Creative Coding in Public Spaces preparation

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Abstract

The development that took place in the beginnings of the twenty-first century, and the raising of the digital revolution, created a new thinking approach in the field of public spaces. The new opportunities brought by the revolutionary digital era have its own considerations in the processes of intellectual and design creativity. This provided technological and digital applications that were able also to establish an innovative and imaginative capability, which give the designers a completely new artistic tools, and creative conceptual approaches. The software and programming media for creative coding are considered of the most important techniques used in artistic and entertainment works. The beginning of using programming and applications in the artistic field goes back to the fifties of the twentieth century. Creative coding is a type of artistic practice that aims to create art works through computer, whereby the artists and designers, with the help of developers, write specific codes that produce artworks created through the computer, and these outputs include variables artistic elements; paintings, models, space processing works and all visual arts images, including new interactive arts and multimedia artworks. Therefore, the research paper urges designers to pay attention to these innovative techniques and capabilities underline this new approach. There are many programming media that can be used as platforms for creative coding, which include; the Cinder Library, Max Language Platform, Processing IDE Platform, and Arduino Platform. Each of these platforms has a set of distinctive characteristics that makes it mostly suitable for technical applications and specific programmatic & electronic type. The paper objectives are to emphasize that environmental designers should have to be familiar with modern methods, techniques and new digital trends in creating artistic works to present a contemporary and environmental designs in general and the installations in public spaces in particular. The research aims to prepare a methodology to take advantage of creative coding methods, techniques, and media in the environmental installations in public spaces. The research followed the deductive analytical method. The research concluded, through its analytical study, that it is necessary to follow specific methodology to achieve innovative design-works in public spaces. The paper presented a road map for designers and artists by suggesting a set of standards which highlight the great advantages of using creative coding in public spaces installation.

Key Words

Introduction

"A Public space" is an important entity in our urban life, it helps us relax and to be part of the society itself, as Stephen Carr says in his book "Public Spaces": "When public spaces succeed, they increase the chances of participating in community activities". [10] People from different cultural groups can come together in an enjoyable experimental context, and public spaces became more meaningful and socially wise. The public space gives a sense of freedom and security to people in society so that they don't view the space as a threat. Therefore, public spaces must create more interactive environments so that people can participate in it. There are many means to do this, and this Paper mainly discusses one of the most important techniques in this field, which is **"Creative Coding"**. In This Paper, the researcher aims to discuss the techniques and methods of creative coding as one of the modern creative practices that depends on its innovation and creation on computer programming in order to reach results that allow the designer and artist to Create interactive artworks and designs in the field of designing public places.

Research problem

The research problem lies into the absence of a specific methodology for utilizing the philosophy and techniques of creative coding in in the field of designing public places.

Research goal

The research aims to find a methodology to benefit from creative coding techniques and using multimedia in designing built environment and public spaces.

Research importance

The importance of the research is that it sheds the light on the importance of the modern methods, techniques and trends of **"Creative Coding"** for the environmental designer in order to Create creative artworks, and to use them in presenting a contemporary vision of environmental design in general and in designing public spaces in particular.

Research Methodology
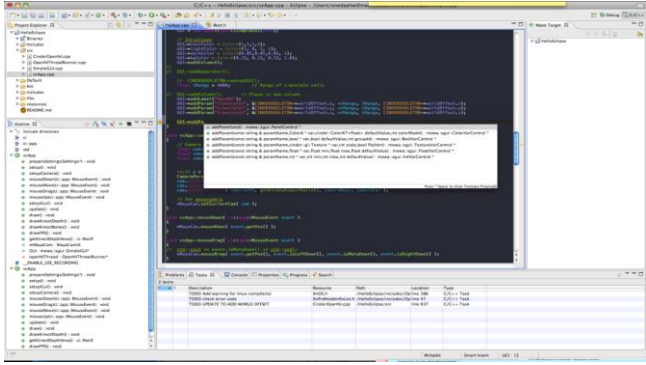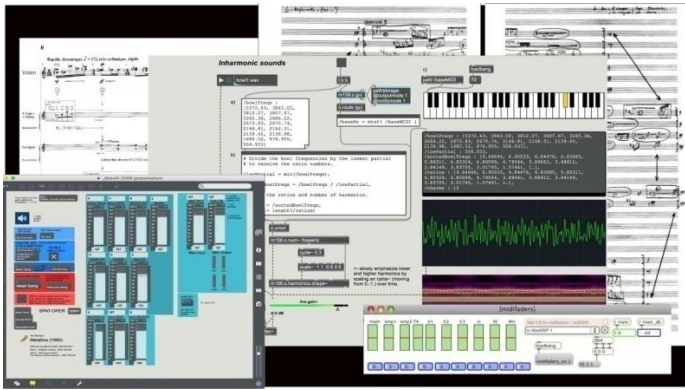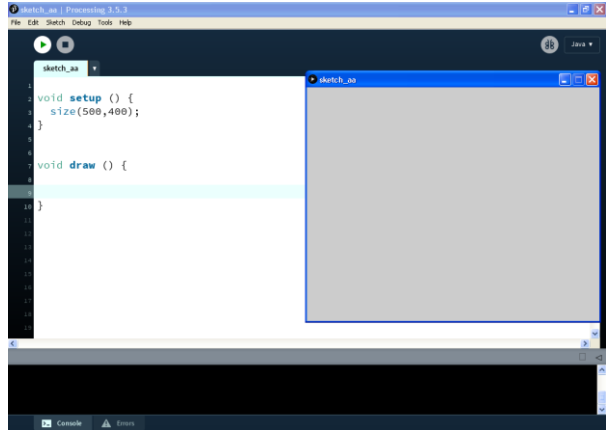
The research follows the deductive analytical approach.

