BERKALA FISIKA INDONESIA
Jurnal Ilmiah Fisika, Pembelajaran dan Aplikasinya
http://journal.uad.ac.id/index.php/BFI/index
2085-0409 (Print) | 2550-0465 (online)

Indoor LED videotron screen design with microcontroller HD-U60-75

Winda Setya *, Fariha, Muhammad Minan Chusni

Department of Physics Education, Tarbiyah and Teacher Training, Universitas Islam Negeri Sunan Gunung Djati, Indonesia
Email: suratwindasetya@uinsgd.ac.id
* Corresponding Author

Informasi artikel
Sejarah artikel:
Dikirim 07/02/22
Revisi 27/05/22
Diterima 05/07/22

Kata kunci:
LED
Layar Videotron
Microcontroller

ABSTRAK

Dunia digital berkembang pesat, sehingga mampu menampilkan visual yang detail dan realistis. Videotron memberikan tampilan visual yang dapat menampilkan perpaduan gambar secara jelas dan detail sehingga menjadi pilihan dalam menyampaikan informasi yang lebih menarik. Harganya yang relatif mahal sehingga penelitian ini bertujuan untuk merancang sebuah videotron dan mengamati pengaruhnya terhadap sumber arus yang dibutuhkan. Metode penelitian ini dengan melihat arus yang dihasilkan dari enam variasi warna background dan variasi panel secara seri. Hasil yang diperoleh menunjukkan bahwa variasi warna dan jumlah panel yang digunakan mempengaruhi sumber arus. Warna biru membutuhkan arus paling sedikit dalam jumlah panel dan warna putih membutuhkan arus paling banyak dalam jumlah panel.

Keywords:
LED
Videotron Screen
Microcontroller

ABSTRACT

Indoor LED videotron screen design with microcontroller HD-U60-75. The digital world, is developing rapidly to be able to display a detailed and realistic visual. Videotron provides a visual display that can display a blend of images clearly and in detail so that it becomes a choice in conveying more interesting information. The price is relatively expensive so this research aims to design a videotron and observe the effect on the current source needed. This research method is by looking at the current generated from six variations of background color and panel variations in series. The results obtained indicate that the color variations and the number of panels used to affect the current source. The blue color requires the lowest current in the number of panels and the white color requires the most current in the number of panels.

How to Cite:

Setya, W., Fariha, & Chusni, M. M. (2022). Indoor LED videotron screen design with microcontroller HD-U60-75. *Berkala Fisika Indonesia : Jurnal Ilmiah Fisika, Pembelajaran Dan Aplikasinya, 13*(2), 57–64. https://doi.org/10.12928/bfi-jifpa.v13i2.23283.

Introduction

Today's technological developments have influenced all fields of life, such as education, business, trade, health, and government (Mailizar et al., 2018). Utilization of technology is needed to be able to keep abreast of the times and to meet human needs effective and efficiently (Chen et al., 2017).

In the digital world, especially electronics, media has developed rapidly that can display detailed and realistic visualizations. Visual displays that are developing in the digital market, one of them is Light Emitting Diode (LED) (Wang et al., 2011). LEDs are made of semiconductor diodes that emit energy in the form of photons when crossed by an electric current (Jung et al., 2012). Initially LED was an application for imaging (Svilainis, 2008) and was known as a small lamp which is usually used to show the monitor is on, the phone is turned off, the oven is hot, and others (Steigerwald et al., 2002). Now LEDs have been widely used in the realm of public lighting and decoration (De Almeida et al., 2014; Khan & Abas, 2011).

LED display has now become an important means of disseminating information has become a symbol of modernization and a source of information in urban areas. LEDs are described as a technology that can reduce energy consumption and can reduce greenhouse gas emissions (Han et al., 2010). LEDs are preferred because of their ability to display high-quality images that are clear and colorful (Baloch et al., 2019), and have a long life (Jung et al., 2012; Nardelli et al., 2017; Tamura et al., 2000).

