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Generating Personalized Abstract Art Paintings by using People's Life Energy Distribution

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Abstract – Data visualization, which is essentially the visual expression of data through mathematical calculations, is a highly effective method for transferring and understanding data. The right data visualization, selected or developed with data and people in mind, has an important role in improving the quality of conveying the relationships, meanings, information, structures and hidden properties of data to individuals from different fields of expertise and enables them to work together.

Data visualization has been a subject that has evolved and progressed in different ways throughout history and has finally reached today's computer technology and conditions. The improved facilities of today's computer such as high computing power has brought data visualization methods to a new horizon. Also the changing definition of the data has expanded the boundaries of the data visualization. Today, data is obtained from many different sources such as; IoT, Embedded systems, Social data, Business data and Real-Life data. This study is also inspired by the Real-Life, and a visualization system was developed based on real-life botanical trees and using humans as data.

Throughout history, computer science and other branches of science have used art as a subject in various studies. This study reunites science and art and proposes a way of expressing the human through art. Thus, an artistic visualization system was developed that uses the activities of people's lives as data and generates artistic visuals inspired by abstract art paintings. Through this study, a sub-art style was created with a visualization system that manages to produce artistic visuals by adhering to mathematical foundations.

Keywords *– Data Visualization, Creative Algorithms, Computational Creativity, Neural Style Transferring, Abstract Art.*

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I. INTRODUCTION

Art is a form of self-expression and a way of relating to the environment and the world, which is produced by artists in fields such as painting, sculpture, music and literature, using their creativity, inspiration and imagination to convey, experience and inspire others with various emotions, ideas and experiences. Art is a multifaceted concept that can take many different forms and serve many different purposes, revealing different perspectives and interpretations in people. **Visual Art** refers to art forms such as painting, sculpture and photography, which by their nature can be understood and perceived with the sense of sight instead of other emotions. As one of the forms of art, it can evoke different feelings and convey thoughts and inspiration. Throughout history, visual arts have been one of the most powerful ways for society and people to express themselves. **Abstract Art** does not attempt to create an accurate depiction of visual reality [1], instead abstract artists draw inspiration for feelings and ideas from visual references in the world and create non-representational or non-objective compositions using the language of shape, form, color, sign and line [2], which allows the artist to project anything they want through their work [3]. Arshile Gorky said "Abstraction allows man to see with his mind what he cannot see physically with his eyes." Because abstract art is not a recognizable subject, it is open to viewers to interpret the work according to their own experiences, feelings, perspectives and methods. **Visual Abstract Art** is a genre used by artists as a way to explore complex ideas or emotions that are often difficult to express in more representational forms, allowing them to communicate them in a clear and accessible way to a wide audience.

Algorithms can be used to create Art that reflects the developer's/artist's perspective as well as solve complex math problems. A creator can use the computer to create artifacts like a painter using his/her brush on the canvas. While in some of these applications, the computer is only responsible for calculating certain "creative" results that the developers want to achieve. In other applications, computers act/work like a partner of the developer and affect the journey of the creator. It reflects the computer's characteristics over the result, shifting the results that were designed and planned by the creator. This is regarded as Art created by an Artist (Developer) cooperated by a computer and examined under the subject Computational Creativity. Computational creativity may or may not involve Artificial Intelligence (AI). Image Generation/Image Synthesizing is the study of generating or

synthesizing images using different techniques including AI, Machine Learning, Creative Algorithms or/and Computational Creativity. Machine Learning based Neural Style Transferring (NST) methods are used to apply the style of an image to the content of another image. Some types of NSTs use Convolutional Neural Network (CNN) and Generative Adversarial Networks (GAN) in the background.

Researchers, Artists and Developers have already worked on Data Visualization and Generative Art. There are studies that use real-life data and regard humans as a source of real-life data. Some of these studies use data to mathematically visualize with more pragmatic approaches, while others use it for more artistic purposes. In this study, a new method of artistic data visualization based on mathematical foundations is proposed, adhering to the abstract art genre. The aim was to create personalized artworks that bring art and people together, reflecting the differences of people with different interests and artistic tastes on digital canvas. Also the system purposed to reveal the diversity in people's lives using art and to transform the energy distribution in people's lives into abstract pictures using Creative Computing and NST methods. In the first step, a 4-stage questionnaire was applied to obtain data from the identified participants. A survey application was developed in Python and QT to collect participants' personal information, their 5 favorite colors, their 3 favorite paintings among the 200 paintings (10 popular paintings by 20 popular painters) and the energy distribution tree of their lives. This real-life data was processed to create different types of tree images inspired by botanical real-life trees. These images were combined to create content images, and finally, the styles and textures of the user-selected style images were transferred to the content images using NST to create the result images.

The paper is structured as follows; In Section II a comprehensive review of literature is performed to demonstrate similar studies. Section III explains the user data, the artistic data, the tools and the libraries used in the study. Section IV introduces the components of the proposed method including collecting data over people, generating content images, using NST to create result images and evaluating the results of the user. Section V presents the experimental results and finally conclusion and future works are drawn in Section VI.

