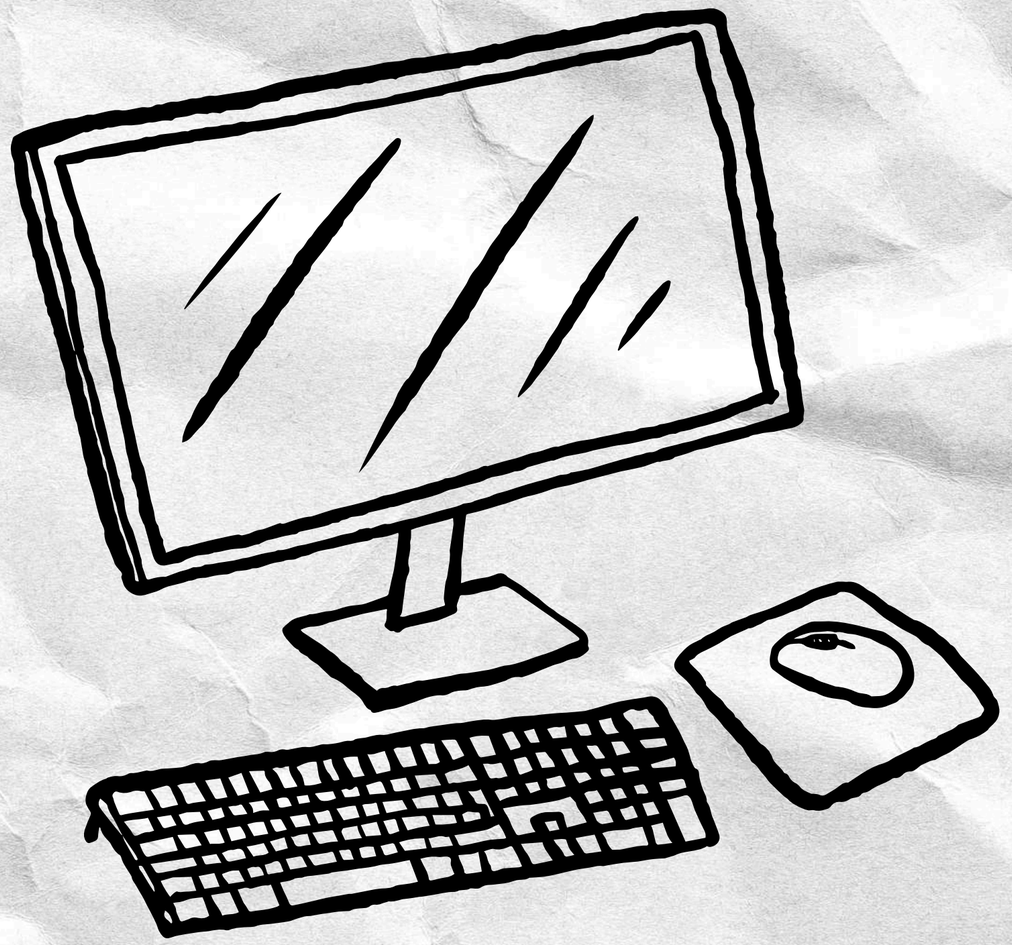
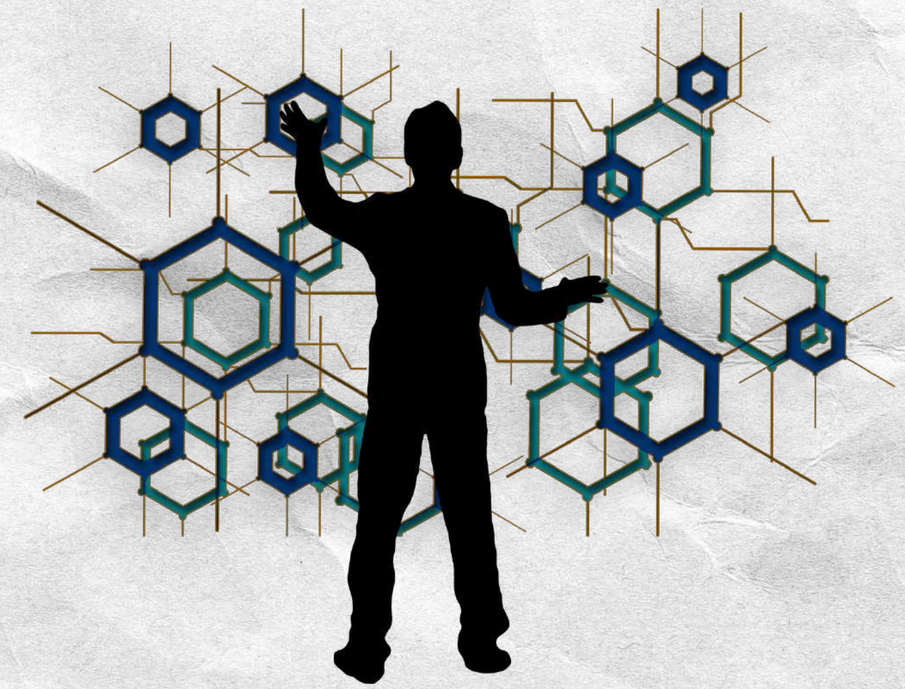
Caleb Kyle Z. Esplanada | BS CS - 1 | CIS 1102 Group #2

