

The San Francisco Public Art Map Application: Using VGI and Social Media to Complement Institutional Data Sources

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ABSTRACT

The City of San Francisco is endowed with a rich variety of art in public spaces. The San Francisco Arts Commission (SFAC) alone curates over 800 pieces of public art. In addition to the SFAC holdings, there are colorful murals, landscaped parks, art monuments, street art of mysterious origin, and pieces curated by other organizations. People taking public transportation, playing in parks, reading in libraries, or performing daily tasks that take them into San Francisco's built environment see art.

There is no one place to learn about all the different art freely available. Existing mobile and web applications that map art locations silo information by covering only certain categories of art such as publicly funded pieces, murals, or street art. No application uses social media as a source of art data. In contrast, the San Francisco Public Art Map presented in this paper (SFPAM at www.sfpam.com) is a web application that aggregates location-based publicly accessible art data in San Francisco. SFPAM addresses the gap identified in other applications.

The application has three levels of art data curation: organizational, administrative, and volunteered. The project compiles art location information from disparate institutional sources that fund and curate public art. Administrative scraping of web sites and local knowledge create additional layers. Volunteered Geographic Information (VGI) creates a dynamic layer of pictures and comments on public art through social media streams such as Flickr, Panoramio, Instagram, and YouTube from contributors who unknowingly take on the role of curator through posting and tagging images. Combining data from multiple curators creates a richer set of art data points for visitors and residents in San Francisco interested in public art.

Assessment of SFAC's art location data reveals quality issues with positional accuracy. Some points are located miles from their actual location and multiple points are collocated. Comparison of sample points from the SFAC dataset and peer reviewed VGI suggests that VGI can improve the quality of the application dataset.

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J.5 [Computer Applications]: Arts and Humanities – *architecture, fine arts.*

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Multiple APIs, Curation, Data Mining

1. INTRODUCTION

Dog lovers walking their dogs at Fort Funston, San Francisco, encounter multiple tributes to canines installed on the crumbling concrete wastewater outflow pipes by the ocean. One bas-relief sculpture depicts running greyhounds. A second shows a mysterious dog buddha gazing out to sea. What is the story behind these pieces?

Agencies and institutions such as the SFAC, Yerba Buena Gardens, Bay Area Rapid Transit (BART), University of California, San Francisco at Mission Bay, San Francisco Planning Commission (SFPC), City College of San Francisco, and SFO Airport Museum curate over a thousand pieces of art accessible to the public.

Over 300 colorful murals depicting daily life, politics, history, community, humor, hope, and culture greet walkers in the Mission District. Thousands of murals and street art grace city walls, garages, and alleys. A single block may contain multiple murals and range in size from a doorway to multiple sides of a building façade.

Artists may be well known, such as sculptor Andy Goldsworthy, little known, or unknown. Whether sublime or tacky, subversive or bland, moving or humorous, funded or unfunded, art is part of the fabric of the city of San Francisco.

No single application or dataset addresses the diversity of public San Francisco art. An application user should not need to guess the category of an artwork, the commissioning agency, or the administrator in order to locate and learn more about art. The San Francisco Public Art Map (SFPAM) brings together multiple data sources cataloguing different types of public art in an interactive dynamic map in order to integrate art Points of Interest (POI) in one interface. The SFPAM is configurable so that new datasets can easily be added. The application provides a flexible interface that accommodates datasets with different attributes. This paper

argues that building a comprehensive art database requires institutional datasets, VGI, and social media.

2. PUBLIC ART

The origin, definition, and purposes of public art are not clear [1]. Did public art originate with the cave paintings at Lascaux? Or did public art in the United States officially originate in 1967 with a commission for a sculpture by Alexander Calder from the National Endowment of the Arts' (NEA) new fund for public art [2]? Others argue public art originated in the 1930's with either the Federal Art Program (FPA) of the Works Progress Administration (WPA) or the Public Works of Art Program (PWAP) [1].

