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Artistic visualization perspective for the (Pedestrian Permit) project

In VRT application for autonomous city (Paris)

Abstract

For several years research in computer graphics aims to develop render to simulate true life especially in 3D rendering environment. This photorealistic method for 3D rendering and modeling is already applied on the platform "Virtual Reality Application For The road safety education for Children in Urban Areas" which been applied in the project R&I *Terra Dynamica* in citu / Paragraph laboratory Paris 8 University.

But through observation and research, applying the non-photorealistic render method can promote an attractive communicative imagery that carries information to children, more easily through colors, illustrative shapes and visual effects.

In general, the non-photorealistic imagery techniques are based on mimicking traditional artistic techniques like handcraft; oil painting, gravure, and watercolor end so one. Combining the imitation of traditional styles, particularly the expressionism, with illustrated 3D scenes; produces a non-linear perspective and a characteristic visualization. With this stylization and abstraction tools and techniques, we aim to produce an artistic reflection and vision with 2D videos depending on a stream of the dynamic data of the (Pedestrian Permit) project.

Keywords

- Visual communication
- Virtual realty
- Simulation
- Computer graphics
- Expressionism

Introduction

First of all, we need to introduce the platform we are going to express and present our non-photorealistic vision on. This Virtual Reality application consists of an innovative application platform designed for pedestrian simulation, integrating a virtual reality application for child risk prevention and education in urban areas. This platform is an open platform, designed and based on a collaborative research and technologies; which refers to a dynamic animation of autonomous city (Paris), containing an artificial intelligence and behavior modeling for pedestrians, crowds, vehicles and traffic in 3D visual and an audio environment, trough the framework *TerraDynamica* project in Paris.

In the beginning we chose 2 guiding methods to construct our artistic vision, through this virtual reality application in (pedestrian permit) project. One of the most important functions in visual communication is transforming information and the eye or the visual guidance in the scene on imagery or video, so the viewer gets the information fast and without interference within the details.

As a technology, virtual reality forms a bridge between human senses and computer outputs. Because the relationship between general media and culture is complex, the use of an analytical tool is necessary to understand its workings. So semiotics is a good way to analyze virtual empiricism because it acknowledges meaning derived from both this technology content and its unique expression.

So we aim to explore and apply the visual communication studies and the interface semiotics analysis to the use of visual and semantic encoding and reduction, and employing the semantic appropriately in order to transfer the largest amount of information in the current platform, through an general artistic method (the expressionism) in order to reach our goal.

The process of simplification and reduction for figures and semantic drawings (the signs) is already amplified in traffic, those presiders are actual techniques which implement semantic or drawing diagrams, as we see in the administration of traffic in urban cities.

And regarding many digital artistic forms for children education, whether it’s 3D or 2D visuals, illustration and cartoon has always been the most dominant techniques of all.

Same as previous, the actual platform is using a photo-realistic render in a 3D visualization of the city and it elements like pedestrian, signs, vehicles, extra… and so we propose a non photo-realistic render method according to our former objectives.

Theoretical reference

"Richard Gregory wrote, "We are so familiar with seeing that it takes leap of imagination to realize that there are problems to be solved (p.17)". While we humans had to learn how to walk to talk and read, we never had learn how to see. Thus, unlike walking or talking or reading, we are less cognizant of the many processes that contribute to what we see".

Many artists today are attempting to identify and describe the visual communication process.

So before starting to analyze the actual statement of the project we need to ask a few questions.

- What is the procedure that affects vision in visual communication?
- What are the methodologies utilized by visual communication researchers?
- How does knowledge contribute?
- How do viewers utilize and perceive different media?
- What is the role of semiotics in motion picture?

In visual communication, a part or the whole of perception relies on vision, and it was presented or expressed with two dimensional or metaphorical images as the global image. The details include: signs, typography, drawing, graphic design, illustration, color, electronic resources, etc. It also explores the idea that a visual message to support text has a greater power to inform, educate, or persuade a person or audience, but in our project the text wasn't included in the experiments.