II. Related Works

Although Art and Science are considered as two different concepts and fields today, they were originally rooted in the same word and their meanings were very similar. In the Middle Ages, logical subjects such as geometry, astronomy and logic, which today are classified under science, were taught under the liberal arts in the first universities, because the word Art originally meant Logic [4]. One of the interests of Science has always been to produce Art. Although one of the two basic views on data visualization evaluates data visualization more pragmatic such as usability and simplicity, the other argues that using visual aesthetics will convey data better by activating human emotions [5]. Based on this view, Science and Art came together once more and the idea of Artistic Visualization of Data was born. Today, the use of art and data visualization together has gone beyond only transferring data, but also enabling people to identify and relate to data and strengthen their experiences [6-8].

Data visualization has an important role in improving the quality of transferring relationships, meanings, knowledge, structures and hidden features of data to individuals. Visualizing data that is only available in text form enables it to be understood by people who do not have expertise in the field. Moreover, it enables experts from different fields to perceive data in the same way and makes it possible to work together [9].

Today, data visualization is an undeniable necessity to improve the quality of understanding, transfer and use of data [10-14]. While companies benefit from the data visualization services of the leading companies in the market for their internal and external works, processes and projects, researchers and developers scan the data visualization literature to find the most suitable solutions for their data, aim and the group they will interact with [9]. Finding the appropriate service and/or method is vital for data visualization. To determine the well-fitting data visualization method; the characteristics of the data, application and the needs of the target audience should be examined and taken into account [9]. Only the right method can improve the user experience as it strengthens and facilitates the user's understanding of the essence, structure and relationships of the transmitted data [9, 13, 15, 16]. Beyond that, there are studies showing the positive effects of personal data visualization on user experience [17]. These studies show that the user experiments are different even among sub-methods of the same visualization method [12]. Due to the abundance of data visualization methods available, it is increasingly difficult to create new visualization techniques. However, developers still have the opportunity to leverage existing visualization methods to design customized methods aligned with their specific goals [10, 16]. Some researchers are working on the artistic visualization of data in order to go beyond the traditional data visualization [6, 17]. The belief is that artistic visualization of data will strengthen human perception since humans are beings with emotions beyond pure logic [5, 6, 17]. The artistic visualization of data enables individuals to establish a personal connection and identification with the data [5, 6, 17].

Today, data can be obtained from different sources including IoT, Embedded Systems, Medical and Real Life [6, 7, 15, 18]. The natural data visualized in previous studies can be exemplified by information about the landing and take-off of airplanes at an airport in the last 10 years, the height of the waves in a sea during the year, the seasonal wind information in a continent, the interactions of a person with the people around. Such transitions can occur both from nature to science and from science to nature [15]. In our study, the percentages of the daily activities of the people are used as a natural data for artistic visualization.

Botanical visualization of a tree structure is a data visualization method based on the representation of hierarchical data similar to real-life trees [15, 19, 20]. In particular, visualizing complex, large and dense hierarchical data with a structure that people are familiar with from real life makes the understanding and perception of data easier [15]. As an example of the field of genetics, the number of species and the hierarchies between them are high and complex. To make it easier for genetic researchers to access, understand and use the data, an application has been developed to represent this tree-based data [19].

The artistic data visualizations generated by science have now gone beyond data visualization and have evolved into computer-generated art [6]. While it was controversial in the past that the computer could be smart beyond making art, today they exhibit striking examples of creativity [8]. On the other hand, it is possible for the computer to produce aesthetic and artistic results and produce art by partnering with a developer/artist. These applications can be produced with Creative Computing and Artificial intelligence [8, 21, 22]. The terms "Generative Art," "Computational Art," and "Cybernetic Art" are occasionally used interchangeably, while at other times they carry distinct connotations. At this juncture, the interpretation of these concepts is somewhat contingent upon the perspective of the artist or developer involved [21]. Today, the results of some creative studies in this field are subjected to the Turing Test and the results that are believed to be made by humans can be considered more valuable [8]. In addition, the outputs of these applications produced as visual or others may have commercial potential [23]. According to Guernica, the creators do this in the hope that their creations will engage people's minds on an emotional or cognitive level. In computational creativity research, the shared objective is to develop systems that can challenge humans through artistic and scientific means [8].

In addition to Creative Computing, AI can also be supported to produce Art with the Computer. NST applications can be used with or without CNN and GAN in the background [22, 24]. These systems involve working on a group of images to produce similar images and transferring the texture and styles of images onto other images. In this study, NST techniques were applied to create artistic textures by transferring users' preferred artistic styles to content images generated through Creative Computing.

III. MATERIALS

Due to the focus on human and art subjects within this study, the collected data from participants and artists is of paramount significance within the system. Four primary categories constitute human data, namely *Personal Information*, *Color Selections*, *Painting Selections*, and the *Live Energy Distribution Tree*. Personal information encompasses the general identifying information of the person, such as name, surname, and age. Color selections consist of 5 hexadecimal colors specified by the user. Painting selections involve 3 images selected by the user from our library of 200 images. The Live Energy Distribution Tree represents a hierarchy of the activities that the person engages in daily, divided into percentages. All user data is stored in JSON data file format. A partial sample data file of a person is shown in Figure 1.

