

# Visual Multimedia Performance for Astronomical Education ‘Eight Planets’

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## ABSTRACT

Astronomy has been a subject that is taught for a long time, but ahead of the ever moving age and breakthrough in technology astronomy is losing its place as knowledge that appeal to today’s youth. Planetarium Jakarta is the destination place for an educational show about astronomy. Nowadays the Planetarium only serves as an attraction for children, while teenagers perceive the show to be less attractive due to its lack of variety. This paper advanced the idea of “Eight Planet”, a multimedia educational video about astronomy based on International Astronomical Union as a new form of solution to the issue. The goal was to produce the visual concept for the multimedia educational video titled “Eight Planet”. Qualitative approach was used to explain the process of design and problem research. The data was collected through observation and reference, visual data of NASA’s, and multimedia visual performance. 5W1H was the chosen analysis method which included astronomy, multimedia visual art performance, target behavior, and the design approach. The end results were the design concept for the multimedia visual performance titled “Eight Planets” a screen projection mapping-based video about astronomy as a new educational format.

**Keywords:** *Visual performance, Multimedia, Education, Astronomy, Planets*

## 1. INTRODUCTION

Astronomy is the scientific study of celestial and phenomena that originates outside the Earth’s atmosphere. The rapid technological advances attract a new public interest on the field. NASA defines astronomy as a “simple study of stars, planets and space”. One of the historic events in Indonesian’s modern science and technology especially in astronomy is the construction of Jakarta’s Planetarium and Observatory which was initiated by the first president of Indonesia Mr. Soekarno.

Nowadays the Planetarium runs a daily scheduled show which is called “Teater Bintang”. It is a 60 minutes Astronomical-themed projection-based audio visual show with narration and background music alongside. The only title available for the general audience is “Tata Surya” (Solar System). Unfortunately, “Teater Bintang” only attracts the elderly and children, and is generally not in the interest of today’s younger generation. One of the main reasons is the current generation’s exposure to highly advanced and grandiose musical performances

that take advantage of new forms of multimedia approaches. The Planetarium Jakarta survey shows that the quality of the visual aspects of the show is far from desirable; lack of detail and color, and many other visual elements are underperformed compared to current technology.

This is unfortunate, because astronomical knowledge does not only need to be known by children at early age but also by teenagers. Therefore, there is a need for an educational media about astronomy that can be sought after by adolescents, one of which is through multimedia visual with the theme “Eight Planets”. In this case, the science of visual communication design plays a role in improving the quality of multimedia shows. The goal is to give a new color to the astronomical education system with refreshing visual use for the younger generation and provide new insights into the importance of visuals and multimedia in an educational show. The scope of design is limited to eight planets according to the *International Astronomical Union (IAU)* about the Solar System namely Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.

## 2. LITERATURE REVIEW

According to Bagus Susetyo, performance art is a cultural expression and medium for conveying cultural values and the realization of aesthetic-artistic norms that develop in accordance with the times, and regions where the form of performing arts grows and develops [1]. Performance arts have religious, social, educational, aesthetic, and entertainment functions. Along with the new era, the form of performance arts also changed. The adoption of technology that is shared by computers and any other digital technology has become a part of the performance arts in the world. In the 2000s, the forms of performing arts with digital media began to develop, including art performances at Tate Modern in London.

Performances with multimedia technology are a combination of various forms of content such as text, audio, images, animation, videos, and interactive content. The use of the technology and the media is carried out with the aim of communication so that the information which be delivered will become more attractive and easier for users to obtain. According to Computer Technology Research, a person will only get 20% of what they see and 30% of what they hear [2]. Whereas through multimedia people will get 50% of what they see and hear, up to 80% of what they see, hear and interact with at the same time.

According to Daryanto, media is a tool that can help the teaching and learning process that functions to clarify the meaning of the message delivered, so that the teaching objectives can be achieved better and more perfectly [3]. The multimedia component consists of 1) text, 2) graphics/images, 3) Audio, 4) Video, 5) Animation [2]. Text is a very basic multimedia element to convey information, because text is the simplest type of data and only requires the smallest storage space. Graphical elements are useful for illustrating the information that being delivered, especially information that cannot be explained in words. Digitized picture is a video or camera image that is transferred to a computer and converted into bitmaps. Hyper-picture is just like hypertext but in the form of images. Multimedia will not be complete without the audio (sound). The use of sounds in multimedia can create differences in any multimedia presentation. In a multimedia project, using video can improve the message delivered to the users more effectively and users will have an easier time remembering what they see. Whereas animation include all things that have visual effects that resulting in changing the time's positions, shapes, colors, structures, textures from an object, camera positions, lightings, orientations and focus, and changes in rendering technique [4].