A big part of the perception is the result of a combination of sensations but not of individual sensory elements. Visual perception is a result of organizing sensory elements in a form of various groups, because the brain classifies by its nature the visual material in discrete groups. So what we see when looking at a picture or a video is modified by our collective memory,

and what we precede is what we have seen in the past or what we want to see according too our inner expectation.

In this project we deal with different theories, mentioning the sensual theories and perceptual theories, which form a mechanism of communication through visual, and describing the conveyance and the path of an idea or information in to a form that can be read or looked at.

In general, there are rules that redirect the elements and their perception in imageries and video, so the whole is different from the sum of its parts.

The rules or laws in sensual theories are mostly related to the Fundamental Grouping system, which combines the discrete elements within a scene so the brain will understand through a series of four fundamental principles and grouping systems. According to The Gestalt theory (forms or shapes), the elements that compose a design are affected by where they are and by what surrounds them. That means that parts and elements identified individually have different characteristics to the whole, and they organize the whole. So perceptual vision correlates with four rules, which are similarity, proximity, continuity and common Fate. These rules would be applied in our research in order to achieve our target.

But in fact, the human eye is constantly in motion while scanning an image. The viewer constructs the scene with short-lived eye fixations that the mind combines into a whole picture; it means that the eye merely takes all the visual stimuli and effects, and the brain arranges the sensations into a coherent image, which delivers information and sensation. This finding helped to explain how the mind perceives difficult images.

The theory of constructivism is generally attributed to *Jean Piaget*, who articulated a mechanism by which knowledge is internalized by learners, children in our case. He suggested that through the process of accommodation and assimilation, individuals construct new knowledge from their experiences in conceptual manner. Piaget's extensive has made affective and cognitive studies on children for intellectual development. *Julian Hochberg*, psychology professor in (Columbia Uni.), 1970, found that when individuals assimilate, they incorporate and integrate their new experience into an existing framework or a structure without changing it. This may occur when individual experiences are aligned with their internal representations of the world, but may also occur as a failure to change a faulty understanding. In contrast, when individual experiences contradict their internal representations, they may change their perceptions of the experiences to fit their internal

representations. According to the theory, the state of accommodation is reframing our mental representation of the external world to fit new experiences, a part of this theory concerns the language links between context and identity. Howard Giles developed the theory of communication; it argues “When people interact they adjust their speech, their vocal patterns and their gestures, to accommodate to others” that refers to the strategies through which individuals adapt to each other’s communicative behaviors, in order to reduce these social differences.

In our case of study the visual accommodation is relaying on the abstraction of the visual representation. So the existing framework is easy to adopt and to be understood no mater the personality or the background of the spectator.

In Perceptual theory, Semiotics is one of the systems of communication, which sense and signs take the form of words, images, sounds, gestures and objects. In visual aspect semiotics has so much impact on the form because it identifies the contents according to its reference and composition. In motion picture, temporary process in a scene has an impact on semiotics, because the animation of picture or text mid interprets the signs, signals, or behavior differently. Contemporary semioticians have studied signs not only in isolation, but also as part of semiotic 'sign systems' (such as medium or genre). They study how meanings are made and how reality is represented.

Pictorial semiotics and Gestalt theory in particular constitute a part of the foundational layer of contemporary pictorial semiotics and a starting point for visual analyses. While semiotic methods of analysis have been applied in various fields, like anthropology (the study of popular culture), advertising, geography, architecture, film, and art history. The majority of semiotics methods and approaches emphasize the systemic character of the object under analysis. This, in turn, requires an analysis for the entire procedures that composing the imageries and the animation in the scene. In this case, the elements in a picture are considered as systems of signs in which elements interact in ways similar to letters, words, and sentences.

In temporal semiotics, the meaning can be revealed only with continuity, like music, movies and video games. So interactions and conditional actions are affecting the semiotics of the scene, that means not only words and signs can interfere with the meaning and the results, but also gestures, images, non-linguistic sounds.