Various tools, libraries, and auxiliary files were used during the study to process the user file and create artistic visualizations. At the beginning of the study, a GUI (General User Interface) application was developed to receive data from users and manage the system. Initially, QT was used to develop a cross-platform GUI application, but then a switch was made to Python on PyCharm CE. Also the Visual Studio Code was used for data and file processing. The free version of Google Colab was used for NSPT.ipynb [25, 26], which was used for neural style transfer. Graphic for MacOS was also utilized to develop designs before engaging in creative coding.

```
{
   "User_Art_style": [
      { "FirstName": "Vincent", "LastName": "van-Gogh",
        "Painting": "The-Starry-Night",
         "Style": "Post-Impressionism", "Genre": "Cloudscape"},
      { "FirstName": "Vincent", "LastName": "van-Gogh",
        "Painting": "Cafe-Terrace-at-Night",
         "Style": "Post-Impressionism", "Genre": "Cityscape" },
      { "FirstName": "Pablo", "LastName": "Picasso",
        "Painting": "Le-Reve",
        "Style": "Cubism","Genre": "Portrait" }],

   “User_Colors”: [“9a194d","000075",“ffa1cd",
                   "ffd919","800000"],

   "User_Information": {
         "Age": "26","Email": “@", "Gender":  "Male",
         "FirstName": “Furkan", "Profession": "Engineer"
         "LastName": "Ayas","Nationality": "Turkish"},

   "Person_Energy_Distribution": [
      {"Description": "RP","Level": "0",
       "Name": "Root","Percentage": "100"},
      {"Description": "Optional","Level": "00",
       "Name": "Work","Percentage": "40"}, ... ]
}
```

Figure 1. A Partial Data of Candidate in JSON format

As part of the study's libraries, Json was used to write and read data. Matplotlib was used for some mathematical calculations. Visualizations were based on drawing and coloring, and the features of the Turtle Library were used for this purpose. Networkx, Squarify, NumPy (Numerical Python), and PIL (Pillow) were also used for graph creation, image display, and image saving. After comparing the results of different color extraction methods in terms of consistency and visual similarity, ColorThief was chosen to extract the dominant colors of the images.

The *Artists_and_Paintings_Data* File contains a comprehensive collection of information related to the 20 artists included in our research study. This file includes the first names, surnames, artistic styles, and the years during which the artists were actively engaged in their artistic pursuits. Moreover, it contains detailed records of their paintings, including the titles, genres, and corresponding links to WikiArt. The *Genres_and_Style_Data* File holds the definitions of the genres and styles of the images, along with the hierarchical information between them.The *Colors_Names_Data*, color naming library was created specifically for the study. Since users may not understand the hexadecimal representation of colors, colors were represented with names corresponding to their codes in places where the user was active, such as the evaluation document. The *Color_Information_Data* file consists of characteristic descriptions of 12 colors. After the extraction of the 3 dominant colors from the user's result image, a short color-based characteristic analysis is performed using this data.

IV. METHODS

The proposed system consists of 4 main methods including *Data Collection*, *Content Image Generation*, *Output Image Generation* and *User Result Evaluation* as illustrated in Figure 2. The detailed explanation of all the parts is given in the following subsections.