At present, many applications of LED use are composed of single LEDs up to millions of LEDs (Steigerwald et al., 2002). One application or visual media that uses LED is videotron. Videotron is referred to as a digital billboard or electronic billboard (Purnama & Thalib, 2018). This videotron is often found in city centers such as bus stops, train stations, large shops and airports (Abramov et al., 2003). Videotron is usually installed in a pillar or column (Baloch et al., 2019). Generally videotron is used to display advertisements or information in the form of text, images, graphics, and videos (Baloch et al., 2019; Zalesinska, 2018). In one videotron panel composed of many LED lights that can emit light with a variety of colors so that the resulting display is brighter, clearer, detailed and realistic (Khan & Abas, 2011). So it can be said that videotron is a visual media that can display detailed and realistic visual appearance.

A brighter and clearer videotron display is one of the most attractive and attractive visual media. However, according to Zalesinska's research, the impact of the light produced by videotrons or billboards causes road drivers to lose their concentration and interfere with the driver's vision [15], [16]. The light produced by videotron is very bright so there needs to be an appropriate setting and color selection so that the light produced can be received by the eye. In addition, the price of videotrons is also relatively expensive, so the need for effective and efficient installation of videotrons. Therefore, this research will discuss the indoor videotron design using the HD-U60-75 microcontroller with color settings to further save the electricity consumption needed.

Method

In this study discusses the design of videotron with HD-U60-75 microcontroller. The videotron design was made using three panels of P.6 videotron that can be installed in series or parallel, power supply 20 A, microcontroller HD-U60-75, data cable, jumper cable and software of application HD2016. The materials used to design videotrons are in Figure 1.

Videotron design that is made is the design of videotron installation which is arranged in series and parallel. Installation of videotron in series is done by pairing three videotron panels horizontally in one socket on the micro-controller HD-U60-75. Whereas the installation of videotron in parallel is done by pairing two videotron panels vertically, each panel connected in a socket on the microcontroller HD-U60-75.

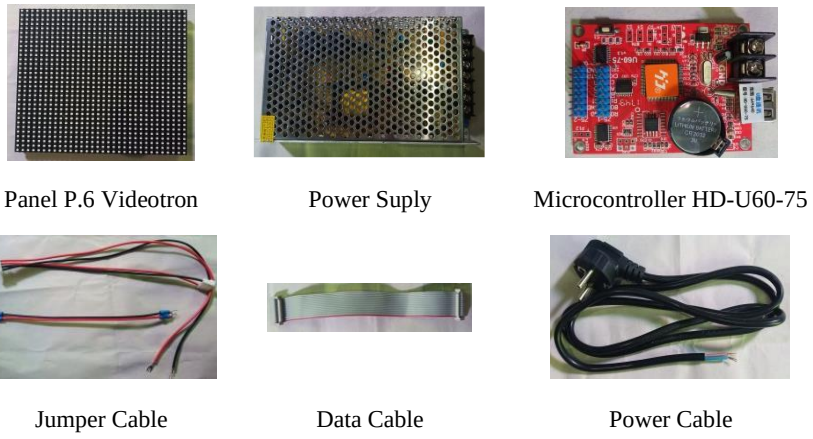


Figure 1. Electronic components are used in research

In addition, the data collection method used is a measurement. The data obtained from the measurement results are the electric current flowing in the Pot videotron panel. The measured electric current is the electric current that flows in the videotron when the colors of the LEDs used are different. Measurement of electric current for each color of the LED was carried out in three experiments, namely the measurement of electrical current in one panel P.6 videotron, two panels P.6 videotron, and three panels P.6 videotron arranged in series. The measurement of electric current in each experiment was carried out five times and only an average was taken from the results of these measurements. After the measurement data is obtained, it is then processed through the Microsoft Excel application so that the data obtained can be presented in tabular and graphical form. The measurement data that has been processed are then analyzed to determine the difference in the electric current flowing on the panel based on the different LED color displays.

Results and Discussion

This research was conducted to find out how videotron designs are more efficient which includes installing videotrons in series, installing videotrons in parallel, and measuring the value of electric current

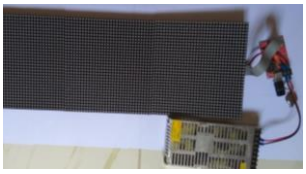
flowing on videotron panels based on the color of the LEDs displayed. The results will be explained as follows.

Videotron Circuit Design

There are two ways to arrange a videotron panel, they are series and parallel series, the language of each series is as follows.

