Imagining Macondo: Interacting with García Márquez's Literary Landscape

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I magining Macondo is a public artwork that commemorates Nobel Prize-winning author Gabriel García Márquez. It was first showcased at the Bogota International Book Fair in April 2015 to an audience of more than 300,000 over the course of two weeks. The project involved extensive collaboration between an international team of artists, designers, and programmers. This article explores the historical and artistic contexts for the creation of the work, discusses the audience reception to the work, and describes the significant software and production requirements necessary to create an installation with thousands of participants and hundreds of thousands of viewers.

Background and Production

The International Book Fair of Bogota, one of the largest book fairs in the world, celebrates the role of literature in Latin American culture and its importance to the people of Colombia. The Colombian author Gabriel García Márquez, who died in 2014, is one of Latin America's most beloved novelists; his widely acclaimed creative work earned him the Nobel Prize in Literature in 1982. For the 2015 Book Fair, the Colombian Book Chamber paid tribute to this renowned author by creating the Macondo pavilion. Macondo is a "literary village" created by García Márquez, whose work typically incorporates a geographic setting in Colombia or the Caribbean. Macondo appears in several texts, but takes an especially prominent role in *One Hundred Years of Solitude*, which tells the interwoven stories of several generations of characters living in the village over a period of one century.[1] The enormous popularity of *One Hundred Years of Solitude* propelled this fictional town of Macondo into the global zeitgeist.[2] *Imagining Macondo*, featured in the Macondo pavilion, functions as an immersive trigger for the imagination and integrates García Márquez's literary themes and technologies of the 21st century by focusing on the interaction between text and image.

The Imagining Macondo project is a collaboration among media artists George Legrady, Angus Forbes, and Andrés Burbano, who assembled creative teams in Santa Barbara, Chicago, and Bogotá, respectively, to coordinate the development, implementation, and installation of this highly complex project. Although the artists worked together to make all creative decisions, the work was loosely split into a series of production, design, and implementation tasks that each artist was responsible for. In addition to the three primary participants, additional key collaborators included designers, producers, and programmers.

Burbano worked with a group of authors and literary scholars to identify eight key concepts that captured essential themes related to the world of Macondo: love, violence, home, landscape, memory, celebration, food, and character. *Imagining Macondo* invites the audience to connect these themes to their own world by allowing viewers

Figure 1. Users interacting with the *Imagining Macondo* installation during the 2015 Bogota International Book Fair. As part of the installation, photographers Nereo López, Camilo Rozo, and Stephen Ferry contributed seed photographs that translate literary themes from Gabriel García Márquez's novels into photographic images.

to submit photographs that represent "their own Macondo" and to label their submissions with one of the eight thematic concepts. This process of attaching words to images parallels events in *One Hundred Years of Solitude*, in which people forget the names of objects in the world around them and are forced to write notes in order to navigate their surroundings. Both to provide guidance to participants and build a connection between images and text, three photographers were invited to contribute a set of "seed" photographs that translate literary themes into photographic images, including Nereo López, Camilo Rozo, and Stephen Ferry. Figure 1 shows a photo from the opening night of *Imagining Macondo*, featuring seed photos by each of these photographers. (See the "Seed Photographers for *Imagining Macondo*" sidebar for details about the photographers.)

Description and Implementation

The development of *Imagining Macondo* required synchronization amongst the multiple teams. In Bogota, Burbano organized the set building and defined the staging within the pavilion. In Santa Barbara, Legrady developed the main visualization concept and worked with designer Juan Escalante to define the look and feel for the user interface. Forbes produced the interactive visualization and worked with the software engineer and information artist Paul Murray and user interface programmer Lorenzo Di Tucci to create the frontend

and backend software, including a mobile user interface and an animated visual installation.