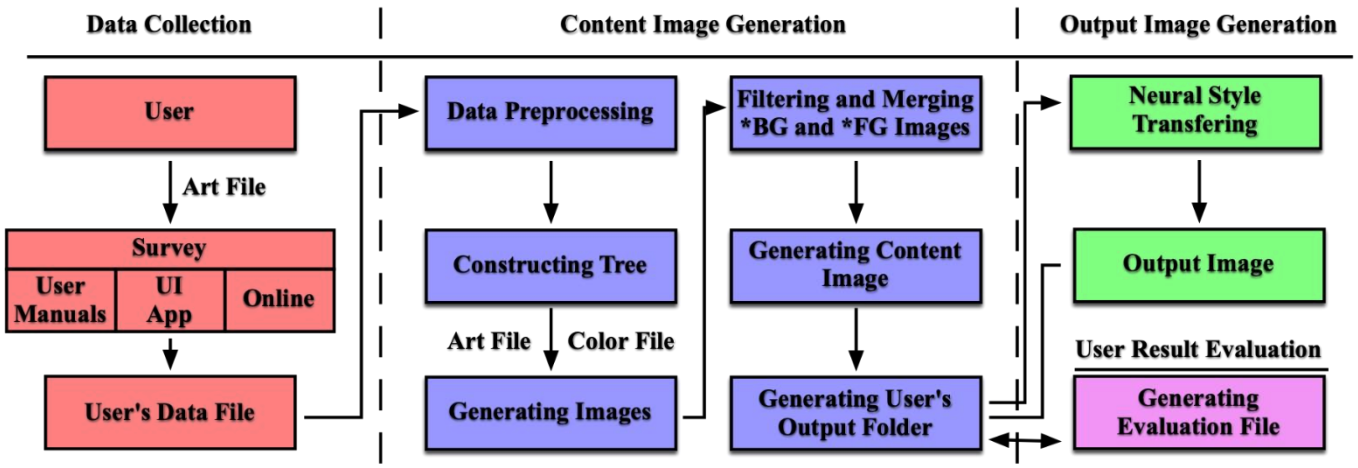
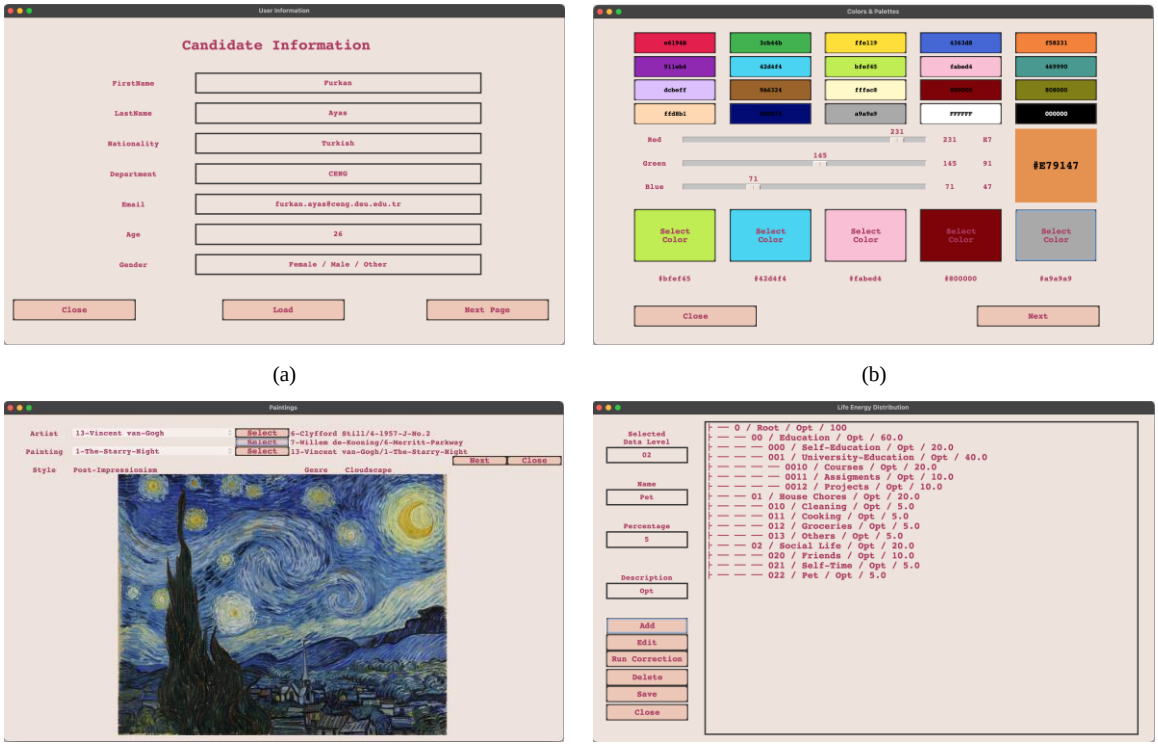


Figure 2. General Overview of Proposed System

A. *Data Collection*

Data is collected through different types of surveys to ensure compatibility and flexibility with our users. The first survey method is the GUI survey application (shown in Figure 3); it is a standard survey application where the blanks are filled in and selections are made by the user. The second method is the e-mail survey method; if candidates are unable to fill in all the blanks and/or want to think more or make changes to their answers, they are directed to online manuals. The third method is the online survey method; in cases where people are interested in the study but do not have time to complete the survey, they are sent our self-explanatory online survey, and their answers are submitted following simple steps. The data is then pulled from the cloud results table. The online manuals and paintings library are always accessible to users. Even in face-to-face GUI surveys, the system is preferably explained with the manuals.



(a) (b)

(c) (d)

Figure 3. (a) Personal Information UI, (b) Color Palette UI, (c) Painting Selections UI, (d) Index-Based Life Energy Tree Input UI

B. *Content Image Generation*

People are prone to make mistakes when dividing their life's activities into percentages. Therefore, a pre-processing system was developed that eliminates potential errors in the data. After this data preprocessing step, the system constructs an n-ary tree from the naturally hierarchical data. Then, new visualization attributes are assigned to each node to create visual trees according to the default tree values determined by the experiments. After the assignments, the data is ready to

produce botanical-based tree visualizations. At this point, the Artistic Visualization system developed using Creative Algorithms is starting to produce different visuals.

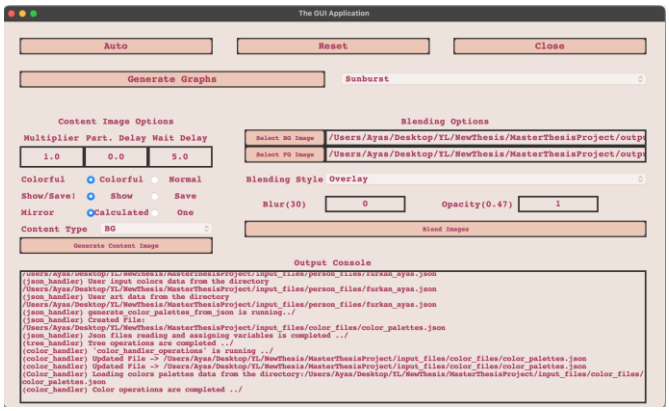


Figure 4. Content Image Generation UI of the Proposed System

The Life Energy Distribution Tree Visualization system (shown in Figure 4) is able to make visualizations in various ways based on the Content Type option, and all these ways are rooted in the Botanical Real-Life Tree inspired base visualization's structure. *TREE* is the main method, *FG* (Foreground) projects the all activities, *FG-TREE* (TREE over Foreground) shows how the FG occurs from the Tree, *BG* (Background) projects the all branch activities, *BG-TREE* (TREE over Background) shows how the BG occurs from the Tree, *BG-FG* (Foreground over Background) is the direct merge of BG and FG in order. *BG-FG-TREE* is the direct merge of the BG, FG and TREE. *DOTS*, *DOTS-LINES*, *LINE*, *RADIAN*, *SINE* are other methods not focused on at this stage of the study.

