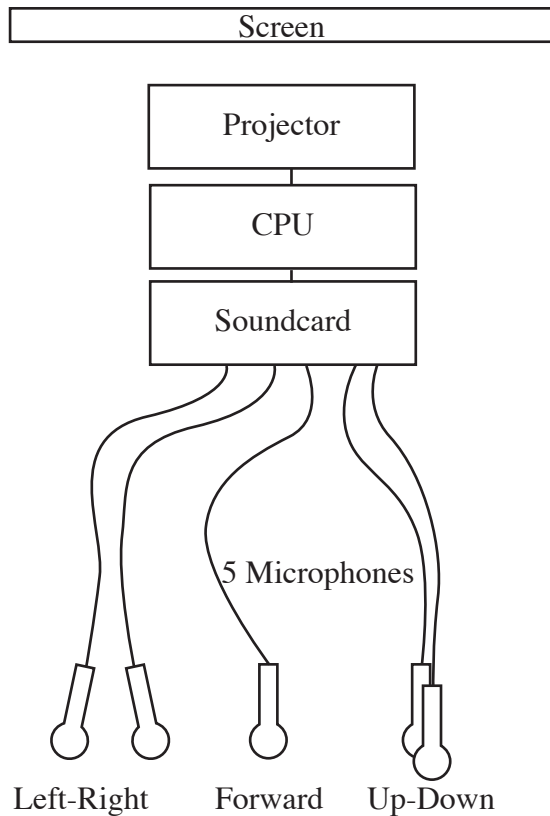


Fig. 3. Schematic setup of hardware, top view, all elements except screen and microphones are under the stage.

## 5. RELATED WORK

During the development of Organum, several voice-based games have been released commercially and in the gallery circuit. To date, most electronic games do not involve the human body in a visible manner, but Dance games such as Dance Dance Revolution (Konami) and the associated novel interface, the dance pad, made the players actions visible to audiences, and gameplay became performance. This interaction is chiefly responsible for the success of the game, as it innovates relations between players and their audiences and creates a new channel of communication between people who would not dare to dance together. The game acts as an isolator and connector at the same time, because players do not need to face their audience directly and can overcome any shyness. They are ostensibly interacting with the machine, which provides a neutral evaluation of their dance skills, not a social one. The “polyvalent performance” (which has multiple values) also addresses the real audience of human beings secretly, but effectively. The social evaluation of the dance is both addressing the dancer’s performance and the dancer’s courage to face the challenge of the machine. DDR is a feat of misdirection: The dancer is focusing on the rapid arrows on the machine’s screen indicating the next dance step, and thereby directs his or her attention away from any shyness or social concerns. There simply is no time to worry.

Eyeto Singstar (Sony London) provides a direct competitive experience for Karaoke singers. Their singing is evaluated based on correct timing and pitch. While the game does encourage singing and a degree of collaboration as different singers choose lead or chorus

performances there is little polyvalence beyond the performative value: Lyrics are given and performers do not have to cooperate. The beautiful game “We Love Katamari Damacy” features a collaboration mode which requires, unfortunately, both players to do exactly the same thing to succeed, so the game does not encourage cross-functional behavior.

Artist Joe McKay developed a game named “Voice Pong” in which the classic Pong game is controlled by two voices. Like Organum, this game features volume-based joysticks, but the game, in keeping with the original Pong, is more competitive than collaborative.

## 6. TECHNICAL DETAILS AND DEVELOPMENT PROCESS

The design and development of Organum has been an iterative process by a team of collaborators from three different disciplines, Art, Information Systems and Performance Studies. The design process the authors have followed merges techniques from art practice, drama and performance, computer science, game studies, and interaction design. The dominant art technique was sheer trial-and-error, the dominant Information Systems techniques were user simulation and feedback, and the dominant performance studies technique was playtesting. Playtesting involves the simulation of a gameplay mechanic with actual players. Similar to playing pretend, the players use minimal assets to pretend that they are playing the game, adhering to a given set of rules and conditions. If the players loose interest, the developers modify rules or incorporate new rules until a dynamic emerges which generates the intended interaction among player and game. Once the rules are established, they can be implemented through new media assets and programming.

One of the key points of collaboration among the artist team has been the discovery of a platform with which they could all contribute to the creation and realization of Organum in different, yet fundamentally equal ways. After early experiments using commercial game engines and then an early prototype using Pure Data and Java 3D, the team chose to develop the current version of the game using Max/MSP, Jitter and Javascript as a way to address the challenges presented by our diverse backgrounds and technical skills. Max/MSP and Jitter is a visual programming language that allows developers to programmatically manipulate audio, video, and graphics by connecting objects together using “cords” in “patches”. The environment was set up so the program and the output could run side by side. All developers could easily modify parts of the programs and observe the consequences. This direct access made learning and communicating about programming very easy and provided a common ground for all team members. Technical challenges were minor and mostly related to speed, as both Max/MSP and Javascript ran slowly. The true challenges were in defining meaningful relations between the sound assets, the visual assets and the gameplay for tight interaction.

