R Scuti:
Creative Star Data Visualization

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ABSTRACT

R Scuti is an audio-visual installation that proposes the transposition of astronomical data into an exhibition environment, using star observation records from AAVSO database. The collected information, which corresponds to more than a century of observations, were digitally converted to sound patterns that materialize through cymatics on a water surface. This surface receives a light focus, which reflects the moving waves and creates luminous patterns on the room's ceiling. The present text acquaints the concept, creation details, and contextualization of R Scuti in the scenario of poetic data visualization, which took shape in this project from the interdisciplinary dialogue between art, science, and technology.

KEYWORDS

Art, Astronomy, Cymatics, Installation, Light, Science, Sonification, Technology

INTRODUCTION

The Realidades Group[1] addresses the theoretical and conceptual aspects of image production processes that belong to models of different natures. The group also produces poetic systems that question different patterns of representation. The crossing between scientific and artistic production enables interdisciplinary artworks. This article aims at documenting the creation and development of *R Scuti*[2], authored by this group in 2019. Therefore, it demonstrates the aesthetic and critical potential of the partnership between art and science, as well as it contextualizes the topic of data visualization from a poetic perspective. The work is the first of a series entitled "When the Stars Play[3]", carried out by the group.

The author-members of R Scuti are (in alphabetical order): Beatriz Murakami, Bruna Mayer, Cássia Aranha, Clayton Policarpo, Dario Vargas, Loren Bergantini, Marcus Bastos, Sergio Venancio e Silvia Laurentiz. Rodrigo G. Vieira was the collaborator astronomer.

A Poetic Data Visualization

Today, a great challenge for artists, and even researchers from other areas, is data visualization (Laurentiz, 2013, 2019). Data visualization is, by its nature, an interdisciplinary field that encompasses programming, visual perception, design and statistics. The challenge for the research group is to investigate new data visualization techniques based on a poetic approach. There are many artworks that can contextualize this issue. The following cases raised important questions for the development of *R Scuti*.

The Football Drawings (1982) by Susken Rosenthal[4], for example, shows traces (drawings) of ball movements during a soccer game through an aerial point of view of the field. These lines provide an understanding of something that was not perceptible before through other representation models. Each drawing is the register of a specific match, as the final match of 1986 FIFA World Cup of Argentina versus German. As explained on the project website, it works like a seismographic sketch. The ball movements are drawn simultaneously to the action on the field. The result is a shuffling of lines, which create different densities as the game progresses. This happens in a strict time (90 minutes) and space (Soccer field).

Although it is categorized as *Pattern Recognition* in Manuel Lima's research *Visual Complexity* (2011)[5], *The Football Drawings* resonate in different areas, as the author adds on the project's website: "at the same time these graphic series are a work of abstract art". What is curious, and even unusual, is that the drawings were hand-made. They were created by placing white paper sheets on top of the screens that displayed the recorded video of the games. The paper surface had enough transparency to allow the recognition of the ball's position, so its path could be traced manually by following the movement of the ball during the match. In other words, although there is a wide exploration of programming strategies, visual perception, design and statistics in this research field, *The Football Drawings* demonstrates that concerns about the structure of data visualization are independent of sophisticated digital technology. So, it establishes other parameters for the area. What both digital and manual representations have in common is the conditioning of strategies to visualize a lot of dynamic data, observed in a certain period, and that were systematically organized to allow the perception of something that had not been perceived before.

On the other hand, *Celestial Mechanics* (2005)[6] by Scott Hessels and Gabriel Dunne, is a work based on statistical, data and protocol visualization of aerial technologies. It is a planetarium-based artwork installation that visualises the paths and functions of hovering, flying and floating machines in global skies. The sky is full of aircrafts such as the ones that transport people, perform utilitarian tasks, help in communications, promote military missions, or even some that wander above us like space debris. This work combines science, statistical display and contemporary art, presenting patterns and mechanical behaviour through a dynamic visual experience. In this case, the work would not be feasible without the use of technological innovations, since access to information depends on these resources.

Terrapattern (2016)[7], by Golan Levin, David Newbury and Kyle McDonald, is an artwork created to offer an unusual image search engine opportunity from the motivation to explore "unmapped" and "unmappable" spaces. *Terrapattern* provides an interface that allows the search for pictures of different locations based on visual similarities with a chosen original location of interest.

Computer Vision and Deep Learning techniques help the user to find similar visual patterns on satellite images. It allows the discovery, location and labelling of typologies that are not normally indicated on maps. In this way, it is possible to track and characterize indicators that were not previously detected or measured. It is important to highlight that the system was not trained on any specific category, it only recognizes a common formal (visual) characteristic between images. Therefore, the formal relations created between different places ends up by showcasing a new perspective about these territories.

Land Lines (2016)[8] by Zach Lieberman and Matt Felsen invites the visitor to explore satellite images from Google Earth through hand gestures. Machine learning and line detection algorithms

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