Set Design and Staging

Imagining Macondo was projected onto a large, custom-built curved screen in order to match the circular layout of the pavilion and foster an organic experience that encouraged public circulation. The height of the screen was 3 meters and the width of the curve had a 10-meter arc and a 7-meter segment; the screen utilized a special textile for back projection that preserves brightness and distributes the light uniformly. The surfaces around the projections were painted or covered in black, causing a sharp contrast between the dark space and the 15,000 lumen projectors and creating the illusion that the video projection was floating in space. Kiosks containing iPads were placed in front of the screen, enabling users to interact with the visualization via a custom user interface installed on each of the iPads. Figure 2 provides a view of how the installation was staged.

User Interface

The user interface consists of a mobile-optimized website that allows a participant to submit and classify a photograph of their choice. After taking a photo (or choosing an existing photo stored on their phone), users are guided through a series of pages that allow them to label their photograph with themes, characters, and attributes based on

Seed Photographers for *Imagining Macondo*

The *Imagining Macondo* installation incorporates the work of three photographers on topics related to themes in García Márquez's novels. At 95 years old, Nereo López is a living legend in the world of Colombian photography and photojournalism. A contemporary of García Márquez, he was the cameraman and played the protagonist for the most influential surrealist film made in Colombia, *La Langosta Azul* [The Blue Lobster]. López has created images of the Colombian Caribbean that share an uncanny resemblance to the scenes described in García Márquez's novels. Camilo Rozo is an accomplished young Colombian photographer who has taken up the challenge of portraying some of the most influential artists and intellectuals in Colombia using colorful images that have a rich visual impact and include a sense of cultural significance. Rozo's photography has taken him into the depths of his home country, and he has recently begun work producing a book of photography related specifically to Macondo, based primarily in the Colombian Caribbean and particularly in the town of Aracataca, the birthplace of García Márquez. Stephen Ferry, originally from Boston, has devoted much of his career to portraying Colombia's history of political conflict. Ferry has worked for National Geographic and has received countless international awards for both his creative work and his commitment to human rights. Ferry's photography captures the essence of Colombian culture while simultaneously conveying a sense of magical realism that is inherent in the literary worlds crafted by García Márquez.

Figure 2. *Imagining Macondo* installation. This photo depicts the curved screen used to project the animation and the interactive kiosks for submitting images.

One Hundred Years of Solitude, which is then uploaded to the installation. After submitting a photograph, users can select one of eight themes, which are the eight concepts selected by experts in literature, described earlier. If the characters theme is selected, the user is then presented with a list of 12 of the most important characters from *One Hundred Years of Solitude*. Finally, users are presented with "semantic differential" attribute sliders[3,4] that allow them to label their photographs along five dimensions, where each dimension consists of two opposing attributes that capture the characteristics of objects in the world of Macondo. These dichotomies allow users to classify their photos within one of the following ranges: real to magical, mythical to historical, literary to journalistic, natural to cultural, and remembered to forgotten.

Figure 3 shows each page of the mobile user interface during the process of selecting, labeling, and submitting a photo. Two versions of the user interface were created, in English and Spanish. Once a user submits a photo along with the user-determined metadata, the data is added to a database within a few seconds, which in turn is incorporated into the animated visualization.