First: Creative Coding

The Concept of Creative Coding … and an Overview History

Since the beginning of the twenty-first century, there has been an increase in interest in using programming as a mean of producing artworks, as many programming media applications have appeared, that turn out to be suitable for designers and artists, and allow them to benefit from computer programming techniques in the production of their various artistic works. Creative coding is a type of computer programming that aims to create expressive applications instead of functional ones, as computer programming is used to create visual applications in the fields of art and design, and these applications include artworks, entertainment works, installation works, media works, and product models, … etc. [5]

Creative Coding Platforms

There are many programming and media software that can be used in building creative coding works. The researcher described some of the most important platforms used by creators and artists to create digital works that use the concept of creative coding, and the following is an overview of these Platforms:

Describtion	User Interface
1- Cinder Liberary It is an open source programming library for C++ language. It works on various operating systems, which includes Linux, IOS and Windows. Cinder has proven itself in creating many creative coding works, and it is an ideal tool for learning the principles of creative coding.	 Eclipse C ++ cinder library. [5].
2- Max Software It is a graphic compositing program for music and multimedia, that first appeared by Miller Puckette in the 1980s, and was developed and maintained by Cycling '74 in San Francisco. Max has been used by composers, performers, program designers, researchers, and artists to create recordings and performances. [9]	 Max integrated developing environment.
3- Processing IDE It is an Integrated Developing Environment(IDE) specifically designed for electronic arts, digital media arts and visual design with the aim of teaching non-programmers of artists and designers the principles of computer programming, and it relies on the Java language. The Processing platform is	 User interface for processing IDE.

also distinguished by its specialization in visual applications, the simplicity of its code and its proximity to the terms of art and visual design. [3]	
4- Arduino Platform It is an electronic platform - open source software based on easy-to-use hardware and software. Arduino boards can read various inputs such as reading the intensity of light from a sensor, recognizing a finger press on a pressure switch, or reading a message from Twitter - and converting them into outputs such as play an engine, lighting a lamp, or posting something on internet. [14].	Embedded Arduino development environment

Table (1) shows some of the different creative coding platforms and interfaces.

Second: Study of Public Spaces

The Concept of Public Spaces

Public spaces are those social spaces that are open and available to everyone. They are the most comprehensive elements of the environment and the most related to people. Some see it from the common framework in which the various activities related to society in general are practiced, whether in daily lifestyle, special occasions, or other activities, and there is a homogeneous overlap of the elements of natural environment and the elements of built environment in them, in addition to what it constitutes of the excitement of all basic human senses. [1] The researcher has adopted a comprehensive definition, as the researcher defines it as: Those places that are open and available to the general people to practice various life, social and practical activities. Public Space includes (public parks, squares, streets, playgrounds, nature reserves, shopping centers and inner spaces for neighborhoods. [4]

The Characteristics of Well Designed Public Spaces:

Public spaces may be a gathering place, a part of a district, a place in the center of a city, a private area, a waterfront, or any other area within the public domain that helps enhance social interaction and creates a community. The characteristics of good public spaces as mentioned by the American Planning Association[9] are :

• It promotes human contact and social activities.

- It must be safe for public, and welcoming to them, and it can accommodate all users.
- Impressive visual interest through good design and construction mastery.
- Promotes community participation.
- Reflects the local culture or history.
- It is well associated with augmented uses.
- It is in good condition.
- It has a significant design personality.