1. Series Circuit

In a series circuit, videotron panels are arranged in series in a horizontal plane. The series of videotrons is shown in Figure 2. In the series circuit, there is only one data cable that is used to connect an HD-U60-75 microcontroller to one of the videotron panels. That is because the series in series makes all videotron panels run the same command directly.



Front view

Back view

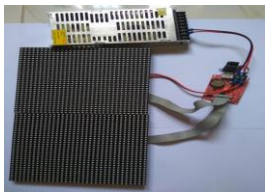
Figure 2. Series circuit of videotron panels

2. Parallel Circuit

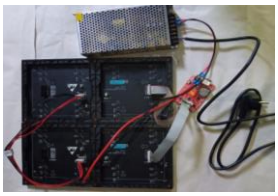
In parallel circuits, videotron panels are installed vertically. The parallel circuit of videotron is shown in Figure 3. In a parallel circuit, there are two data cables that are used to connect the microcontroller with each videotron panel. This is done because each panel that is installed in parallel has a different command but is done simultaneously. The more videotron panels installed in parallel, the more data cables needed to connect each panel to the microcontroller HD-U60-75.

In addition, the installation of videotron can also combine two ways, namely series and parallel. For videotron sequences in series and parallel, many videotron panels are needed. Because of the limited number of videotron panels in this study only two series were used.

Videotron design using the HD-U60-75 microcontroller can be programmed through the application HD2016. The programming is not difficult. The way to program is in Figure 4.



Front view



Back view

Figure 3. Parallel circuit of videotron panels

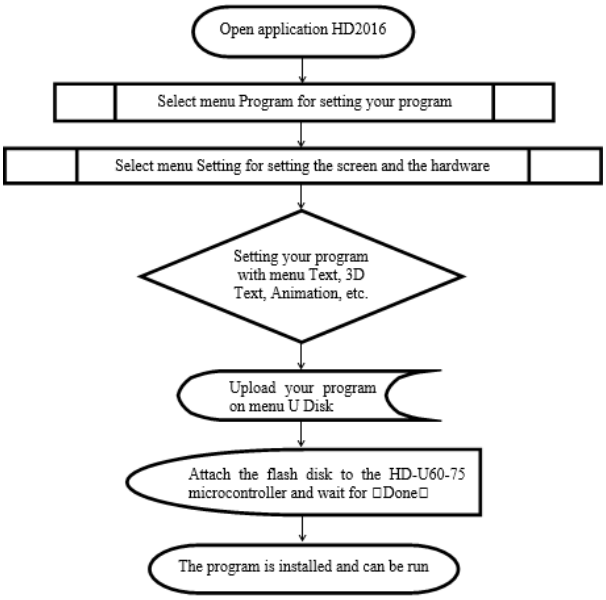


Figure 4. Flowchart of programing and installing videotron

Measurement of Electric Current in Videotron Panel

Videotron consists of many LEDs or lights of various colors (Purnama & Thalib, 2018), including white, blue, green, red, yellow, light blue, and purple. Each color has a different brightness, so the electric current needed is different. In this study, measurements were made of the amount of electric current flowing in the P.6 videotron panel of the colors used. The data on measurements of the electric current there are.

1. Color Background

Data from the measurement of electric current in panel P.6 videotron in accordance with the background color used is show in Table 1.

Table 1. Data from the measurement of electric current in panel P.6 videotron with different background color

Color Background	*I* (A)		
	1-Panel	2-Panels	3-Panels
Red	2.780	2.816	5.560
Green	2.786	2.424	4.332
Yellow	4.370	3.580	6.204
Blue	1.350	1.376	2.712
Light Blue	3.622	2.952	4.806
Purple	3.948	3.542	6.222
White	4.972	3.538	6.366

In Table 1, the electric current needed for each color is different. In one panel, the color sequence that requires electric current from the largest to the smallest is white, yellow, purple, light blue, green, red, and blue. In the two panels, the color sequence that requires electric current from the largest to the smallest is yellow, purple, white, light blue, red, green and blue. And in the three-color sequence panels that require electric current from the largest to the smallest namely white, purple, yellow, red, light blue,

green, and blue. Based on the three different panel arrangements, blue always requires the smallest electric current among other colors. According to Table 1, to illustrate Table 1 more clearly shown in Figure 5.