Visualization

The visual component of the installation is digitally projected onto two large screens and runs continuously throughout the installation. Figure
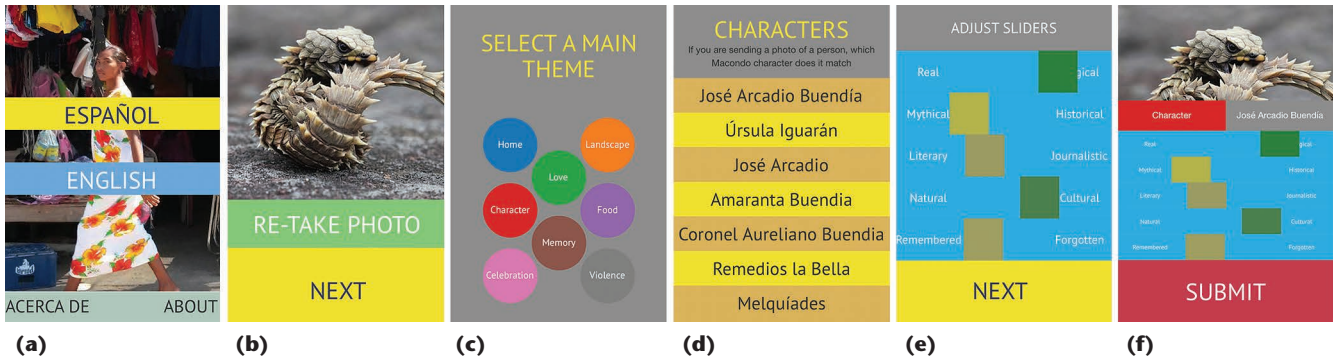
Figure 3. Screenshots of the *Imagining Macondo* mobile user interface. The progression of pages presented to participants included pages for (a) language selection, (b) choosing a photo, (c) theme selection, (d) character selection, (e) setting the attribute sliders, and (f) submitting the photo and metadata to the installation.

4 illustrates the steps described in what follows. The visualization utilizes Teuvo Kohonen's self-organizing map (SOM) algorithm[5] to organize the photographs in terms of the themes and characters we mentioned earlier. The SOM is an unsupervised clustering algorithm that produces a 2D representation, or map, that is based on a set of training data. SOMs are often used to produce low-level visualizations of high-dimensional data, and they effectively reveal the topology of a high-dimensional input space.[6] For instance, a SOM was used to find clusters within over one million documents from Usenet newsgroups.[7] SOMs have also been used extensively in meteorology and oceanography, and studies have shown that using a SOM to map complex meteorological data into two dimensions is often more useful than using other common dimensionality reduction techniques.[8] SOMs have also been used in innovative biological visualizations, where they help produce uncluttered views of complex biological interaction data.[9] *Imagining Macondo* makes use of a SOM algorithm to place labels and photographs on top of a large colored grid, where each square in the grid represents a node in the network of nodes that are used by the algorithm to dynamically create thematic clusters.

The visualization includes three phases that proceed continuously, one after the other: the characters, themes, and attributes phases. Each of the three phases uses a distinct set of labels that are used as training data for the SOM algorithm, and which in turn create a map that is used for photograph placement. At the beginning of each phase, each node is initialized with a random weight vector of length equal to the vector lengths in the training data, and each dimension of a vector is scaled to fit into the range [0, 1]. Throughout the visualization, each node's fill color is determined by reducing their current weight vector to a hue angle in HSL space using a color function, which differs depending on the phase. The grid of nodes is at first randomly colored; the color of each node

in the grid is updated after each iteration of the SOM algorithm. Distinct clusters of color begin to appear as the SOM algorithm proceeds and as the topology of the SOM emerges.

In both the characters and themes phases, the training data are a list of labels (character or theme labels), where each label's weight vector is an arbitrary integer between 0 and *n*, where *n* is the number of labels in the current phase. In the attributes phase, the training data includes 10 labels, two per attribute slider (one for each end). The weight vector for each attribute label is a 5D vector, where the dimension that includes a given attribute is maximized in the direction of that attribute. For example, the attribute label Natural belongs to the slider that includes the dichotomous attributes Natural and Cultural. In this case, Natural is mapped to a value of –1, and Cultural is mapped to a value of +1. Because this slider is in the fourth position (relative to the other sliders), it is represented as the fourth dimension of the attribute label's weight vector. Thus, the weight vector for the Natural attribute label is [0, 0, 0, –1, 0]. In each of the phases, the hue value for each node in of the phases is colored based on the node's weight vector.

At the beginning of each phase, the grid of nodes is reset, and the SOM algorithm begins anew. The SOM algorithm proceeds by using bootstrap sampling on the set of labels associated with the visualization's current phase. At each time step, one label is selected at random, and the best-matching unit for that label is found. The best-matching unit is the node with a weight vector that is closest to the given label's weight vector, where the distance is defined by the Euclidean distance metric.