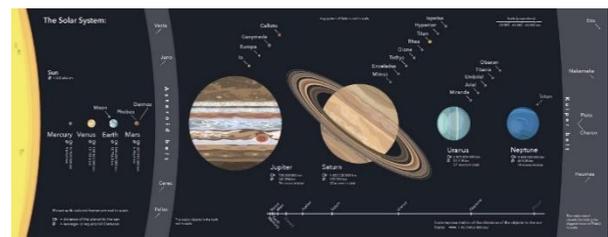
## 3. METHOD

Qualitative method was used for describing this research and design process. R&D (*Research and Development*) approach had been done to get the user's needs (needs assessment), and then it continued to the development activities to obtain products and test the effectiveness of these products. This research used R&D

approach because it obtained a product in the form of learning media. Data was gathered from observation and astronomical references, visual data from NASA, and multimedia visual performance. Analysis was done with *5W 1H* method which included astronomy, multimedia visual performance arts, and target's characteristics, also multimedia visual design method. The design concept was made after going through the analysis of information and initial data. The concept was being limited to the multimedia visual performance called "Eight Planet".

## 4. RESULT AND DISCUSSION

A planet is an astronomical object that orbits a star or remaining star large enough to have its own gravity. According to the *International Astronomical Union* (IAU), there are eight planets and five dwarf planets recognized in the Solar System. According to the distance from the Sun (near to far), these planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune. Planets in the Solar System can be divided into several categories based on their composition, namely 1) Earth-like planets whose surfaces are covered in rocks including Mercury, Venus, Earth, and Mars, 2) Planets formed from gas material and larger than earth planets include Jupiter, Saturn, Uranus, Neptune.



**Figure 1.** Structure and The Solar System

The target of the show is the entire community who likes to come to art shows and specifically for millennial teenagers between the ages of 15 - 34 years in Jakarta and its surroundings. Nearly 80% of the millennial generation wants experience in their lives. Various activities that create new experiences will certainly be an attraction for them. Millennials or Generation Y is technologically sophisticated and digitally fluent generations. This is supported by the conditions in which they are very dependent on current media technology. The main formative characteristic for Generation Y is early and frequent exposure to technology, which has advantages and disadvantages in terms of cognitive, emotional, and social outcomes [5].

Logo is a visual element that is very important for a product other than as an identity, the logo has a distinguishing function between one product and another. The logo design of this show wants to give a strong astronomical impression. Logotype uses the Nasalization font with the development of forms to interpret the state of light distribution on the face of the planet. There is a side of the planet that does not get sunlight at any given time but the letters remain well-read. The letters at the bottom of the logotype are made simple so that they are easy to be remembered and recognized.



Figure 2. Astronomy Logo: Audio Visual Multimedia Performance



Figure 3. Font Avenir Next Pro

The typography used is the Avenir Next font which is a sans serif letter on the main media and supporting media. This font is chosen for the impression of being modern, simple, and firm, thus affecting the comfort and clarity of letters in animation. This font has a clean style, is easy to read, and has many variations in style from its letter family.

The color used is a combination of dark blue, bright blue, black, gray with dark colors to give the impression that blue cinematic space, and is also used to look futuristic, cold and fresh.

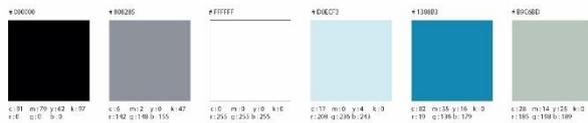


Figure 4. Visual Key Colour

The illustrations used are 3D objects by designing an illustration of an atmosphere that has the impression of space, planets, performance installations, cold, dark, and of course with paying attention to the elements of light that are pleasing to the eye.

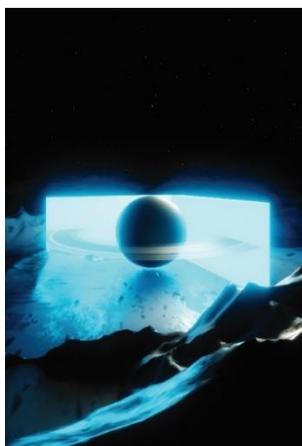


Figure 5. 3D Illustration

The concept of the show presents audio visual and multimedia about "Eight Planets" which multimedia music and visuals support each other and go hand in hand in such a way as to produce multimedia audio-visual performances that provide a memorable experience. The show lasts 20 minutes, displayed on the installation media. The show is presented to provide an educational and entertainment experience for viewers who attend the show.

