Collaboration with the Future: An Infrastructure for Art+Technology at the San José International Airport

Matt Gorbet, Susan LK Gorbet, Banny Banerjee

Matt Gorbet
Designer, Artist, Educator
Gorbet Design, Inc.
matt@gorbetdesign.com
www.gorbetdesign.com

Susan LK Gorbet
Designer, Artist, Educator
Gorbet Design, Inc.
susan@gorbetdesign.com
www.gorbetdesign.com

Banny Banerjee
Designer, Artist, Educator
Stanford University
banny@stanford.edu
dschool.stanford.edu

ABSTRACT

This paper summarizes the development and implementation of a three-part infrastructure for the ongoing program of technology-based public artwork at Silicon Valley's newly expanded airport. The physical, technological, and human infrastructure provides flexibility and opportunities for future artists and future technologies while providing a robust framework for the ongoing maintenance and evolution of the program and mediating between the needs of artists and the constraints of an airport.

Introduction

The City of San José's Office of Cultural Affairs has established an ongoing, rotating program of technology-based and technology-themed public art in conjunction with the revitalization of Silicon Valley's Norman Y. Mineta International Airport (SJC). Three major permanent artworks and ten short-term (18–24 month) "rotating" installations make up the first round of Art+Technology commissions, launched with the opening of the airport's new terminal in June 2010.

Airports that include technology-based artwork typically have a small number of individual works [1–4] within more traditional public art collections, and any infrastructure installed to support them is designed specifically for those pieces.

When more general, building-wide infrastructures have been created to support evolving collections of technology artwork, these are found in facilities that are dedicated to technology art as their primary purpose, such as museums, galleries, and exhibition centers [5–8].

San José Airport's Art Activation project brought these two directions together. We created an architecturally integrated infrastructure consisting of physical, technological, and human systems to enable the SJC Art+Technology program to be robust and extensible within the constraints of a functioning airport.

Background

Master Planning

The Airport Public Art Master Plan [9], completed in 2004, defined a framework for a unified program of "Art+Technology," showcasing the innovation, diversity, and change that defines San José and Silicon Valley. The Art+Technology program:

> Aims to give travelers an immediate sense of San José as a place where ideas are born, and reinforce its stature as a creative and tech-savvy city. [10]

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Art+Technology is defined in the Master Plan as:

- Art that uses technology
- Art that is inspired by technology
- Art that is developed with technology
- Art that comments on technology [11]

Airport Art Activation

The planners recognized the need for "activating" the airport buildings to enable Art+Technology work:

> *Architectural Infrastructure*
> A qualified team of artists will be selected to work with the architectural design team to identify sites and integrate appropriate accommodations for a program of Art+Technology. [12]

The City put out a call for artists to form the Airport Art Activation Team. Of 24 qualified international submissions, our team was chosen in May 2005. Our mandate was threefold:

1. Work with the airport's design team to analyze the architecture, discover opportunities, and integrate the public art infrastructure.

2. Design and install "flexible technological platforms" to enable a rotating program of commissioned works. The Master Plan established that:

> Sites within the architecture and/or landscape will be designed as flexible Art+Technology platforms to incorporate dynamic projects that rotate over time. [13]

3. Create three "pilot" artworks (of the initial 10) to showcase and test these platforms.

Initial Research

We investigated the airport art program context, speaking with many types of people to gain insight on the role of art in an airport and the goals for an enabling infrastructure. The research [14] included:

- San José Public Art Program: Understand public art processes with respect to the community and to economic development plans for San José.
- Airport Design & Operations: 13 meetings with over 35 airport staff and stakeholders, including architects, IT, maintenance, landside and airside operations staff.
- Art and Technology Field Research: Field trips and online research exploring emerging technologies and their use in art and design.
- Airport Observations and Research: Observations and interviews of airport users at SJC, and observations at other airports: PHX, YYZ, YYC, DEN, SFO, ORD, BUR, LAS.

- Artists' Input: Research visits to Art+Technology shows, public "community visioning" groups for both traditional and technology artists, an invited roundtable, and one-on-one artist interviews.

Guiding Principles

Collaboration with the Future

The most significant challenge of activating the airport for technology-based artwork is that technology changes rapidly, and there is no way of knowing what tools, media, or genres future artists will be working with. Every activation must be thought of as a *collaboration with the future*: the infrastructure will be part of each artist's piece, and therefore must contribute functionally while allowing the largest possible aesthetic and thematic flexibility.

Integration with Airport Function and Passenger Experience

Because this is a highly functional space, the art should enhance the existing experience of travelers through the airport rather than requiring a detour to view artwork or to visit a gallery. This also means that the infrastructure must integrate tightly with the airport architecture, disappearing when not in use.