Once the best-matching unit is found for the selected label, each node's weight vector is adjusted toward the current label's weight vector according to a neighborhood function. The neighborhood function is an exponential decay function that is used to adjust the weights for the nodes near the best-matching unit. The neighborhood function
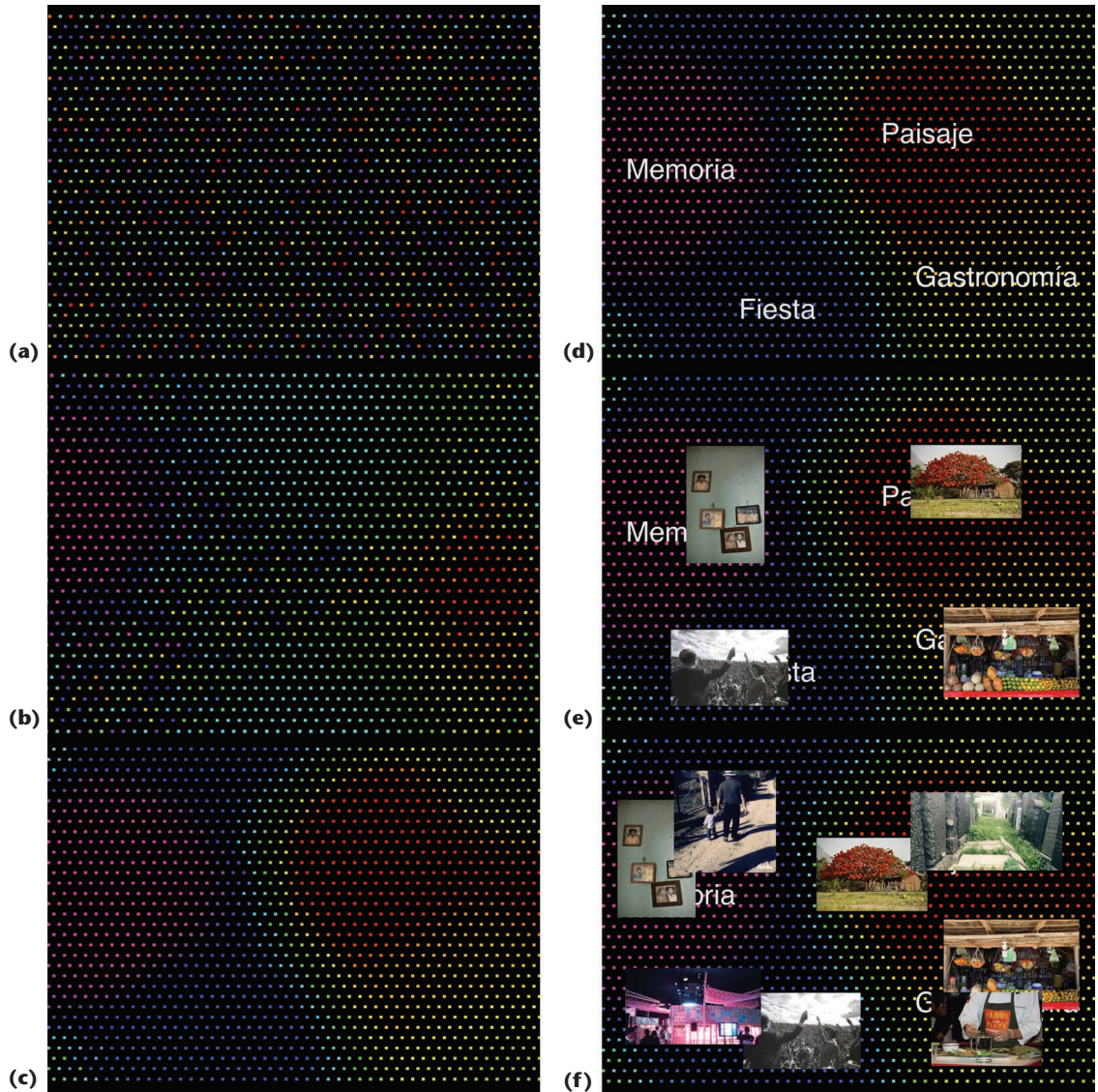
Figure 4. Details from the *Imagining Macondo* animated visualization. (a) The self-organizing map (SOM) algorithm starts by assigning random weight vectors to a grid of nodes. (b) After several iterations of the SOM algorithm, clusters begin to appear. (c) Once the clusters converge, the SOM algorithm ends. (d) Labels are placed on top of the map. (e) Seed photographs from the three contributing photographers are placed on the SOM. (f) User-submitted images are placed on top of the previously placed images. As images are placed, a force-directed algorithm allows new photographs to push old ones out of the way, preventing excessive overlap.