Third: the Deductive Analytical Study.... Analyzing and Deducting a Methodology for Preparing Public Spaces Using Creative Coding

The Relationship between Creative Coding and Public Space Processing:

The previous study reflects many aspects of creative coding and public spaces. Through that study it was found that creative coding is a type of artistic practice that aims to create works of art by computer, and these outputs vary that can include paintings, models, installation works, and all forms of visual arts, including interactive and multimedia arts. Below is an analytical study of these outputs for some examples of creative coding work.

1- Analytical Study of some Examples of Creative Coding Work

Programming for creative coding has many shapes and here comes the main question of the research "what are the technical outputs of that type of programming practices?". The researcher analyzed and described some of the creative coding works by using several different software platforms, to determine their programmatic structure and their outputs of art and design:

First Artwork		
Description		**Model**
Art work data	The first work, is called "Luma" produced by Kevin Siwoff and Lisa Park.	
Platform	Cinder platform.	
Description	The artwork consists of a group of interactive light units that respond to sound and are inspired by "A natural phenomena" which is children's fairy tales. Each model consists of a giant block of millions of fiber Optical strings illuminated by indoor lamps when activated by sound.	

Second Artwork	
Description	**Model**
Art work data	The second artwork, "Aether" was created by Thomas Sanchez and Gilberto Castro.
Platform	Cinder platform.
Description	This is a series of studies for the geometrical analog, and the Dynamic Interactive Particles, as it can be displayed on a large screen, as It allows users to explore digital sculpture manipulation techniques with it. [15]

Third Artwork	
Description	**Model**
Art work data	The third work, "volume" was created by the New York City Art and Architecture Team Soft Lab.
Platform	Processing platform.
Description	It is an installation consists of a network of 100 identical panels and installed mirrors, and there is a group of cameras working to monitor the audience of viewers and then the artwork responds by rotating the mirrors to face the closest person to it, and the LED lights that work independently according to the existing sound in the context of the work. [18]

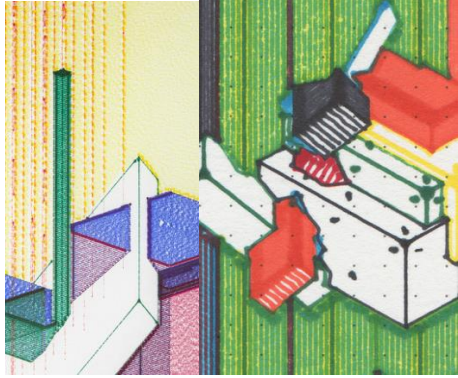| Fourth Artwork	
Description	**Model**
Art work data	The fourth artwork is called "The Possible Structure, Reasonable Void, Probable Sculpture", produced by Miguel Nóbrega. [16]
Platform	Processing platform.

Description	It is a set of three series of equally-sized graphics generated by coding, through which Miguel explores a link between the iterative aspect of algorithms and the topological aspect of modern architecture, with each drawing representing a unique diversity in the same set of rules and random decisions are taken carefully.	

Fifth Artwork		
Description		**Model**
Art work data	The fifth artwork is "PLAY".	
Platform	The work was implemented based on Arduino Platform	
Description	It is an interactive installation where the shadow is used to play with falling objects. This artwork was accomplished by a group of design students in the context of the Interactive Modeling Media Course at the Department of Computer and Information Sciences at the Norwegian University of Science and Technology (NTNU). [9]	

Table (1) Analytical study of some creative coding models used in public places.

2- The Suggested Methodology (by the researcher) on how to benefit from Creative Coding Media in supporting the Environmental Public Space Design.

From the previous analytical study of the essence of creative coding and designing of public spaces, the researcher finds that using such digital techniques support and improve the outputs of the environmental design. The Public Spaces can also benefit from creative coding, where creative coding practices can be used.

Stages of Designing Public Spaces by making use of Creative Coding (Model Suggested by the Researcher)

Spatial design represents a mixture of art and design practices. Accordingly, the research proposes a series of stages that help the environmental designer in designing public spaces to benefit from creative coding techniques and media. These stages can be summarized as follows:

● **The first stage:** Studying the targeted public space and determine the most important features that distinguish it, including all users and the most important activities that take place at it. This stage ends with determining the most important requirements to be provided in the spatial design.

● **The second stage:** Finding out the planning, philosophy, or artistic way for the environmental design in the specific public space, through the presented context and in a way that does not conflict with its distinctive and predetermined features in the previous stage, and in a manner that meets the spatial requirements to be provided by it.

● **The third stage:** It is the translation of the philosophy of artistic work formulated in the previous stage in the form of an idea or a general conception of what the space should be, and at this stage it is not required to adhere to any medium or pillows dedicated to setting this perception.

● **The fourth stage:** It is the identification of creative coding platform which is suitable for the previous visualization, which can be utilized in its realization in a large proportion. It is likely at this stage to identify more than one proposal for those media. In general, the spatial design depends on many artistic outputs, which include paintings, murals, and installation works, it is not possible to achieve all of these outputs based on one medium only.