The other options of the content image generation system are *Mirror*, *Colorful*, *Multiplier*, *Partial Delay* and *Wait Delay*. The mirror creates circular reflections according to the maximum depth of the tree -inspired by the petals of the flowers-. When the mirror option is active, the same activities are reflected in the reflections with the same colors, but the colorful option allows the same activities to be reflected in the reflections with different colors. The multiplier is multiplied by all predefined length dimensions, making them longer and shorter. This also provides a zoom effect and makes the output image easier to inspect. The Partial delay creates a pause between all activities, so that the user and the developer can follow the system and the stages of image generation. The wait delay freezes the resulting image when the developer wants not to save the result or only to show it to the user.

All the variables of the Tree are assigned while constructing the tree. Some values are set defaults. Level and the some Inner Variables directly taken from candidate such as *Name*, *Description* and *Percentage* but all the other ones are calculated over this data such as *Length, Angle, Regional Angle, Direction, Width, Path, Position, Child Number, Branch Angle* and *Central Angl*e.

For the next steps of our study, the focus was narrowed down to only two of these images, despite the system's ability to visualize the data in various forms; BG (Background) and FG (Foreground). These 2 images are filtered with Overlay, Opacity value 0.47 out of 1 and combined with 30% Blur. The Blur value ensures that the regional transitions in the Result Image are smoother, so that the resulting image is more natural and people are less likely to realize that it is computer generated.

During all of these content image generation processes, colors are also used frequently. There are 7 palettes in total and each one consists of 5 colors. The first palette consists of the user's favorite colors. It's created by the user selecting the desired colors. The second, third and fourth palettes are the 5 dominant colors of each of the selected paintings. The fifth, sixth and seventh palettes are calculated from our palette library based on the first palette -the user's palette-. So each user has a total of 35 colors for coloring and the system uses them in a prioritized circular order.

C. Output Image Generation

In Figure 5, as depicted, the content image is created into the user's output folder (as illustrated in Figure 2). This folder is then imported into NSPT.ipynb [25, 26], a widely used, well-known, well-developed, open-source neural style transfer system. It is run on Google Colab. At this stage of the study, a specialized NST has not been developed as the focus is on transferring people to art using Computational Creativity under Creative Art. However, as one of the future works, a more specialized NST system would be desired to be developed.

Nevertheless, tests have been conducted on the system options to make this NST implementation more customized to our needs. All 20 options have been tested with different values and combinations, and the results have been analyzed to make each option suitable for each iteration. Although the system comprises 20 options, some of them are not informative, so only the effective ones will be described to produce our results.

Since the system uses 8 iterations with sub iterations, an *ipython* script has been developed to manage the system, set NSPT options, and integrate this system with the cloud part of our system. GPU has been chosen as the processing unit of option since it is known to be a better power source than CPU in Visual ML computing systems. The *init* option is set to random for the first iteration because noise is used as the starting point instead of an image. For the other iterations, instead of using noise, the generated output of the previous iteration is used as the input image. The *content_weights* option affects how much weight should be given to the term style reconstruction. Precise testing has been performed with values of 1, 5, 10, 20, and 50, and it has been found that 5 is the best for the system.

Since the user colors and other palettes were processed in the previous content image generation phase, in this step, the *original_colors* are set to preserve them. The other option is to extract and reflect the colors of the input style images. For the *pooling* option, *avg* is preferred over *max* due to limited resources and better RAM optimization. Other options of the system have also been optimized to achieve better results as suggested by the developers for the avg option.

The *style_blend_weights* are also kept equal, as the default option, since there is no prioritization between style images (the users' painting selections). The *style_scale* option defines the extraction of features from style images, and after testing values of 0.5, 1.0, 1.5, and 2.0, the value of 0.7 has been set for our system. The cudnn backend option has also been chosen to reduce memory usage based on our examinations.