Physical, Technology, & Human Systems

To create a flexible and sustainable program, the Art+Technology infrastructure must provide physical systems, technology systems, and human systems, further detailed in the Curatorial Process section of this paper.

Platforms

Technology Art and Public Art

In our research, it became clear that in the context of traditional, permanent public art, working with technology is a challenge because it is a constantly changing, somewhat ephemeral medium. The "flexible platforms" are a way to bridge this gap and allow artists to create public art with technology.

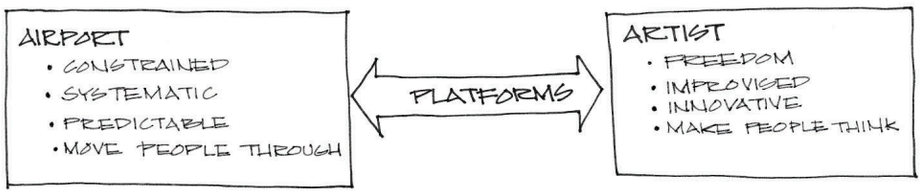

Figure 1. Platforms mediate between the constraints of the airport and the needs of the artist. © 2010 Matt Gorbet et al.

Mediation Between Airport and Artist

The Art Activation infrastructure enables artists to create art within the airport environment by mediating interactions between artists and the airport (Figure 1). Unlike a museum or gallery, many aspects of the airport are inflexible, from strict data access and security concerns to physical needs such as wall space or power outlets. Negotiating for these needs in advance provides opportunities as well as constraints for future artists.

(Re-)Defining Platforms

While the Master Plan introduced the concept of *flexible technological platforms*, the term was originally understood in the context of media systems that could be installed and reused for a variety of content, e.g., screens and playback systems for video art.

Rethinking the meaning of "platform," it became clear that specialized display equipment should be avoided wherever possible. These are the most visible and fastest-changing technologies, so they are likely to constrain the expression of future artists and quickly obsolesce. Instead, activations focus on the mostly invisible infrastructure that connects artworks to airport systems.

To give both the art program and the artists flexibility, the platforms are conceived of as a "kit of parts" supplied to artists. These "parts" take the form of simple infrastructure elements located at specified sites within the airport, like hooks and power sources, as well as universal elements like flight data and camera inputs. These can then be combined in the curatorial process to create the platforms for which art is commissioned.

Curatorial Process

Though this paper focuses on the supporting infrastructure and not the motivations or processes of the overall program, it may be useful to understand the curatorial process that led to the current round of commissions. The City of San José has a well-defined ideological approach to its public art program:

> The San José Public Art Program strives to select artists versus specific artworks, so that each artwork that is added to the City's collection is unique and specifically designed for its site. Community outreach is extensive and involvement is encouraged at all levels. [15]

Within this framework there is flexibility around the specific curatorial approach to take for any given commission. For the first rotating commissions, guest curators were invited by the Public Art program to select artists for specific platforms and sites after the infrastructure and platforms had been finalized. The artists were selected from a pre-qualified pool of artists that is maintained with a rolling open call. Once commissioned, the airport artists were asked to reflect on issues of concern to travelers and the local community and, where possible, to engage with the local community in the development of their artworks.

As designers of the infrastructure, we contributed general curatorial guidelines to this process. We also proposed three of the platforms for our own "pilot" artworks, to showcase the possibilities and explore the limits of the infrastructure we had designed.

The Infrastructure

Physical Systems

Physical systems such as mounts, power and data ports, space for equipment, and display cases provide both ready-made opportunities and guidance for artists in their approach to the airport environment. The physical activations that comprise the Art Activation Program are fully detailed in public design development documents [16, 17] created for the project. Following are illustrative examples of physical systems in specific locations:

Gate Seating Areas

In the gate seating areas, passengers await their departing aircraft. Power and data are provided in the floors of gate seating areas to accommodate custom display cases or sculptural artwork. Ceilings in three of the nineteen gate areas include equipment storage and concealed mounting points above the tiles for hanging artwork, projectors, sensors, displays, etc.