includes an additional learning coefficient that decreases monotonically with each additional SOM iteration. In other words, a given node's neighborhood weighting decreases as the number of iterations increases, which allows the SOM to stabilize as time goes on.

After the SOM algorithm has finished running (after a predetermined number of iterations), textual labels fade in and are positioned over the grid, followed by the seed images and finally followed by user-submitted images. Labels and images are placed by locating the best-matching node for that label or image, using the same technique described earlier: by finding the smallest Euclidean distance between weight vectors. Once a best-matching node is found for a given label or photograph, that node is marked "occupied," and each node cannot be occupied by more than one label or photograph at once. Because labels and photographs are large relative to each node's size, they are also fed (as nodes) into a force-directed algorithm.[10] In this algorithm, each node has a *charge value*, which is calculated relative to the size of the label or photograph occupying that node. Thus, larger photographs will push other photographs out of the way, preventing excessive overlap.

In this manner, labels are placed on top of the map generated by the SOM algorithm. After a

pause, a random selection of 30 professional seed images is placed over the labels. The nature of the SOM algorithm means that images with attributes that match a particular label are placed close to that label. Finally, the 30 most recently submitted user photographs are placed on top of the professional images. Although the themes and attributes phases both select from the set of all user-submitted photos, the characters phase shows only user-submitted photos that are labeled with the characters theme. After the user-submitted photographs are presented, there is a pause, allowing spectators to appreciate the display. Finally, the photographs and labels faded away, and the visualization proceeds to the next phase.

System Details

Both the visualization and user interface were hosted on a Node.js server. The visualization and SOM algorithm were written as a client-side JavaScript module using the D3 JavaScript library.[11] When users submitted a photo, the original was saved and a smaller, compressed copy was made for use in the visualization, which reduced file sizes and server load. Photo metadata was stored in a PostgreSQL database, which was queried at the beginning of each phase of the visualization. The open, Web-based nature of the *Imagining Macondo* user interface allows participants to easily access and contribute to the installation. Each submission was archived, and a publicly accessible website (see http://macondo.net.co/archive) allows visitors to interactively browse the user submissions along with their metadata and to discover sets of similar photographs across the thousands of submitted photos.

Artistic and Cultural Contexts

For more than three decades, George Legrady has explored issues related to archiving cultural data and examining how public artworks can function as investigations into the tensions and opportunities between cultural content and data processing technologies.[12,13] Angus Forbes' research investigates the visual display of information, and his artwork features novel reinterpretations of text, music, and video.[14-16] As a media archaeologist, Andres Burbano explores technology as a fundamental component of culture, understanding that history needs to be continuously re-elaborated in the present by both domain experts and citizens.[17] Burbano's interest in Latin American cultural history provided the original motivation for developing this project.