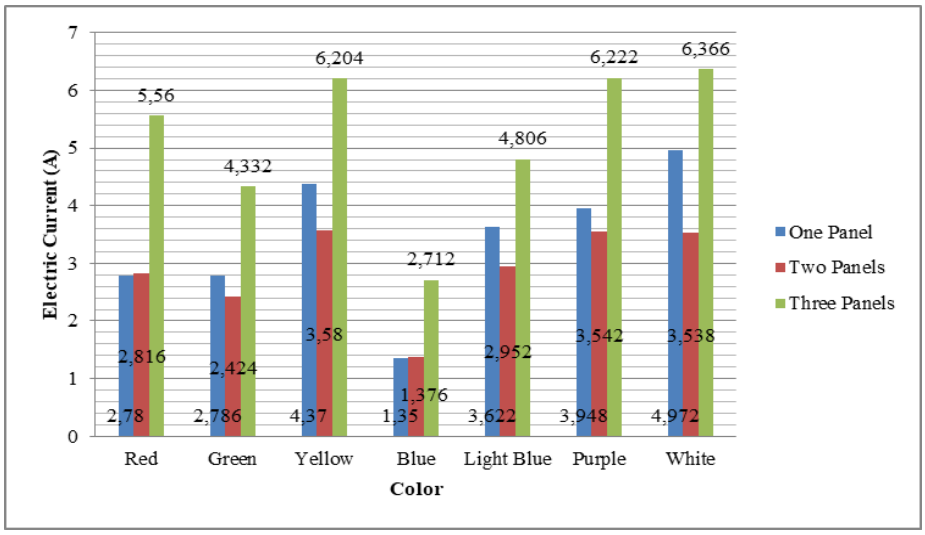


Figure 5. Data from the measurement of electric current in panel P.6 videotron with different background color

Based on Figure 5, each color used as the background or the most dominant color, blue requires the least electrical current among other colors, the blue electric current is 1.350 A on a videotron panel P.6. While the white color requires the most electrical current among other colors, the white electric current is 4.972 A on a P.6 videotron panel. That happens because the white color has a greater light intensity than other colors. Based on research conducted by M. Zalesinska, white LEDs have a light intensity of 7000 cd and an illumination value of 7000 cd/m^2 (Zalesinska, 2018).

Each LED display requires current and voltage to flow on the panel (Wang et al., 2011). The electric current will control the intensity of the LED color displayed (Kurdthongmee, 2005). The required electric current will affect the electrical power used and will also affect the voltage generated. If the higher the voltage, the higher the LED's light intensity will also be higher (Fajri A et al., 2014). So the greater the light intensity of an LED, it will require a large electric current. Therefore, in order to display videotron more efficiently and environmentally friendly, videotron can be designed by considering the colors used. Choosing the right color and adjusting the time of transfer of images or videos can minimize negative impacts from videotron lighting such as disturbing the driver's concentration (Zalesinska, 2018), disturbing eye sight, and others. In addition, to save electricity, you can choose the color of the LED that has a small light intensity so that the required electric current value will be small, such as blue or green.

Conclusion

Based on the discussion the videotron design and the results of data obtained from measurements, it can be concluded that the videotron design using the HD-U60-75 microcontroller can

be arranged in series and parallel as well as a simple arrangement and the programming is not difficult. In addition, variations in color and number of panels used affect the source of electricity needed. Blue color requires the lowest electric current and white color requires the most electricity in the same number of panels.

References

Abramov, V. S., Polyakova, I. P., Tomilin, M. G., & Chuvashov, A. I. (2003). LED modules for large screens. *Journal of Optical Technology*, *70*(7), 492–494. https://doi.org/https://doi.org/10.1364/JOT.70.000492

Baloch, N., Jun, C.-S., & Kwon, B.-I. (2019). Design and Performance Evaluation of a Modular Linear Induction Machine for Rotating Electronic Billboard. *IEEE Access*, *7*, 127393–127401. https://doi.org/https://doi.org/10.1109/ACCESS.2019.2940524

Chen, L., He, Y., Yang, Y., Niu, S., & Ren, H. (2017). The research status and development trend of additive manufacturing technology. *The International Journal of Advanced Manufacturing Technology*, *89*(9–12), 3651–3660. https://doi.org/https://doi.org/10.1007/s00170-016-9335-4

De Almeida, A., Santos, B., Paolo, B., & Quicheron, M. (2014). Solid state lighting review–Potential and challenges in Europe. *Renewable and Sustainable Energy Reviews*, *34*, 30–48. https://doi.org/https://doi.org/10.1016/j.rser.2014.02.029

Fajri A, U. D., Wibawa, U., & Hasanah, R. N. (2014). Hubungan Antara Tegangan Dan Intensitas Cahaya Pada Lampu Hemat Energi Fluorescent Jenis Sl (Sodium Lamp) Dan Led (Light Emitting Diode). *Jurnal Mahasiswa TEUB*, *2*(5).