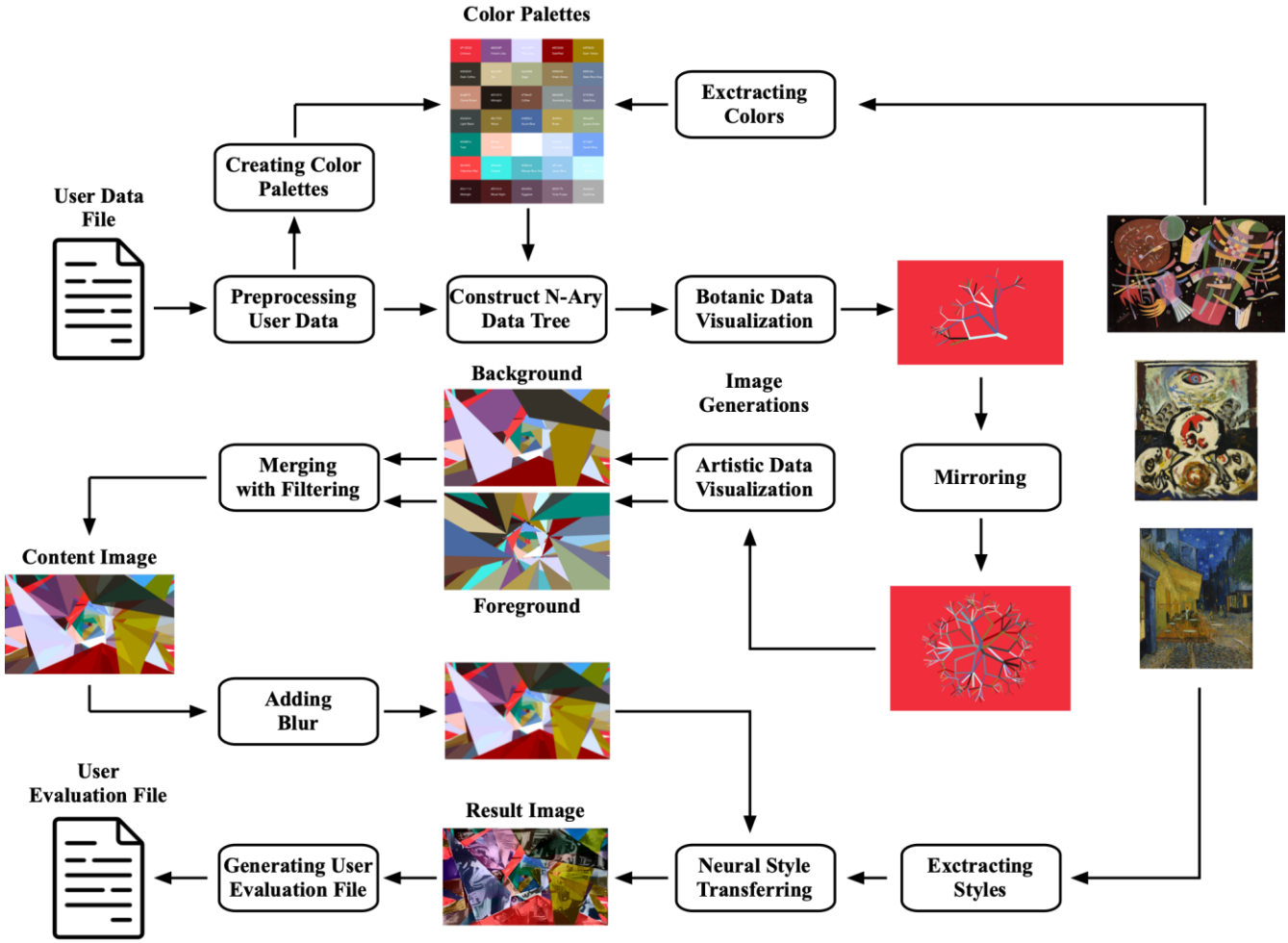


Figure 5. Artistic Data Visualization System Flow

Table 1. Options by Iterations

IT: ITERATION, SID: STYLE_IMG_DIR, CID: CONTENT_IMG_DIR, MF: MODEL FILE, OI: OUTPUT_IM

	IT1	IT2	IT3	IT4	IT5	IT6	IT7	IT8
style_weight	100K	100K	100K	100K	100K	100K	100K	10K
num_iterations	1000	1000	1000	1000	1000	200	200	10
image_size	512	768	1024	1400	1400	1800	3600	7200
model_file	MF1	MF1	MF1	MF1	MF1	MF2	MF2	MF3
optimizer	lbfgs	lbfgs	lbfgs	lbfgs	lbfgs	lbfgs	adam	adam
tv_weight	0.00001	0	0.00001	0	0	0	0	0

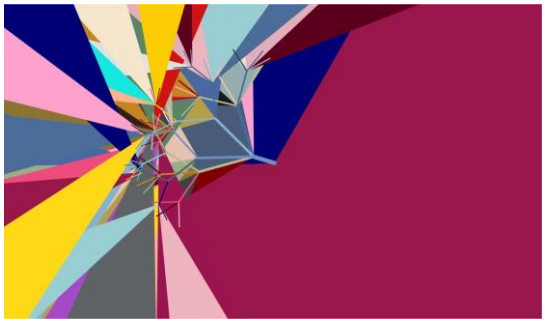
The options that are changed from iteration to iteration are shown in Table 1. The style restructuring term is weighted by the *style_weight*, and the values in the table were set after testing the values 500, 5K, 20K, 1M, and 10M. The number of iterations is determined by *num_iterations*. Testing was conducted from 500 to 10000 in a range of 500 steps. The horizontal image size of the output image in pixels is denoted by *image_size*. Higher values are used to generate high-resolution outputs, and even higher values are used to generate outputs that are more suitable for canvas printing. The Path to the .caffemodel file for the VGG Caffe model is specified by *model_file*. The default is the original VGG-19 model, and the defaults were kept for the 8 iterations. The optimization algorithms to be used, lbfgs or adam, are selected using the optimizer option. The *learning_rate* option was set to 1 from the values 1, 4, 10, and 20 that were tested, as the system is using the ADAM optimizer for IT7 and IT8. The total-variation editing weight, which helps to smooth the image, is represented by *tv_weight*, and the default values for this option were also kept.