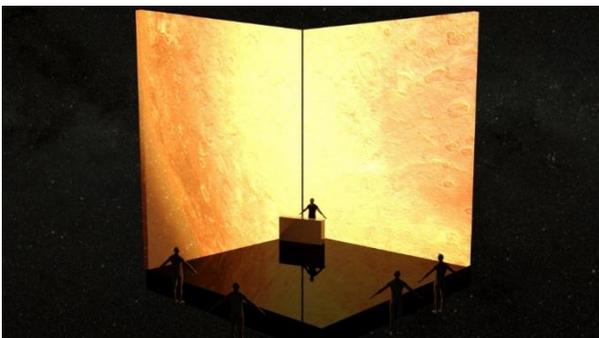
Motion graphic media uses 3D design concepts, because 3D design can create objects in more detail and in accordance with the display model and can be seen from all sides. The use of colors is tailored to the information of each planet such as the color of the planet, its atmosphere, and temperature. Camera angle, animation, shot type and composition use cinematography techniques to produce cinematic visualization. The use of background music, special effects (sfx), and planetary ambience is matched with the character needs of each planet.

The multimedia visual performance scene for astronomy education "Eight Planet" consists of:

1. Facts about astronomy then proceed with the sun's visual object to provide information that the sun is one of the main components of the solar system. The sun's visual uses a color tone that adds heat to the object. Animation of the title uses the sun as the background, and the animation in the title uses the lens flare effect to add the impression of strong light reflection on the lens.
2. Mercury is the first planet to be displayed in a color combination which describes the chemical, mineralogical and physical differences between the rocks that make up the planet's surface. The transition to the end of the Mercury is a camera that moves away from Mercury, and then appears at the second planet, Venus.
3. Venus has the characteristics of the hottest planets because the atmosphere is enveloped in carbon dioxide and has thousands of volcanoes on its surface. The atmosphere of Venus is visualized with an atmosphere that is made thicker and uses hot colors such as yellow and orange in the surface structure and fog.
4. The Earth is displayed by visualizing the characteristic structure of green for its plants, brown for land, and blue for the oceans, clouds on earth using white and the atmosphere using blue to represent elements of nitrogen, oxygen, argon, carbon dioxide, water vapor and other gases, with ambience light lighting. Transition is done by zooming out from Earth at full speed to Mars.
5. Mars looks reddish is due to oxidation or iron rusting on rocks, regolith (Mars land), and Mars dust. Movement animation of the planet uses the transition of zoom in towards the planet by following the tempo.

6. Jupiter is a giant gas, with a ribbon tapestry and colorful cloud spots. Jupiter's surface animation appears to move at certain points. Before the transition to the next planet, a visual of Astronauts running on Jupiter's moon was made to convey the message that the planet has no surface to land so that it can only be observed from a distance. The transition continues to use the medium shot technique and then cut in into the spacecraft and cut away from the plane's window to Saturn.
7. Saturn has many shades of yellow, brown and gray. Saturn is the densest of all, so the medium shot ring is made with different line of thicknesses. After a medium distance shot, the scene continues into the details of the Saturn's ring. The lighting uses the ambient light and some additional lighting such as back light, fill light and key light to reinforce the ring from this huge planet. The transition continues to use ice particles scattered in the ring as a transition out to the Uranus.
8. Uranus gets a blue-green color, or can be called as toska, from methane gas in the atmosphere of interesting color combinations. The lighting still uses ambient light because the distance from the sun is far, thus there will not be many lights. Extreme pressure and temperature will destroy metal spacecraft. A visual astronaut is made on the moon with a view facing Uranus to convey the message that the plane cannot land on the surface of Uranus because of the conditions. The transition to get to the Neptune uses a fade in from the dark because of the distance travelled.
9. Neptune is very far from the Sun so that during the day on a large blue planet it will look like a dim dusk for us. Therefore the planet is made as dark as possible but still bright on some sides. It uses spotlight lighting on certain surface parts while ambient light used is very little.

The main installation media measures 18 meters in length divided by 2 that forms the letter L and with a height of 9.25 meters, using 4x Barco SLM R12+ projector. Visual resolution measures 3840PX x 2160PX.



**Figure 6.** Main Installation Media

## 5. CONCLUSION

The younger generation is more interested and focused on experience than the product. The use of visuals in the form of photos and videos is an effective medium in communication with millennial targets, and the use of various media platforms is an effective concept in product marketing and educational media. The educational approach through multimedia visual performances themed "Eight Planets" for astronomy education for teenagers is chosen based on the interest of adolescents in music and visual performances that utilize digital and multimedia technology.

The use of the 3D Design concept with the use of detailed planetary texture surfaces with 10K-sized image quality that can build an attractive visual display displayed on a large screen on the performance stage. Additional objects such as space satellites at the opening of their appearance make the audience invited to see the visuals of the space planet and seem to be exploring space with the wave of music. With the concept of visual performances, it is expected to increase the interest of the younger generation, especially adolescents, towards astronomy in general, and the Planetarium in particular.

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