Cartiere notes that many terms and kinds of art such as "permanent works, temporary works, political activism, service art, performance, earthworks, community projects, street furniture, monuments, memorials, plunk, and plop art," are used to describe public art works [1]. An art installation may be as small as one's hand or encompass several acres.

Over time, several paradigms have defined public art [3]. Memorials commemorating loss or monuments celebrating heroes and victories comprise early state sanctioned art. Other paradigms include functional art, such as tables and chairs; art in the park such as Christo's *The Gates*; art as the agora or public place; and art as pilgrimage. An extreme example of art as pilgrimage is De Maria's *Lightning Field*, a work with a 3.2 mile perimeter requiring a guide to find the site, an accident release form, and an overnight stay with up to 5 other pilgrims in a small cabin cut off from cell coverage.

Monuments, statues, and sculptures also serve the common good as references for navigation or way finding due to their landmark saliency: characteristics that differentiate a landmark visually from the surrounding environment [4]

Hein [5] notes that concurrent with the development of art sponsored by agencies on behalf of the public, various communities began developing their own voice in the 1970s through murals that began to appear on available wall space. The murals were generally funded by grassroots donations and created by local residents. Hein quotes Timothy Dresher who talks of public art, "done for a general undefined population ... and commissioned by official bodies" in contrast to community art "created by or with a group of people who will interact with the finished artwork." The Mission murals of San Francisco integrate common symbols of the community such as the Virgin of Guadalupe with contemporary events, providing a voice for those communities.

Cartiere [1] defines public art broadly as "art outside of museums and galleries," that meets one of the following criteria: publicly accessible or visible; of public interest to individuals or a community; maintained for or used by individuals or a community; or publicly funded. This broad definition of public art informs the SFPAM.

Using John Dewey's work describing types of experience, Hein [5] classifies the encounter with art as one kind of consummatory experience that adds zest to life. A consummatory experience stands out in that subject and object are one, and there is a satisfying completeness. The aesthetic experience may be transformative or generative. Ideas are brought into focus and become private experience as a person engages the object. Art has the power to challenge ideas and transform people.

3. SFPAM APPLICATION

3.1 ESRI Public Information Map (PIM)

In 2010 ESRI created a prototype web application for VGI using ArcGIS 10 and web services. This application was used to support the Deepwater Horizon recovery by combining authoritative content from organizations such as NOAA, the disaster response feed from Ushahidi, and live data feeds from social media such as YouTube, Twitter, and Flickr. Users could also post content and links. Several iterations of the PIM have been released. The SFPAM uses the framework of PIM 2.0 [6] but customizes the code and data sources to create a web based art map.

3.2 Technology

The SFPAM is written in HTML and JavaScript using the ArcGIS Javascript API, version 2.7 and Dojo. The database backend uses Microsoft SQL Server 2008 R2 with ArcSDE.ArcGIS server 10.1. REST services provide neighborhood boundary and art data layers. Feature layers were prepared using ArcMap 10.1 and published as REST services. Three domains, sfpublicart.com, sfpublicart.org, and sfpublicart.net point to a virtual server hosting the client side application code.

The PIM consumes basemaps as ArcGIS tiled map services layers and OpenStreetMap layers; this is expanded in the SFPAM to include web tile layers (Figure 1). Stamen Design created three beautiful maps that are available as web tile services: Watercolor, Toner, and Terrain. The PIM was recoded to take advantage of these services as particularly fitting for an art map.