Semiotics can help advance some of the major goals of Human-Computer Interaction (HCI) and be useful when designing interactive products, and it appears that the paradigm of the analysis should include Functionalism, Social Relativism, Neo-humanism, Choice between Objectivity and Subjectivity, Choice between Order and Conflict and Assumptions about Reality. (*Hirschheim and colleagues'* paradigms at the base of information systems development)

As previously mentioned, elements could be considered as a node and can be placed in the paradigm according to level, composition and functionality in the architecture of semiotic.

In our actual platform we applied the interaction knowledge between module machine and human, as the following table.

Interaction between modules:

- Child <-> Permits Module: Control and response
- ACA <-> Child: Control and response.
- ACA <-> Davi platform: voice command.

So it actually applied the interaction method to dynamics and statics projected data, which are the elements of the scene. In this case the immersive dispositive (VRT) application is creating different results through interaction between elements and human in temporal statement; that change by artificial intelligence participant in each course of pedestrian permit simulation.

That means all the moves and shifts of trajectory by the pedestrians and cars in our simulation are not subject to any form of active monitoring on our part. In this case the relations between units are the syntagmatic structure that should be measured by the composition level of the image.

In games and motion pictures the narrative is based on sequences and causes, like in film and television narrative sequences, there are also syntagmatic forms based on spatial relationships for montage in graphic design, which works through juxtaposition and on conceptual relationships, to expose an idea or retrospective for an idea. So the distinctions between the modes of narrative, description, exposition and argument are not clear-cut "(Brooks & Warren 1972, 44). In motion picture there is more than one type of syntagmatic structure, but some can be dominant, depending on its role and reference.

So by combining that cognitive knowledge and analysis, we aim to construct a new artistic visualization perspective for the (Pedestrian Permit) project In VRT application for autonomous city (Paris).

Technical methods

Applying a non photo-realistic render (NPR) and visual communication studies in (pedestrian permit) project:

First we will explain the executive and operational steps that would lead us to a non photo-realistic render in order to produce a visual communicative environment.

- **The outline (contour):**
  Usually, outlines don't exist in real life, so the photo-realistic render mustn't apply to the outline in terms of rendering or graphics design, and the shapes should be presented according to luminance and color only and the gradient they make. Therefore, we will adopt the ink outline style to show outlines specific form relying on a full three-dimensional scaling in drawing cartoon image.

  According to 3D (NPR) application for outline, there are 3 guidelines that can produce a wide range of line drawings, and often contribute to more complex illustrations.

  - Silhouettes or "contours" separate front facing from back-facing regions of the surface, as a function of viewpoint.
  - In 3D creases are paths that define statically on the mesh surface generally representing sharp features.
  - Suggestive contours that are dynamic features similar to silhouettes that are view dependent and help denote the shape.

There are many methods in visual art concerning simplifying lines and shape in the animation field that we can quote from. Overall the abbreviation of elements and characters is necessarily followed by the artistic technical style, so mutating shapes and summarizing or exaggerating in certain parts in term of creation and design lead to a simplified draw in proportion to the core idea of a narrative or a scenario.

In process of designing a character, usually the text provides a description of the character life style, the general situation, the specifications, etc. Therefore the design follows the character's profile, starting from lines drawing through modulation, coloring, until the final render.

Figure 1,

The actual 3D environment the application of (NPR) Illustration tech the application of (NPR) gravure tech.

- **The coloring**

  As we refer previously the color can deliver an expression and a sign, and it can redirect the scene or guide the eye to a certain point. Usually, the diversity and brightness of colors attract the children, so are pastel colors for younger kids.
  Worth mentioning that some colors are dominant, like red or black in deferent uses, that lead the viewer to a certain point even leading him to a certain feeling.
  Briefly, the non-realistic coloring impact affects the script or the objective, and redirects the narrative goal or the imagination, so it has to be related to the subject and the target in a way that provides the right sense and direction in the same time.

- **Coloring techniques:**

  There is many ways and styles in coloring, some of it referring to a certain traditional art school, but digital graphic technology can mimic and produce different and merged coloring techniques in the same imagery.
  Among the traditional techniques:
  - Aquarelle
  - Oily
  - Acrylic
  - Pastel
  - Charcoal

- Collage, which relies on adding different elements and textures during the coloring process.