PORTFOLIO #3





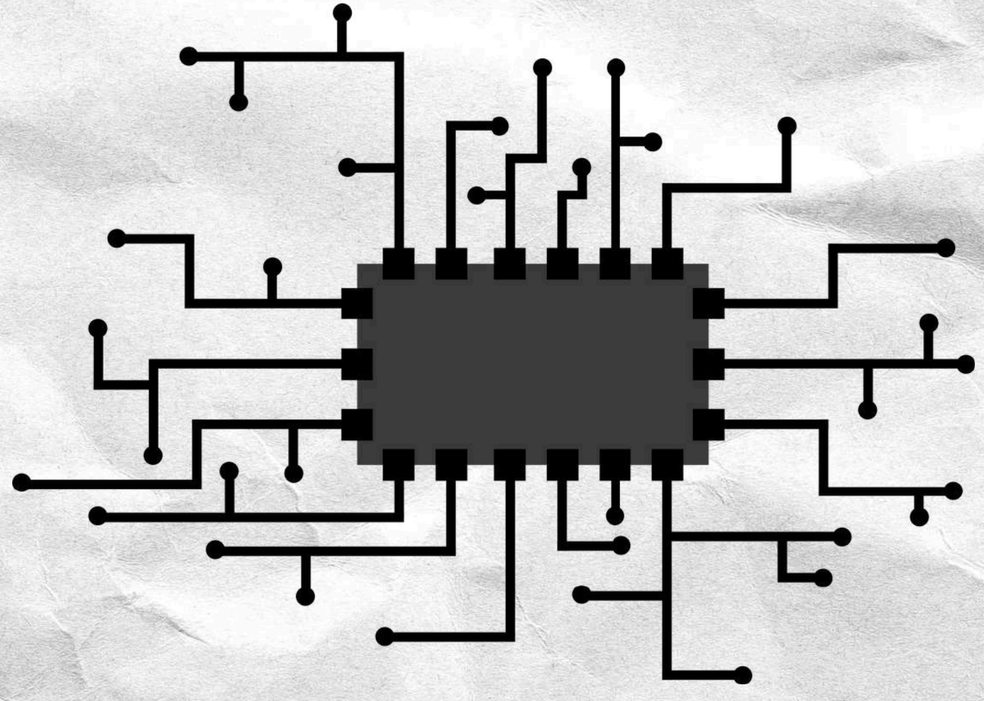
NUMBER SYSTEMS

- A set of symbols and rules that is used for number representation, or any system used for naming or number representation(Latif et. al., 2011).

- Defined by the set of values that each digit can adopt, as well as an interpretation rule that determines the mapping between the sequence of digits and their numerical values. (Wanhammar, 2007).

WHY ARE THEY IMPORTANT?

- They are important from the perspective of understanding how data is represented before it is processed by any digital system, including a digital computer (KL University, n.d.).



TYPES OF NUMBER SYSTEMS

According to KL University (n.d.) and Olajide (2017), the types of number system are:

Binary

Most of the electronic components will have a state or binary operation, ON and OFF. The number system used for digital systems is binary number system. It is a base-2 number system with ‘0’ and ‘1’ as the two independent digits.

Octal

The octal number system has a base of 8 and thus eight distinct digits. This number system represents every number (value) as 0, 1, 2, 3, 4, 5, 6, and 7.

Decimal

The decimal number system is most appropriate for humans since it employs 10 digits in each location of a given value; the base or radix is 10. This number system represents each number (value) as 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Hexadecimal