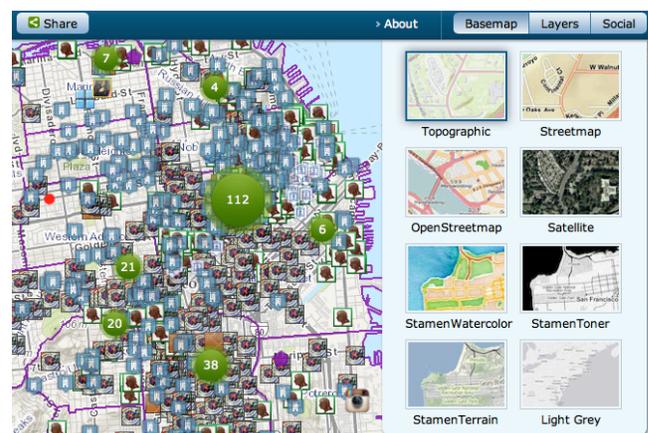


Figure 1 Basemap selection

SFPAM adds functionality to use Instagram and Panoramio social media APIs to map art locations, complementing Flickr and YouTube capabilities provided by the PIM. Ushahidi is turned off, as this is not a disaster or crisis map. Twitter is disabled, as the latest API (version 1.1) requires authentication for search queries.

Users can select which basemap, art data layers (Figure 2), and social media to display, in effect enabling them to create their own artistic map. The application provides zoom controls, panning, search capability for addresses, and place bookmarking.

A user can share the map based on current configuration settings to Facebook or Twitter; create a web link; or generate HTML to embed the map.

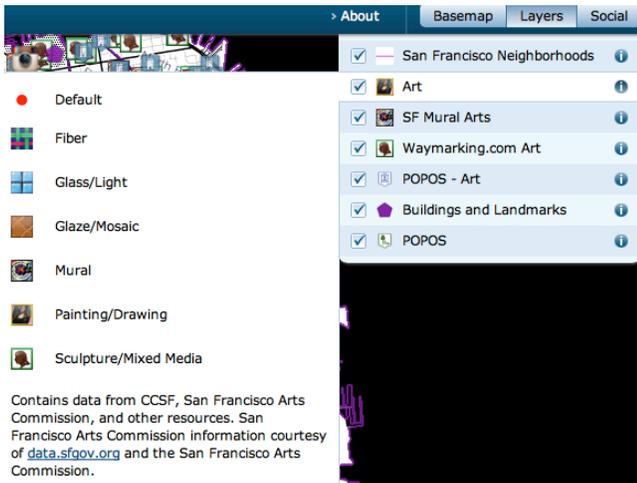


Figure 2. Layer selection and legend

Map points and clusters display a pop-up menu (Figure 3) when clicked on with information on the art. Clicking on images and hyperlinks open a browser window forwarding the user to the original data source..

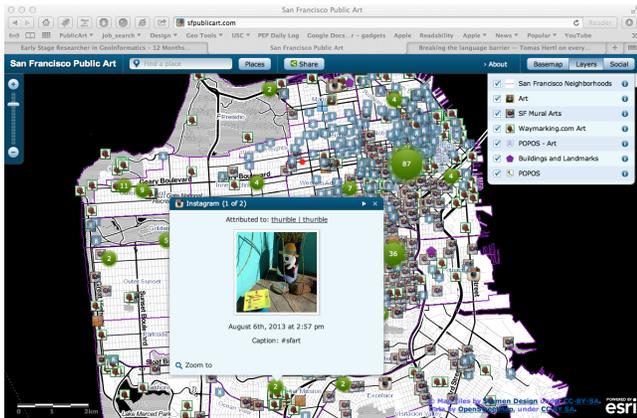


Figure 3. Screenshot of SFPAM with social media popup and Stamen Design Toner basemap. Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under CC BY SA.

Clustering is available for social media points. Clusters can be selected and different points clicked through in the pop-up. Art points from services are portrayed with different imagery depending on the data source and category of art. A user can reconfigure social media layers (Figure 4) using different search terms or time frames.