Since we are dealing with a large amount of pedestrians and a wide area in the city with a lot of buildings and monuments, we figured on applying several layers of coloring techniques and effects, to separate the focal point from the background crowded with elements.

- **The luminance**

  The luminance of the dynamic flow of the module (city and the pedestrians) is under the influence of a realistic method. The platform can produce visualizations for weather, which impacts on the lighting and the colors on the whole city. We are determined to use and apply its effects without changing it.

- **The texture**

  Adding different textures to our scene can help separating the elements from the background, but it can also produce disruption. Usually the photo-realistic render uses texturing in term of description and definition for the element, but in a (NPR) this uses are not the same according to many 3D renders for kids and cartoon. In a 2D render the texture is more used to unify the elements in the same environment, creating a certain artistic vision.

  In a visual communication aspect, the identification and the signs should be, according to our project, presented as a front layer, so the visualization of the city can adopt a different texture like 3D technology can produce.

The non photo-realistic in traditional art:

- **Humans use imagery to communicate visual information.**

People, as content creators, are interested in these tools for the production of imagery to communicate visual information, but the important point is: the appropriate form of imagery for a given task depends upon the nature or purpose of this communication, as well as the artistic vision and school.

There are many artistic schools that digital art can mimic and imitate as a brush pattern or a plugging effect through the wide paradigm of computer and digital arts.

- **Why choosing the impressionism method and style?**

This method can provide:

  - Impressionist method provides video as a different vision and perspective for the reality in terms of shape, color, luminance and texture.
  - It can also provide the scene with signs and identification without distraction, which traditional realistic art can't provide without the interaction of abstract.
  - The imagery can carry information without the help of another medium like sound or text.

The principle that the impressionism re-explores the world transmutes the reality and re-configured the narratives and it signs in a different perception and presentation from either the artist or the intended target.

Currently many of the digital art graphics work except for the photo- realistic render that are extensive and variable applications under the influence of Impressionism, including some of the 3D art works that can be observed in several games combing different artistic styles and techniques.

Software

- Adobe suite
- Adobe After effect
- Adobe Premier
- Terra dynamica process

Semiotic interference in the visual presentation and (VRT)

One of the sciences that interferes significantly with the visual communication aspect and it mediations is the semiotic of interface based on the management of the interactive visuals and its executive or functional employment, like Interactive games and web sites.

Since the surface in this project and plat form is a visual display that mediates between the machine and the user (human), we will explain certain points that indicate and direct our video in the scene through analyzing, by recalling the components of the project and its visual and semantic impact on the scene.