Among the program's first ten rotating commissions are two gate seating area works. *Dreaming F.I.D.S.*, by Ben Hooker and Shona Kitchen, is a custom-built aquarium with live fish and

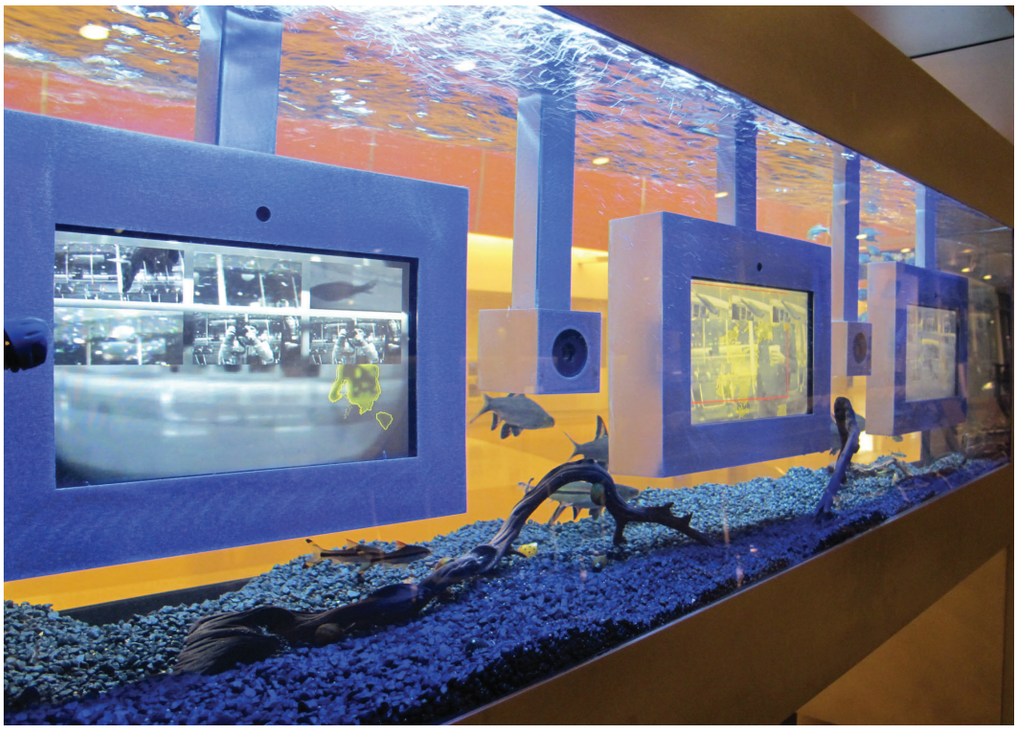

Figure 2. ***Dreaming F.I.D.S.*** **by Ben Hooker and Shona Kitchen. Collection of the City of San José. © 2010 Ben Hooker and Shona Kitchen. Photo © 2010 Daniel Brown.**

submerged video displays showing custom graphics and fish-tracking software from underwater cameras (Figure 2). The piece uses floor-mounted power and a concealed data jack to remain connected to the network for monitoring and maintenance.

Another gate seating area features *Chronos & Kairos*, a ceiling-mounted robotic sculpture consisting of 130 paired aluminum arcs that move in choreographed patterns and respond to the movement of people below via video tracking (Figure 3). Concealed in the ceiling are power supplies, a control computer, and a rigid mounting system.

Passenger Bridges

Six-channel speakers, data connections, audio equipment, and sensors are integrated into the ceilings of passenger boarding bridges, driven by a digital audio distribution system [18] to enable context-specific soundscapes (reflecting a particular flight's destination or origin, for instance) to be experienced by boarding or deplaning travelers.

Curved Concourse Wall

Large sections of a curved overhead concourse wall are activated with simple, architecturally integrated mounting points, enabling art to play a prominent role in creating interest over long distances. Standardized threaded inserts provide hanging opportunities. Space for equipment and power are accessible from a catwalk behind the wall, and cabling can be passed through distributed openings in the wall.

Dedicated IP-based video cameras ("ArtCams") can be flexibly repositioned along the wall, allowing input for active artwork located anywhere in the airport, plus visual monitoring of artwork for maintenance.

Baggage Claim Projection

As travelers await their bags, their attention is focused on the moving belt. Projectors and a video tracking system integrated into the ceiling allow artists to augment the flowing stream of luggage with projected interventions that respond to the presence of the bags.

Reactive Wall

Centrally located between arrivals and departures on the main level is a space outside the restrooms where people often stand and wait with their travel companions' bags. It is also the wall with the least natural light in the airport, due to the low ceiling. Two edge-blended projectors are concealed in the ceiling, and a removable front wall with access behind it for equipment and sensors enables projected images to react to passersby.

Figure 3. *Chronos & Kairos* by Banny Banerjee, Matt Gorbet, Susan LK Gorbet, and Margaret Orth. Collection of the City of San José. © 2010 Banny Banerjee et al. Photo © 2010 James Lin.