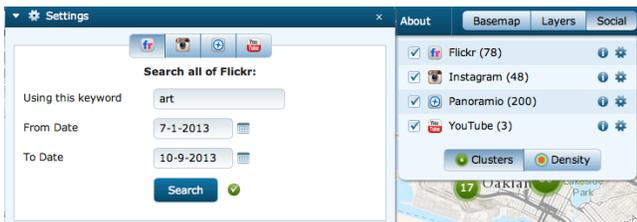


Figure 4. Social media configuration options

3.3 Other Art Applications

Over 30 art applications for web and mobile platforms were surveyed while developing the SFPAM. Several representative applications are discussed below. The primary differences between other art applications and SFPAM are:

- Applications usually specialize in a particular category of art such as murals, public art, street art, graffiti, signs, or fonts, or the data content is driven by the interest of the application administrator. The SFPAM brings together multiple categories of art and datasets.
- SFPAM uses ArcGIS for Server, ArcGIS services, and REST services instead of the Google maps API.
- No other art application uses Stamen Design basemaps.
- No applications use social media as a source for art POIs. This adds a dynamic, constantly changing source of art data.
- Applications using the SFAC dataset have not corrected the geolocation and duplication errors or found ways to mitigate the errors.

The SFAC has a public art map that was last updated in 2009[7]. The map contains a subset of the agency's holdings, is difficult to find from the main SFAC website, and does not have a VGI component or social media layer. Recently the SFAC partnered with the STORY application to provide a tour of public artwork on the waterfront. While 18 of the POIs are correctly located at Coit Tower, the remaining 8 POIs are incorrectly geolocated blocks or miles from the actual locations.

Multiple mobile applications such as San Francisco Public Art—SF Art, San Francisco Civic Art Finder, and SF Public Art, use the SFAC public art dataset as is, with minimal correction if any, for geolocation errors. Content is not enhanced with descriptions or pictures, and duplicate entries are not removed.

SF Mural Arts is a web gallery of almost 800 murals in San Francisco that documents basic information such as artist, pictures, date of creation, and location. The website has a map of the murals, however clicking on individual points generates mixed results. An iOS application was released in December 2012 that allows a user to view locations of all the murals. Users can submit pictures of murals on the web for consideration or send an email from the mobile application suggesting new sites. The website was scrapped to create a dataset of mural points for the SFPAM. Clicking on popup information in the SFPAM for any SF Mural Arts POI opens a browser window on the SF Mural Arts site.

4. DATA SOURCES

4.1 VGI and Social Media

Connors [8] summarizes benefits of using VGI and social media as the ability to leverage volunteers; to increase scale of coverage; to create a more informed public; and to build consensus. Challenges to using VGI and social media include data credibility, quality and consistency; lack of standards; and the unpredictability, bias, and motivation of contributors. According to Pultar [9], an additional advantage of VGI, in this case social media, is the creation of a dynamic GIS that makes use of changing geographic objects over time. A dynamic GIS leverages temporal geodata and provides better analysis, queries, and visualization.

VGI for public art differs from scientific, disaster or crisis mapping in several ways; data quality is not a matter of life and death, data has a long lifespan unless the POI is temporary, and data can be revised. A consumer of public art data is not monitoring how close a fire is to property and making a decision to evacuate. Public art data should be located and described verbally or visually with enough accuracy for a consumer to locate the physical POI. The POI should be relevant to public art. Strategies such as filtering and incremental improvement of data accuracy can improve data quality.

VGI may not provide consistent or complete attributes such as title, artist name, medium, or art category for POIs compared to an institutional dataset. The primary contribution may be in the form of a georeferenced image. Images engage the eye, as well as provide visual clues to recognize the art piece.

4.2 Curation and Social Media

Liu [10] has developed a model of socially distributed curation during crises. Curation is a process of choosing what is meaningful and usually associated with institutions that employ curators to make decisions about what stories or objects to preserve. Liu argues that social media supports curation tasks such as collecting, organizing, storytelling, and preserving of memories in a way that allows others to reuse and redefine collective memories, whether experienced directly or indirectly. Social media shifts curation from an individual defining what is worth preserving to a social network of multiple people defining cultural heritage. While Liu focused on the role of social media as curator of crisis heritage, the SFPAM uses social media as curator of public art.

4.3 Levels of Curation

There are three levels of curated data in the SFPAM (Table 1). The levels are institutional, administrative, and social. Institutional curation consists of datasets provided by institutions that administer or fund public art projects such as the SFAC and the SFPC.