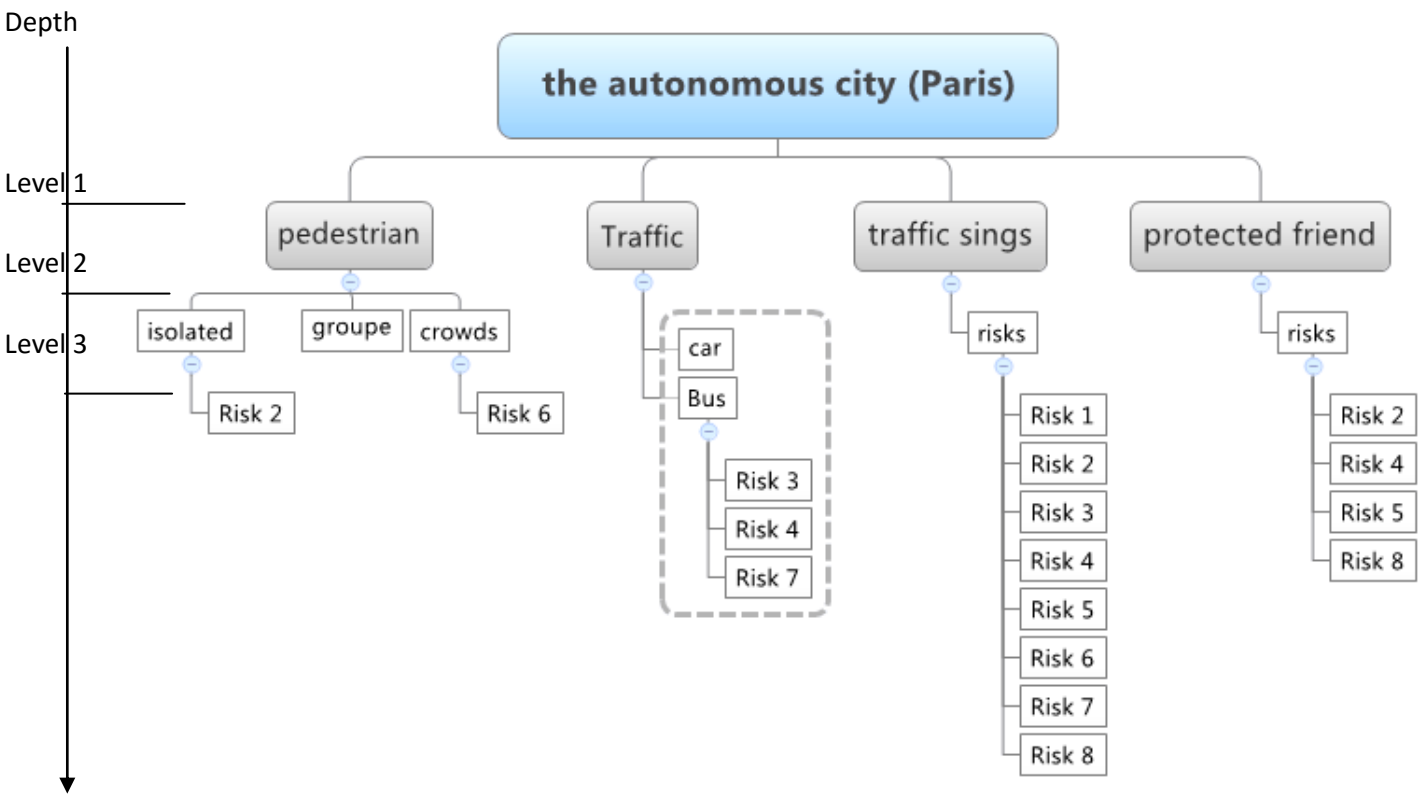

Figure 2, Architecture of the visuals

- Pedestrians (grouped, isolated, crowd).
- Vehicles (bus, car).
- Environment (City and buildings, plants, monuments).
- Player associated characters (protected friends).

Figure 3, the actual project.