D. User Data & Result Evaluation

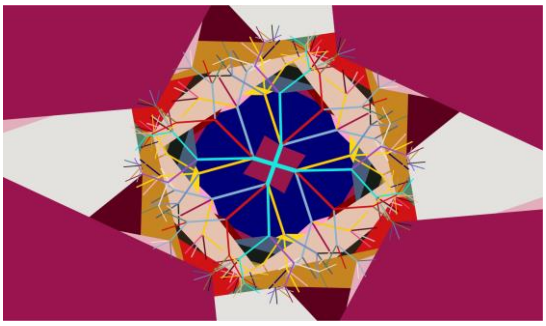
As the study is based on People and Art, the people surveyed found the study very interesting and took the time to help. They also expressed a desire to see the resulting artistic visualizations. Therefore, an evaluation file generation system was developed, both to link the results to an academic standard and to thank the users by sending them their results.

At the final step of the system, it reads all the input and output files of the previous steps and generates an evaluation file. This step is based on the final status of the *output folder*. Which contains; All the *Content Images*, *User Data*, *User*

Color Palettes, *User Tree Graphs* and *Result Image*. The *evaluation file* contains; *User Personal Information, Tree Data Evaluations, User Color Palettes, User Style Images* and the explanations of their *Genres* and *Styles, Result Image Color Extracted Character Analysis, User Data* as table, *Tree Graphs* (*Tree Graph*, *TreeMap*, *SunBurst*, Icicle, *Kamada-Kawai Graph*), Generated Content Images (*TREE*, *FG*, *BG* and combinations of these three and *BLENDED*) and the Result Image. Figure 6 shows 2 examples of Content Images that are not used to create the result image but help explain the system. Figure 6 (a) shows how activities of a person are visualized through botanical based visualization and Figure 6 (b) shows how mirroring works. In the evaluation file, they are used to describe and transfer the process and method to individuals.



(a)



(b)

Figure 6. (a) An Example Content Image, Multiplier 2, Mirror is False (Colorful is automatically False) (b) An Example Content Image, Multiplier 2, Mirror is True, Colorful is False

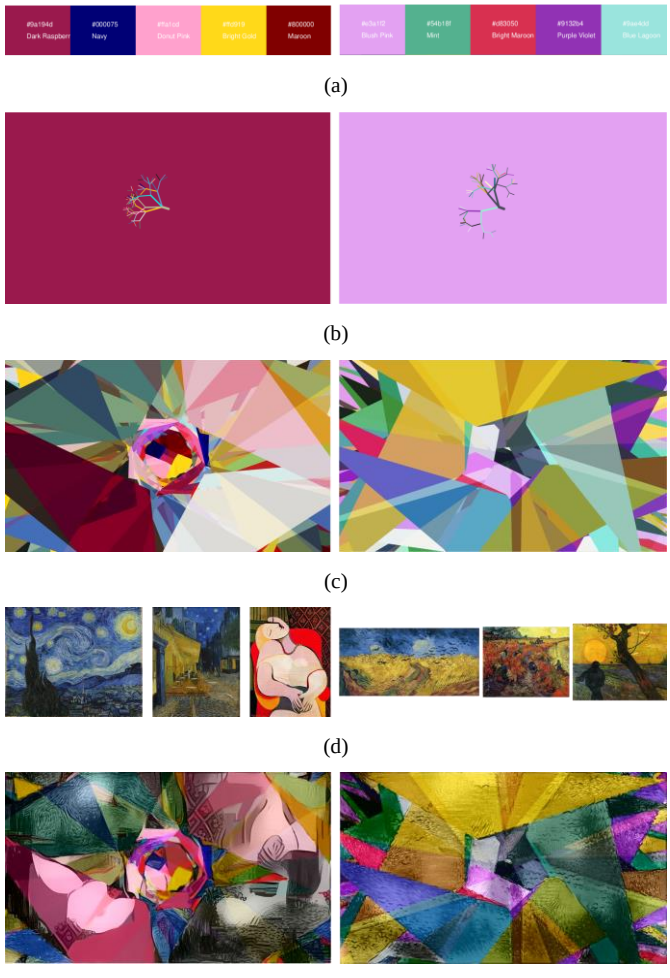
V. EXPERIMENTAL STUDIES

Figure 7. TreeMap Visualization of a Sample User Data

The test subject is a senior electrical and electronics engineering student, and her life energy distribution data is represented as TreeMap in Figure 7. Her life is divided into three main activities, *Academic*, *House* and *Social*. Even though most students have similar divisions, they represent their life in very different ways. This diversity is something to be observed in the study. Their description and representation of their life in their way has an important effect on creating Art of their lives. It allows the data to be personalized. This subject's data visualization is also shown in Figure 5 in our method with all the steps.