Table 1. Data Sources and Points of Interest (POI) in San Francisco

| Source | Curat-ion | Description | #Art POI |
|--|----------------|--|----------|
| data.sfgov.org | Insti-tutional | SFAC publicly funded art | 689 |
| data.sfgov.org | Insti-tutional | Privately owned public open space (POPOS) SFPC | 60+ |
| sf-planning.org | Insti-tutional | SFPC Landmarks | 294 |
| sfmuralarts.com | Admin | Street Murals collected by administrators or submitted by users (VGI) to site | 797 |
| waymarking.com | Admin | VGI submissions of unique locations that are peer reviewed prior to approval | ~300 |
| flickr.com instagram .com panoramio.com youtube.com | Social | Depending on API, Geotagged images that can be searched by tag, extent/location and date range | varies |

Application administrators, who create, manage, or review data content for art POI, curate at an administrative level. This level can have VGI data content that is reviewed by an administrator or designated peer for positional accuracy and data quality. SF Mural Arts and waymarking.com are examples of administrative curation and VGI content.

Finally, individuals unknowingly act as curators at the social level by submitting geotagged and tagged images to social media applications. Social media tagged with “art” or “sfart” within the

SFPAM map extent is displayed as a POI depending on additional criteria such as date or number of data pages to retrieve using JSON callbacks.

4.4 Data Quality

4.4.1 Assessment of SFAC Dataset

Wright [11] puts the SFAC art collection at over 4000 items,, making the organization one of the largest administrators of public art in the country. Little money is available for management and maintenance of the collection and the organization is uncertain of the actual inventory or details such as location for all the pieces. This confusion is reflected in the publicly available dataset. The SFAC dataset is the primary source of information for publicly funded art POI, but the data is problematic. Neither detailed descriptions, nor image URLs are included in the data set. The dataset contains multiple entries for the same art POI. Most challenging is the spatial accuracy of the entries.

The City of San Francisco is divided into 11 districts. Based on the brief location description included in the SFAC dataset, a district was assigned to each art POI. Each POI’s assigned district was compared to the actual district. 151 points, or 22%, were not located in their described district.

Figure 5 shows the distribution of collocated art POIs for the SFAC art dataset. There are 157 locations for 689 art pieces. Only 101 locations are associated with one art piece. Three locations account for over 300 pieces of art. One location containing 123 art works is a hospital campus with restricted access to all but a handful of pieces. The 93 San Francisco Airport art pieces were collocated despite the airport consisting of multiple terminals with art POIs being distributed in publicly accessible locations, private offices, and passenger-only locations past security. 92 art pieces are collocated downtown. A review of each art piece’s assigned district reveals that most of the points belong in other districts.