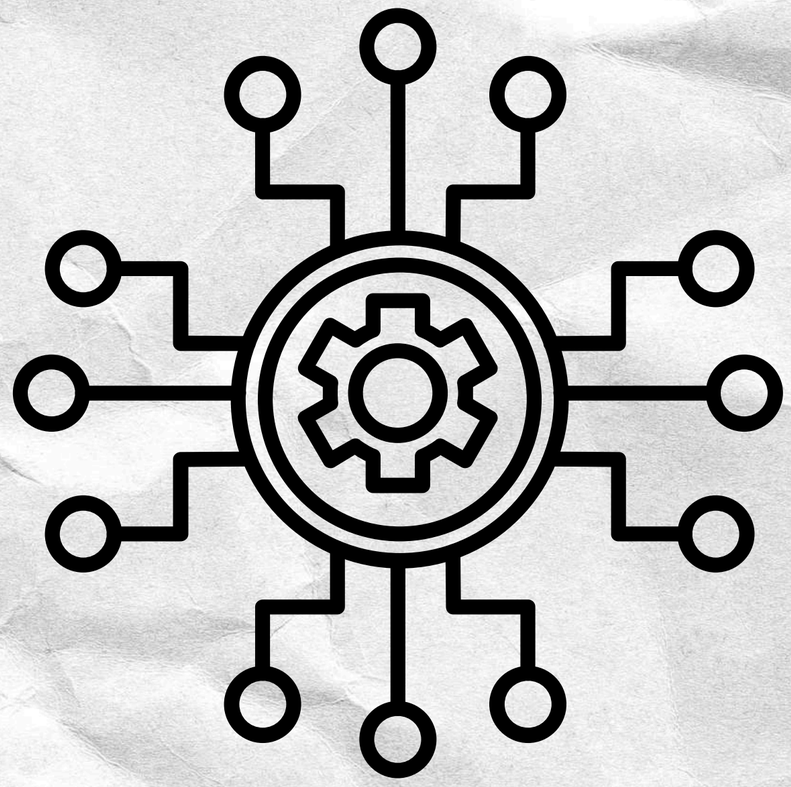
Large numbers are represented in digital systems such as computers using the hexadecimal number system. It has a base of 16, resulting in sixteen (16) alphanumeric values ranging from 0 to 9 and A to F. Each number is denoted by 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F.

USES/SIGNIFICANCE OF EACH NUMBER SYSTEM

According to Lameres (2024),

The study of **decimal** and **binary** is obvious since they reflect how our brains comprehend the physical world (decimal) and how computers operate (binary). Logic circuits are used to create and transmit 1s and 0s in order to compute and convey binary information. And as humans, our brains have been trained to count, label, and measure using the decimal system.

Furthermore, **Octal** is rarely used, but it is studied to demonstrate how the formalization of number systems can be applied to any system, regardless of the number of symbols they include. Lastly, **Hexadecimal** is explored because it is an efficient way of representing a large quantity of binary values with a little number of symbols.



ANALYSIS

Learning about number systems helped me understand how data is represented and processed inside digital systems. Before, I only saw numbers as what we humans use for counting, measuring, or calculating, but now I see that different systems exist, each with its own specific purposes. The idea that computers rely on the binary number system, which only uses 0s and 1s, makes sense because digital components can only be in two states—on or off (Latif et al., 2011). This simple concept is actually the basis of how computers function.

I also realized that the decimal number system, which we use in everyday life, is not universal in computing. It is just one of many possible systems. According to LaMeres (2024), the decimal system is most familiar to humans because it reflects how we naturally count, calculate, and measure things. On the other hand, computers use binary to process data efficiently, while hexadecimal is used for the simplification of the representation of long binary numbers. The octal system, though not as common today, still shows how flexible numerical representation can be (KL University, n.d.; Olajide, 2017).

What stood out to me most is how each number system serves a unique purpose. Binary is the foundation of all digital operations, decimal connects computing to human understanding, octal provides another way to group binary digits, and hexadecimal makes large binary values easier to handle (Wanhammar, 2007). Even though we mainly use only a few systems, there truly isn't a fixed number of how many number systems there are. Theoretically, there could be infinite number systems, each with its own base and symbols.

Ultimately, studying number systems gave me a deeper appreciation for how computers translate data into something we can utilize and understand. It's fascinating how these systems, though abstract, make all digital technology possible. Understanding them helps close the gap between how humans think in decimal and how machines operate in binary.

REFERENCES

LaMeres, B. J. (2024, January). Number Systems. Introduction to Logic Circuits & Logic Design with Verilog, 7-41. https://doi.org/10.1007/978-3-031-43946-9_2

Latif, S., Qayyum, J., Khan, K., & Lal, M. (2011, July). Novel Approach to the Learning of Various Number Systems. International Journal of Computer Applications. 26(7),18-28, https://doi.org/10.5120/3116-4283

Olajide, A. O. (2017, October). Number System. https://doi.org/10.13140/RG.2.2.18838.04167

Wanhammar L. (2007, September 2). Processing Elements. DSP Integrated Circuits 11, 461-530. https://doi.org/10.1016/B978-012734530-7/50011-8

Review of Number Systems (n.d.). KL University. Retrieved from https://ecm2d.weebly.com/uploads/2/2/4/1/22419142/chapter-1.pdf