The first reactive wall commission is a piece by Camille Utterback, *Shifting Time*. The artwork uses tracking from a camera mounted in the ceiling to detect a viewer's location. Video images of San José's past and present are juxtaposed in response to people's movements (Figure 4).

Figure 4. *Shifting Time* by Camille Utterback. Collection of the City of San José. © 2010 Camille Utterback. Photo © 2010 Camille Utterback/Creative Nerve.

Showcases

Two very large showcases (15' long x 5' wide x 8' tall) were designed for the non-ticketed area between the ticketing lobby and arrivals. This is the only space where both departing and arriving passengers come together. Viewable from all sides, these glass cases (Figure 5) use an architectural support column to support the weight of the ceiling, which also provides concealed space for equipment, power and data, and lighting controls. They include a false floor and ceiling for cable management, as well as removable sliding panels and rails for flexible display opportunities.

Figure 5. One of two large showcases, featuring *Small Wonders*, curated by ZeroOne. Collection of the City of San José. © 2010 ZeroOne. Photo © 2010 Matt Gorbet.

Another long and shallow display case (48' long x 8' high x 1' deep) is integrated into the long wall leading to security. This case also incorporates concealed, ventilated storage with power and data, as well as removable rear panels and floor for cable management.

Figure 6. *eCloud*, a permanent artwork by Nik Hafermaas, Dan Goods, and Aaron Koblin, uses real-time weather data from around the world (provided by the Art Server) to render cloud forms in thousands of glass "pixels" suspended over the concourse. Collection of the City of San José. © 2010 Nik Hafermaas et al. Photo © 2010 Ben Blackwell.

Technology Systems

An IT infrastructure enables artworks to connect to data sources for input, as well as providing tools for monitoring and maintenance.

Art VLAN

The SJC airport's integrated network is divided into virtual local area networks (VLANs) for the departments and tenants of the facility (e.g., airlines, operations, security, concessions). The public art program has its own VLAN that is monitored by airport IT staff but configured and maintained by the program to suit the specific needs of artists. Access, security and network protocol restrictions were negotiated with the airport IT department during the design phase. Every artwork-specific terminal location incorporates CAT-6 data connections to the art VLAN, sometimes in unusual places, such as behind ceiling tiles or walls, supporting installation of concealed equipment and sensors.

Art Server

At the heart of the Art VLAN is a Linux-based server aggregating data from various sources, including weather data from the National Oceanic and Atmospheric Administration (NOAA) and flight information from the Airport Operations Database (AODB). APIs and open-source sample scripts for artists' use (Figure 6) are provided in multiple programming languages.

The Art Server also plays a vital maintenance role, controlling peripherals such as IP video cameras and network-enabled power switches for easy troubleshooting and remote control of lighting and projectors. Access to the Art Server is available on-site or remotely via VPN. A browser-based interface to its functionality has been implemented using the Django web framework [19].

Art Cloud

To provide flexible functionality without full knowledge of future requirements, a second server is implemented using Amazon's EC2 [20] service. This server provides access to data about each piece, including regular status-monitoring "heartbeats" (Figure 7). In addition, the Art Cloud provides a gateway between the highly secured on-site Art VLAN and third-party web services such as the Twilio [21] telephony application, enabling artists to build external application controls for their artwork. Finally, the Art Cloud also hosts a Wiki-based handbook for artists, an inventory system, and other documentation for use in administering the Art Program.

Figure 7. *Space Observer*, a permanent work by Björn Schülke, sends status "heartbeats" to the Art Cloud. Every active artwork can be monitored in this way. Collection of the City of San José. © 2010 Björn Schülke.

Human Systems

An essential part of the Art Activation infrastructure is the human element. Human systems maintain and enhance the infrastructure and its capabilities, ensuring the long-term viability of this complex and dynamic program in the real-world context of the Airport.

Art Technician

The Art Technician is an individual with a technical background and an understanding of art practice who acts as support for planning, installation, and ongoing maintenance of the artwork. This part-time contract position has full understanding of the art program IT infrastructure and works to maintain and extend it as the program grows. The Art Technician's role includes:

- Working with artists in advance to help them navigate the airport tech environment
- Helping artists plan technology decisions for easier maintenance and better fit with the airport systems
- Acting as liaison between the art program and the airport IT, Facilities, and Operations

- Helping with installation logistics
- Monitoring day-to-day status of airport artwork
- Responding to on-site problems with artwork, and contacting artists for troubleshooting
- Maintaining the Airport Art Program infrastructure, including troubleshooting and making changes as needed
- Updating the inventory system for pieces of the Airport Art infrastructure, including current location and status

The Art Technician has dedicated office, storage, and workbench space at the airport.