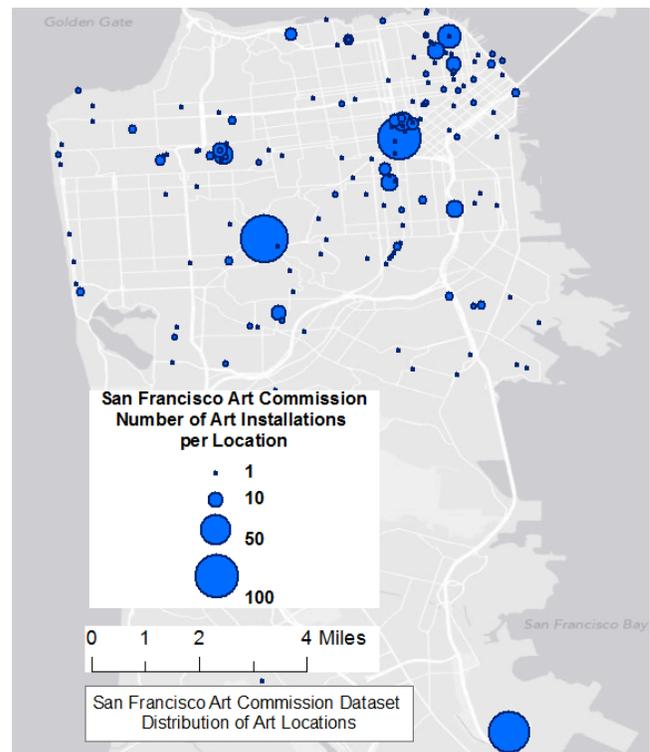


Figure 5 Distribution of SFAC art installations per location

4.4.2 Comparison of SFAC Sample Data Points Location to Waymarking.com VGI

A high-density area for public art POIs was selected to provide a sample set to compare positional accuracy of the public art dataset versus Waymarking.com VGI. 24 GPS data points representing monuments and artwork in Golden Gate Park's Music Concourse were mapped using VGI from Waymarking.com. The corresponding 22 data points from the SFAC were identified and mapped. The distance between corresponding datasets was calculated. Figure 6 shows the overall location and discrepancy of the two sets of data points, while Figure 7 shows the Music Concourse in greater detail.

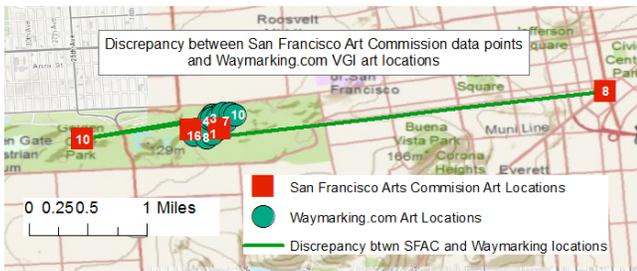


Figure 6. Discrepancy between SFAC data points and Waymarking.com VGI

Several things are immediately apparent: while there are 22 SFAC POIs, only 4 are represented graphically, and several points are more than a mile from the Music Concourse.

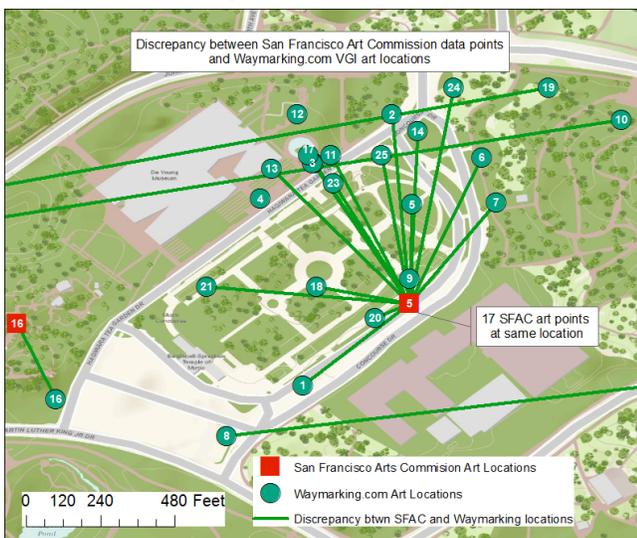


Figure 7 Music Concourse detailed view

The average distance between corresponding points excluding the three points over a mile away was 456 feet. The closest SFAC point to a Waymarking.com point was 101 feet. Feature 8 was 2.7 miles away, while features 10 and 19 were 1 mile away. 17 of the SFAC points were located at the same coordinates as Feature 5.

4.4.3 Comparison of iPhone Data Collection to Waymarking.com VGI

Since mobile devices are commonly used to generate social media VGI, a mobile device was used to create data points for comparison with Waymarking.com's peer reviewed VGI. 22 data points were captured in the Music Concourse using an iPhone 4s and the EveryTrail Pro application. Figure 8 shows the iPhone data points and the Waymarking.com data points. The furthest

distance between corresponding points was 137 feet, however the sculpture in question, feature 4, spans a distance greater than the discrepancy. The average discrepancy between iPhone coordinates and Waymarking.com coordinates, excluding feature 4, was 22 feet. Standing on the opposite side of a large statue could easily change the results by several feet.