Han, H. J., Jeon, Y. I., Lim, S. H., Kim, W. W., & Chen, K. (2010). New developments in illumination, heating and cooling technologies for energy-efficient buildings. *Energy*, *35*(6), 2647–2653. https://doi.org/https://doi.org/10.1016/j.energy.2009.05.020

Jung, S., Hann, S., Park, S., & Park, C. (2012). Optical wireless indoor positioning system using light emitting diode ceiling lights. *Microwave and Optical Technology Letters*, *54*(7), 1622–1626. https://doi.org/https://doi.org/10.1002/mop.26880

Khan, N., & Abas, N. (2011). Comparative study of energy saving light sources. *Renewable and Sustainable Energy Reviews*, *15*(1), 296–309. https://doi.org/https://doi.org/10.1016/j.rser.2010.07.072

Kurdthongmee, W. (2005). Design and implementation of an FPGA-based multiple-colour LED display board. *Microprocessors and Microsystems*, *29*(7), 327–336. https://doi.org/https://doi.org/10.1016/j.micpro.2004.12.002

Mailizar, J., Rahmawati, M., & Rahmawati, M. S. (2018). Efektivitas Penggunaan Videotron Sebagai Media Sosialisasi Program Pemerintah Terhadap Peningkatan Pengetahuan Masyarakat Kota Banda Aceh (Suatu Penelitian Pada Videotron Di Taman Ratu Safiatuddin Lampriet Kota Banda Aceh). *Jurnal Ilmiah Mahasiswa Fakultas Ilmu Sosial & Ilmu Politik*, *3*(1).

Nardelli, A., Deuschle, E., de Azevedo, L. D., Pessoa, J. L. N., & Ghisi, E. (2017). Assessment of Light Emitting Diodes technology for general lighting: A critical review. *Renewable and Sustainable Energy Reviews*, *75*, 368–379. https://doi.org/https://doi.org/10.1016/j.rser.2016.11.002

Purnama, A. P., & Thalib, A. A. (2018). Keefektivitasan Videotron Dalam Menyampaikan Pesan Iklan Kepada Masyarakat. *Jurnal Dakwah Tabligh*, *19*(1), 44–57. https://doi.org/https://doi.org/10.24252/jdt.v19i1.5927

Steigerwald, D. A., Bhat, J. C., Collins, D., Fletcher, R. M., Holcomb, M. O., Ludowise, M. J., Martin, P. S., & Rudaz, S. L. (2002). Illumination with solid state lighting technology. *IEEE Journal of Selected Topics in Quantum Electronics*, *8*(2), 310–320. https://doi.org/https://doi.org/10.1109/2944.999186

Svilainis, L. (2008). LED brightness control for video display application. *Displays*, *29*(5), 506–511. https://doi.org/https://doi.org/10.1016/j.displa.2008.05.002

Tamura, T., Setomoto, T., & Taguchi, T. (2000). Fundamental characteristics of the illminating light source using white light-emitting diodes based on InGaN semiconductors. *IEEJ Transactions on Fundamentals and Materials*, *120*(2), 244–249. https://doi.org/https://doi.org/10.1541/ieejfms1990.120.2_244

Wang, D. Q., Shi, Y. Q., Wang, T., Wu, X. K., & Zhou, Q. L. (2011). Secured Publishing AntiBlocking Multimedia Realtime Billboard Display. *Advanced Materials Research*, *282*, 104–107. https://doi.org/https://doi.org/10.4028/www.scientific.net/AMR.282-283.104

Zalesinska, M. (2018). The impact of the luminance, size and location of LED billboards on drivers' visual performance—laboratory tests. *Accident Analysis & Prevention*, *117*, 439–448. https://doi.org/https://doi.org/10.1016/j.aap.2018.02.005