## 7. RESULTS AND DISCUSSION

Over the past eighteen months, this research team has playtested Organum with about 1000 players in diverse venues. Empirical observations led the team to identify four themes in relationships between individuals and groups which address our projects’ core interests.

The first theme is emergence of group presence from a collection of individuals. At a recent installation, a woman asked one of the team members “Can someone play by herself?” On encountering

Organum by oneself in front of five microphones, this woman and others have instantly become aware of the fact that they are helpless alone. Most players in this situation have chosen to either recruit friends to play or have struck up a conversation with strangers and asked them to play. By requiring team collaboration to succeed in the game, Organum engaged players in finding and forming cross-functional groups, in which each member performs in “separate but equal” ways with optimal information exchange to reach common goals. Needing to find players was an obstacle to some players who preferred not to be reminded of their isolation, but was very rewarding for players who visited venues in groups. Interestingly, members of two groups were much more inclined to play together than individuals.

Yet playing Organum together did not mean that the voice of an individual must submit to the collective will of a group. The characteristics of the player were preserved, if not catalytically enhanced by the group interaction, because the interaction was non-exclusive. The volume parameter of a player’s voice needed to relate to the group goal, but the content and pitch parameters of a voice needed to relate only to the individual. The player was a team player and an individual at the same time, because of the association of specific parameters to specific goals. While playing as a group, players express their own unique voices and use their own words, styles, and characters, generating completely different sounds with minimal explicit coordination, which sustains the individual’s presence in a group.

The third relationship concerns players and audience. The team has observed many situations in which the presence of spectators has had considerable implications for how the game has been played by the group. Sometimes, audiences became active participants and the playing of the game led to an engagement between the two. At other times, audiences have played more passive roles, which has led some groups of players to feel more self aware and others to reach out to the audience by inserting humor into their play (such as animal noises, inside jokes, movie lines, children’s songs, and so forth) or in making more of a spectacle.

This awareness of the presence of an audience heightens the players’ relationship to the physical and social space in which they are playing. In the playing of most games, the more deeply engaged and present a player is in the virtual game world, the more his or her presence is absent from the real world. The player “zoned out”. However, with Organum, the opposite is true: the more engaged and involved players are in the game, often the more they engage with the world around them. Deep and active interaction with the game and other players has created spectacles that in turn have drawn more people into the game.

The Organum team believes that these four relationships originate in the “polyvalent” nature of human vocal interaction. A voice is amplitude, pitch, timbre, syllable, emotion and proof of existence. On a computational level, the game turns the voice into a stream of raw data working much like a standard game-controller. Yet the vocal signal also contains other levels of meaning, including an emotional, a musical, a biological and a semantic level. These non-computational layers of the input signal promote sharing and social learning [5] among individuals and teams, among players and audiences, and highlight the physiological and social context of the voice.

## 8. CONCLUSION

Organum provides players with a novel experience of interacting

with a large, virtual body of data collaboratively. Although it describes an artificial model of a voice box, this body of data is real, inasmuch as it organizes the relations between three people and their audience. This type of experience is important because it explores relations between individuals, lived reality and information, a theme that is central to the understanding of new media and which not surprisingly is explored through play [4]. Most players immediately engage with the game on three levels: They engage with the graphics once they start singing. They also engage with other players and with the audience. At the game graphics level, they tend to settle for a responsive mode, because the game graphics present the state of all three players and the game, a situation which exceeds the power of an individual player. At the player level, one player often becomes the leader or teacher among the group of three, and others take on different roles, from rebel to follower to innovator, creating a small network of learners [5]. Here, the game quickly reveals individual character. At the audience level, a parallel game unfolds. The players are performers, and they cater to their audience, frequently quite skillfully, either through dramatic, narrative or vocal performance. Here, the interaction of small groups of people with larger bodies of data is stratified in four layers: data, individual, peer group and audience. Each layer contains its own dynamics, and many of the dynamics influence each other. The audience, for example, can shape the data by motivating the players to sing louder, or by changing the game through loud applause. Such polyvalent and transgressive experiences are crucial to the understanding of the potential of new media, which has many more sides than the proverbial coin.

## 9. ACKNOWLEDGMENTS

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