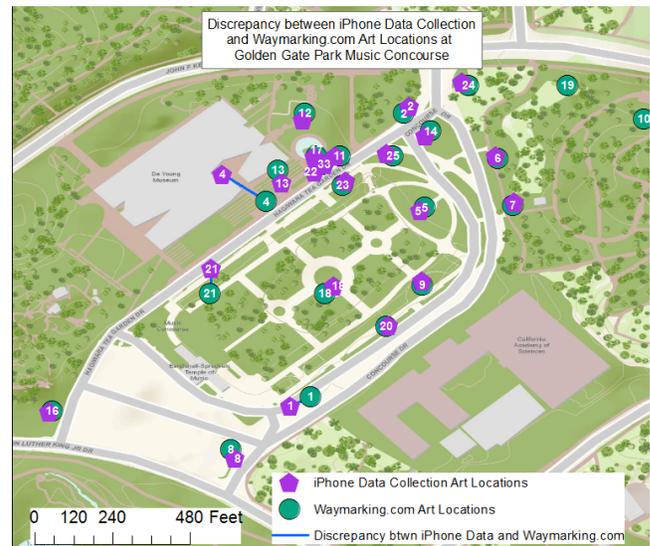


Figure 8. iPhone data collection vs. Waymarking.com VGI

4.4.4 Analysis of Instagram Sample Set for Relevant Content

The Instagram API does not provide the capability to search using a location bounding box and tag. The challenge for using this social media stream as a data source for public art was creating a search to return relevant art images located in San Francisco.

Using the tag "sfart" as shorthand for San Francisco art, 1614 geolocated images were retrieved from instagram.com on 10/3/2013. The images were mapped and 1582 of the images were within the greater San Francisco Bay area. Only 32 images (2%), were located outside the area. 1052 or 65% of the images were located within the City of San Francisco. The tag "sfart" returned relevant geographically tagged data despite the handicap of not being able to specify a bounding box as part of the search term.

The Instagram data was analyzed for appropriate content to answer the question, "How many images are of publicly accessible art, such as murals, street art, or publicly funded art?" A randomizing program, random.com, was used to generate a random ID list of 105 images representing a 10% sample set of the images within San Francisco. The images were reviewed and categorized as art, galleries, or personal. The art classification indicated an image was publicly accessible. Images classified as galleries comprised pictures from art galleries, museums, and fairs. These images may be time sensitive or require admission, but contain pictures of art. The remaining images consisted of pictures of people, food, personal artwork, or other content not relevant to publicly accessible art. Table 2 shows the results.

Table 2. Instagram Images by Category

| Category | # of Images | % of Images |
|-----------|-------------|-------------|
| Art | 67 | 64% |
| Galleries | 24 | 23% |
| Personal | 14 | 13% |

Almost two thirds of the image content was of publicly accessible art, with an additional 23% being art related but restricted by time or venue. Only 13% of the sample content was not relevant for the purposes of documenting public art.

5. Conclusion

Analysis of the SFAC institutional public art dataset reveals flaws with positional accuracy for many of the POIs. Useful data for engaging users and providing way-marking clues such as visual images or descriptions are missing. The dataset is incomplete from an institutional perspective. There are also many other publicly accessible art works within San Francisco.

The iPhone data capture simulates the geolocation accuracy possible for VGI images submitted to social media sites. The iPhone feature locations were within close visual range to the peer reviewed VGI GPS locations for features. This suggests that art POIs from reviewed VGI as well as social media sources can provide more accurate location for features than the SFAC dataset. While VGI may not have the same attributes as an institutional data set such as title, artist, or medium, VGI can complement and supplement institutional datasets with images of art features and greater location accuracy. A review of the Instagram data images showed that search terms can be refined to return a high percentage of relevant images.

VGI improves the overall accuracy of the application and provides guidance for correcting institutional data. Mapping social media provides a dynamic set of art data points that change daily and provides a glimpse of what public art is engaging the public.

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