The difference between our method and the TreeMap method is understandably quite large. In total, there are more than 300 tree visualization methods and TreeMap is considered to be one of the most space efficient. TreeMap was introduced as a solution to the problem of standard Tree Graphs, which require a lot of space, especially as you go to the leaf nodes, but even in this document, TreeMap is insufficient to represent relatively small data. Functional digital TreeMaps can use space more efficiently by moving inwards with a clicking. TreeMaps are suitable for all kinds of hierarchical data. On the other hand, our system can be displayed in the same way in a document like this one, or on canvases meters high. Although our system is based on hierarchical tree data, it is an artistic representation developed specifically to visualize humans. It needs the user's color and painting information.

Based on this comparison of the same data, it can be said that the right visualization for the right data is essential in data visualization, as all visualization research indicates.

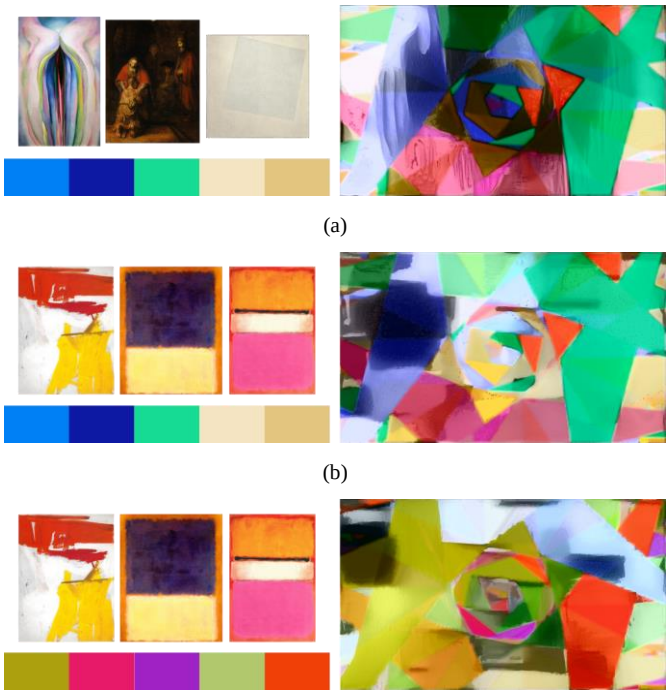


(a) (b) (c) (d) (e)

Figure 8. Key Visualizations Generated During the Processes

Figure 8 shows the basic visualization steps of two different users' data. (a) the users' color palettes, (b) the generated

botanical-based visual trees using the users' preprocessed data and the generated color palettes, (c) the content images obtained after mirroring (b) and creating BG and FG images from it and then combining them with filtering, (d) the user's painting selections, (e) the result images after the neural style transfer. This figure shows how the system generates a botanical-tree inspired representation of the data and then builds a content image on it using palettes, and then uses the selected paintings at NST step for the create the result visualizations.



(a)

(b)

(c)

Figure 9. Comparison of Outputs

Figure 9 shows how the output image varies according to the effects of the user's color selections and painting selections. The 3 images on the left show the painting selections, the 5 colors on the left show the color selections and the image on the right shows the user's output image. (a) and (b) has the exact same color selections but the painting selections are different. (b) and (c) have same painting selections but different color selections. The user's color palette is the highest priority among the 7 palettes -the next three palettes come from the 5 dominant colors of the selected paintings and the other 3 palettes are calculated from the user's palette-. The effect of the palettes can be easily observed in this Figure while creating the content image. The effect of the selected images used in neural style transfer on texture transfer is also observable in the same Figure.

VI. CONCLUSION

The right visualization method suitable for the data and the target audience, or even a new method based on existing methods, is essential to effectively convey the data in data visualization. In this study, an artistic visualization system has been developed to represent people's daily life activity & energy distribution data. To achieve a Creative Computing study, the data was processed with special Creative Algorithms and Neural Style Transfer.

In the study, not only mathematical data but also people's favorite colors and artistic perspectives were used to reflect the human being in a unique way. The results of the system are also open to interpretation, just like the people themselves. At the end of the study, it was observed that the proposed system produced consistent results and thus created a specific art style. This observation can be interpreted as the creation of a new sub-art style during the study.

For future work, it is aimed that the system have developed during the study, will be supported with licensed images and offered as an online service, so that individuals and institutions can produce and use artistic result images that reflect themselves or the people concerned. Activities will be categorized into selectable categories as a support system and further additions will be possible.

VII. RECOMMENDATIONS

The artistic outputs produced by the system are expected to be used in future phases to interpret, group of people in a non-mathematical way, through the observation of art. The users should be divided into groups such as students and professionals, and it should be observed what similarities and differences the data of students from different majors have in the resulting images, or what commonalities the members working in the same team have.

With a system of predefined activities based on the selection to be made in the background, it is expected to observe the similarities and differences between the results of people with similar lives in terms of activities. Thus, the interpretation of the observed results and the evaluation of the new results that are being generated will allow our study to be used for the interpretation and evaluation of people and groups.

Authors' Contributions

The authors' contributions to the paper are equal. The study and article were conducted by Furkan Ayas and supervised by Feriştah Dalkılıç.

Statement of Conflicts of Interest

There is no conflict of interest between the authors. Furkan Ayas is the creator, owner and implementer of the idea and Feriştah Dalkılıç is the academic advisor of the article processes.

Statement of Research and Publication Ethics

The authors declare that this study complies with Research and Publication Ethics. This project has no commercial interest, as we use paintings by 20 well-known artists as style images.

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