● **Fifth stage:** Achieving the design concept formulated in the third stage, depending on the media specified in the fourth stage, and this stage is largely technical, as it relies on coding and preparing the various physical and software media necessary to build, realize and operate the design concept.

● **Sixth stage:** Evaluating the concept after completing its formulation and reviewing it before presenting it to recipients. It is preferable at this stage to seek the help of the elite of installation artists and art connoisseurs before submitting the final concept in order to determine the extent of the readiness of the space as an artistic and design work for the context presented through it, and in the case of positive results, the preparation is presented, in case of negative results we return to the previous stages. Figure (1) shows a summary of those stages:

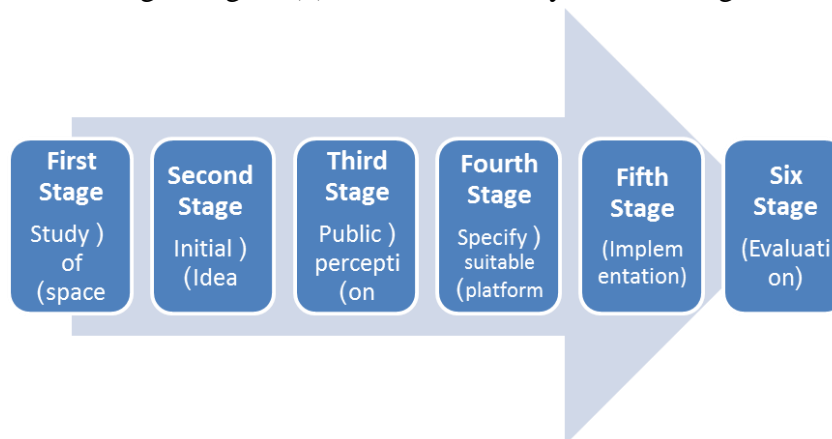| First Stage (Study of space) | Second Stage (Initial Idea) | Third Stage (Public perception) | Fourth Stage (Specify suitable platform) | Fifth Stage (Implementation) | Six Stage (Evaluation) |

Figure (1) stages of preparing public spaces to benefit from creative coding. (Preparation of the main researcher)

Suggested Standards for Creative Coding Platforms for Public Spaces (Suggested Model by the Researcher)

Given the study's findings of the multiplicity of creative coding platforms that can be used in the fields of arts in general, and given that no criteria were found to help the environmental designer to choose the most appropriate creative coding platforms for spatial design work in public spaces that are based on the electronic-software aspects mainly in achieving them, the research suggested a set of criteria that can be relied upon when selecting the appropriate creative coding platforms for those applications, which the research summarizes as follows:

Easy Learning	The easy learning and the use of the medium encourages practitioners of creative coding to continue these practices and acquire more knowledge and skills related to them. Providing an easy-to-use medium reduces the interest in technical aspects, which enhances the subjective aspect of the outputs of the environmental designing of public spaces.
Supporting various artistic applications.	The environmental design process output is varied and encompasses different forms of visual arts, so the medium used in the creative coding should support the greatest amount of artistic applications.
The ability to install on different devices.	Where the operating systems of computers differ, which may hold back practitioners and art students from achieving their artistic works due to the lack of the suitable software programs that can be used for operating systems, and to avoid this obstacle, several versions of the medium used must be available to suit the different systems.
Supporting advanced applications.	The arts and the design of public spaces are generally constantly evolving, so the techniques and media used in creative coding must keep pace with this development so that artists and designers can benefit from them in formulating their different perceptions appropriately.

Table (2) suggested Standards for creative coding platforms for public spaces   (Preparation of the main researcher).

Research Results

There are many spatial installations in public spaces, which were built on creative coding platforms that reflect the fusion of art and programming to produce a distinctive creative product. The role of creative coding is to improve the outputs of the environmental designing in public spaces, considering that the first is one of the means of art - that is, creative coding - and the second - that is, the designing of public places - is one of its outputs. The research discussed an analysis and deduction of the most important criteria for selecting the most appropriate creative coding platforms. Selecting the electronic space processing software for installation design in public spaces based on several points, including ease of learning, support

for various technical applications, the ability to install on different devices, and support for advanced applications. The creative coding platforms are selected based on its features best suited for the spatial installation work and to the electronic programming properties in public spaces.

The researcher concluded a (proposed) methodology to benefit from creative coding media to support the environmental designing in public spaces, which depends on several stages; starting with studying the public space, followed by determining the initial idea, then developing the general concept, determining the appropriate platforms, and finally the application and evaluation.

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