In addition to its contextualization within the focus of the Book Fair and the work of Garcia Marquez, *Imaging Macondo* is also influenced by a rich history of Latin American experiments in both literature and media arts. One of the most influential examples of a Latin American writer who has had an impact in the world of new media and interactive art is the Argentinean Adolfo Bioy Casares.[18] Casares wrote *The Invention of Morel* in 1940, which clearly anticipated novel concepts like virtual reality and augmented reality. This short novel inspired extraordinary films, such as *Last Year at Marienbad* by French director Alain Resnais. Casares' novel also proved influential to artists who worked with immersive systems in the 1990's, such as Maurice Benayoun.[19,20]

In Latin America, there are several interesting examples of artists working at the intersection of literature and new media arts to create literary, artistic, and technical experiments using emergent media. Examples include works based on holographic technology like the *Holopoems* exhibit created by Eduardo Kac[21] or the experimental poems that used the Minitel (also in Brazil in the 1980s).[22] In a separate field, several important interactive works by media artists are based on texts by renowned writers. One of the most compelling examples in this category was created by Santiago Ortiz, who developed an interactive visualization focused on patterns found in the novel *Rayuela* by Julio Cortazar. Through this project, Ortiz effectively demonstrates how *Rayuela* anticipated the concept of hypertext.[23] Throughout his life, García Márquez produced literary works that substantially impacted the art world, inspiring countless works in photography, painting, theater, and film. However, to our knowledge, *Imagining Macondo* is the first media arts installation directly inspired by the literary work of García Márquez.

Both by virtue of its computational methodology and its use of thematic clustering, *Imagining Macondo* poses questions about the act of categorization. Taking a photograph is an intentional cultural act that is contextualized, whether inadvertently or not, by meanings among multiple dimensions.[24] Although the use of the SOM attempts to position the photos in such a way so as to identify, rather than obscure, these contexts, the installation nonetheless highlights certain aspects of the photos at the expense of others. This is a fundamental issue in the information sciences,[25,26] but its occurrence takes on a greater significance when dealing with matters of digital heritage.[27] Indeed, a recurring theme in *One Hundred Years of Solitude* is the relationship of individual memory to cultural memory; García Márquez's writing often

Figure 5. User-submitted photos. A visitor to the Macondo pavilion prepares to take a photo to submit to the *Imagining Macondo* installation.

explores the ways in which and the reasons why the retelling of stories can mythologize and distort history.[28] These topics are also relevant to the contemporary sociopolitical climate in Colombia as the country decides on the value of transitional justice and begins the complex process of truth and reconciliation.[29]

Audience Reception

In 2015, the International Book Fair of Bogota had more than 500,000 attendees, the most in its history of over 30 years. According to the official documentation tally, the attendance during the two weeks of the Book Fair, there were 318,000 visitors to the Macondo pavilion, and nearly 14,000 photos were submitted to the *Imaging Macondo* installation. The Macondo pavilion had an unprecedented impact on the national and international press. It allowed the public to immerse themselves in a complex and multifaceted series of experiences and interactive installations, including *Imagining Macondo*. The pavilion enabled the exploration of a novel that is one of the most beloved aspects of Colombian culture as well as one of the most valued literary works in the world.

Once the installation was in place, it quickly became clear that the characters theme was the most popular for labeling photographs. The majority of participants captured their own portrait and, using our user interface, associated their own image with one of the 12 characters in *One Hundred Years of Solitude*. By the end of the Book Fair, more than 9,000 selfies had been submitted, each representing one of the characters in the novel. This overwhelming tendency of the public to make connections between themselves and the inhabitants of Macondo reflects perhaps the deep emotional connections between the Colombian people and García Márquez's characters. The audience reception of the installation will be further analyzed using the archive of

photos stored in the database, and future iterations of the project will explore ways to elicit more evocative juxtapositions between user content, seed photography, and García Márquez's literary themes. Figure 5 shows an example of when a majority of the most recent user-submitted photos appearing in the visualization are selfies.

At the press conference that introduced the opening of the Book Fair, García Márquez's biographer Gerald Martin[30] stated that Macondo is the literary realization of the idea of the Global Village popularized by Marshall McLuhan.[31] This phrase is also appropriate as a way to introduce the Imagining Macondo project, not only because it helps to contextualize the literary themes in the installation, but also because it accurately describes the community of artists, designers, scholars, and writers from different parts of the world who came together to participate in this unique event. ❧

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