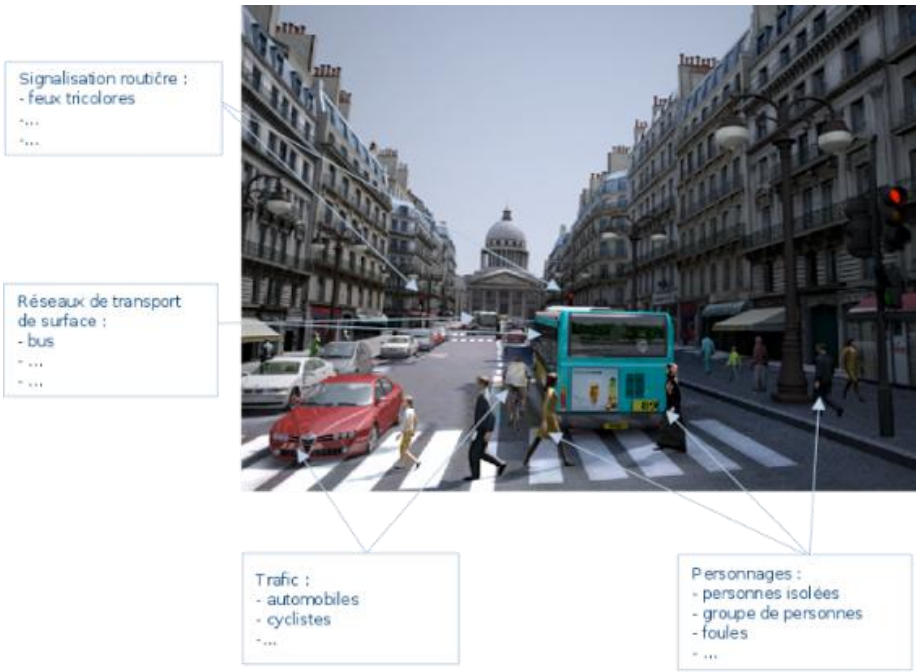

Figure 4, the actual project elements.

According to the previous analysis, we find that most elements are functional and interactive in its region of strategy, which means they affect and get affected by the platform in term of plying. Some of these elements only purpose is to deliver signs and indications, like Traffic signs, others like Pedestrians have more than one function as they represent the pedestrians, which are a sign of civilization in the street, and they add 2 kinds of risks for the player, like pedestrian crossing without traffic light and crowd coming from opposite directions. To conclude, the pedestrians interfere with the levels in the experience for the child, by their behavior (wrong/right). They gravitate in an area facing the player; and they always remain visible to the player, and they act differently depending on the actual coordinates on the path.

Also, the vehicles interact with the player as transactional and functional node, and add more deferent kinds of risks for the player.
Protected friends are also recognized as interactive elements, by adding more obstacles to the player with the risks they make. We can therefore obtain the player's results through the functional and effective elements to evaluate their progress in the experience.

The autonomous city of Paris is more a presentational element, which is connected with dynamic data made from actual plans of a Parisian neighborhood in order to give the most realistic and educational experience possible. So the main objective of the city visualization is to present and simulate the real city, explain the location, and add few risks and obstacles with choosing a direction in the journey.

Conclusion

Human culture is an expansive subject, and there are many research specifically assessed in terms of virtual empiricism, to decrease the difficulty associated with interpreting meaning from cultural interactions with signs and actions, in an experiential virtual reality media. Immersing the individual in a simulated world, with the advancements in computer graphics function by providing renditions of imaginary content that either resemble real-world objects or concretize abstract concepts and transfer signs information in term of the experience itself is ideal.
The fact that the visual element performance and their homogeneity in a visual system or medium, engaging participants in the scene of task, the present study explored how the different regions of the visual field contribute and interact.
So in order to fully benefice from all the elements of the game, we will separate the actual visualization to 2 levels concerning what they present and their functionality in transferring information and their state of interactivity.
The first level will hold all the interactive elements; which are:

- The vehicles
- The pedestrians, the no-player characters and the player character.
- The group of friends and the cartoonish character (fox).

The second level consists of the autonomous city of Paris (buildings and monuments).

Figure 5. Separate visual data. Statics and dynamics elements in real time projection.

So by applying the visual communication studies and the interface semiotics analysis, we came to certain conclusion for the visualization of the second level or the background elements, by using a harmonious coloring and graphic design and decreasing the level of the details by blending them with one technique (simplifying the outlines); focusing on their presentation as an environmental form and map, according to its dynamic and actual data, in order to complete the “Pedestrian Permit” program.

As for the first level, we will apply more outlines with ink style and technique, use brighter and stronger colors to give us a more cartoonish approach, so the child would be more focused on the risks in entertaining visual aspect.

The coloring technique will be unified so it doesn’t separate the two levels completely.

As 2D video render, the silhouettes and outlines cannot be rendered differently, but can promote style and coloring that match and mimic many non-realistic artistic styles, like

marker, pencil, brush, etc…

Figure 6, (NPR) sample1. Applying aquarelle method on 2D video.

Figure 7, (NPR) sample2. Applying aquarelle and ink method on 2D video.

Figure 8, (NPR) sample1. Appling cartoon animation method and adding cartoonish root sign.

We have picked few techniques that support our objective and deliver a non-realistic render, which can deliver information and entertainment in the same time for children as simulation visualized in 3D in dynamic and 2D artistic methods in (VRT) application.

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