Airport Art Handbook
The Airport Art Handbook informs participating artists and other stakeholders, such as program staff, about the infrastructure. From receiving a commission to guidelines for creating work in the airport to installation to maintenance, all parts of the process are documented. The Handbook is implemented using MediaWiki [22] to act as an ongoing repository for experience gained as the program grows. It is editable by the Art Technician, the OCA staff, and the artists.

Close Cooperation with Airport Operations
The program can only succeed into the future if airport staff such as IT personnel, groundside operations, security, and maintenance staff remain aware of the artwork, understand its intent and functioning, and know how to work with and around it. The OCA staff actively maintain relationships with key advocates at the airport in order to foster a sense of ownership and pride in the collection, meaning it will be looked after and promoted.

Reflections
Though the infrastructure and the Art+Technology program are still very new and designed to evolve over time, it is worth noting some of the successes and surprises encountered so far. As of this writing, the airport has been open for nine months and has been through only one initial round of commissions, so several of the elements, such as the integrated API for mobile device interaction and the mounting system on the large Curved Concourse Wall, have not yet been used by artists.

The first ten rotating and three permanent artworks were installed simultaneously with the completion of the building, and in parallel with the final implementation of the technology infrastructure. One drawback of this was that maintenance documentation was not initially available for all artworks (and is still being compiled for some). Further, the Art Technician was hired after installation of the first round of artworks had begun, so he had a lot of learning to do very quickly.

The collection has experienced understandable maintenance issues with several pieces, in particular those with moving parts or water. This was anticipated, and the presence of the Art Technician has been enormously helpful, as has the presence of ArtCams and the ArtVLAN for monitoring and remotely diagnosing the work.

The experimental and dynamic nature of much of the work means that some of the artists have continued to contribute, tweaking software parameters and making adjustments to the behavior

of their pieces. This ongoing relationship is facilitated by the artworks' being online and software-based, and raises logistical, contractual, and theoretical questions about when a work is "complete." See [23, 24] for further general discussion of these issues.

In addition to the artworks that are currently installed, three other artists were originally offered commissions in the initial round. One artwork was not completed due to the artist's lack of time to engage appropriately with the demands of the infrastructure. One artwork was not approved by the Public Art Commission in the design development phase due to difficulty designing within the required constraints of the platform, and one commissioned work has been delayed due to unforeseen technical issues with the artwork. One of the "pilot" artworks in the collection is also likely to undergo revisions, as its impact on the travelling public has not been as strong as desired by the artist or by the Public Art program. Such conditions illustrate the need for commissioned artists to be aware of the infrastructure's specific constraints, the importance of strong oversight during the commissioning and design process, as well as flexibility with management of the work once installed. Now that the constraints and possibilities of the infrastructure have become more tangible, it will be easier for future curatorial teams to match artists to the platform opportunities.

Going forward, there are many possible ways for the San José Public Art program to approach commissioning new rounds of artwork for the airport (guest curatorial teams can be established, proposals can be solicited, residencies can be created, etc.). Every approach has its own ideological, political, procedural, and practical ramifications. We view this as a healthy situation, as curatorial practices, notions of "site-specificity" and "community" are continuously shifting in public art discourse. Art historian Miwon Kwon describes the "resilience of the concept of site-specificity, as indicated by its many permutations" [25]. In fact, during the course of the Art Activation project, San José's Office of Cultural Affairs produced a new master plan for the city's Public Art program [26] which recommends new approaches to such issues as site-specificity and community engagement.

By integrating closely with the architecture, while providing abundant potential for bold commissioning opportunities, the SJC Art Activation infrastructure is designed to accommodate flexibility of curatorial and stylistic strategies in addition to ever-changing technological opportunities.

Conclusions

Technology presents artists with ever-evolving opportunities for creative expression, demanding a flexible art program that can easily evolve. The practical constraints of a functioning airport, on the other hand, demand a high level of standardization, forethought, and structure.

The Art Activation infrastructure at SJC bridges these two worlds, offering a simple and flexible kit of parts that mediates between the structures and systems of the airport and the creative potential of artists. This enables new opportunities to enhance the experience of the airport while providing a robust framework for the ongoing maintenance and evolution of the program.

As the San José Airport Public Art Program evolves and embraces different curatorial and aesthetic approaches, we are hopeful and confident that the activation infrastructure at the airport will evolve as well, continuing to support meaningful, engaging, and groundbreaking work – in collaboration with the future.

Acknowledgments

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