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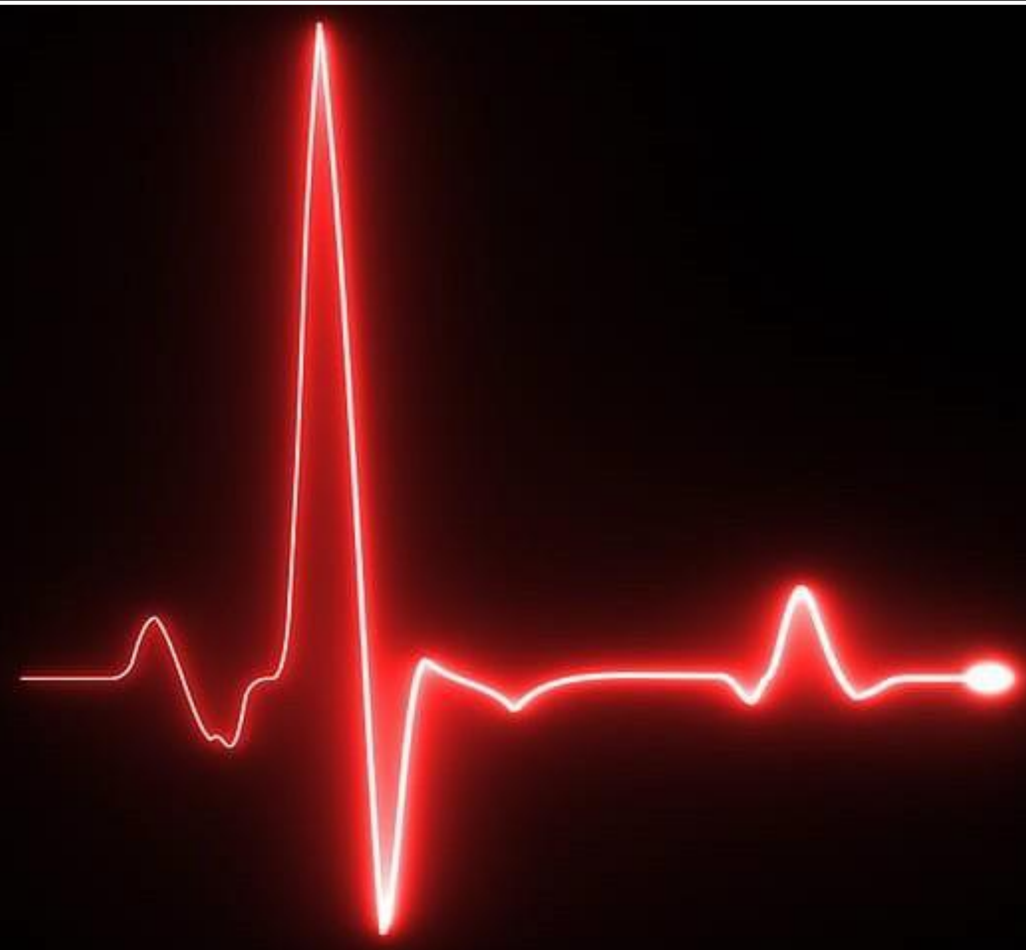
THE PULSE

NEWSLETTER
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING



Vision

To emerge as a centre of academic excellence in the field of Electronics & Communication Engineering to address the dynamic needs of the industry upholding moral values.

Mission

- Impart in-depth knowledge in Electronics & Communication Engineering to achieve academic excellence.
- Develop an environment of research to meet the demands of evolving technology.
- Inculcate ethical values to promote team work and leadership qualities befitting societal requirements
- Provide adaptability skills for sustaining in the dynamic environment

FACULTY CONNECT

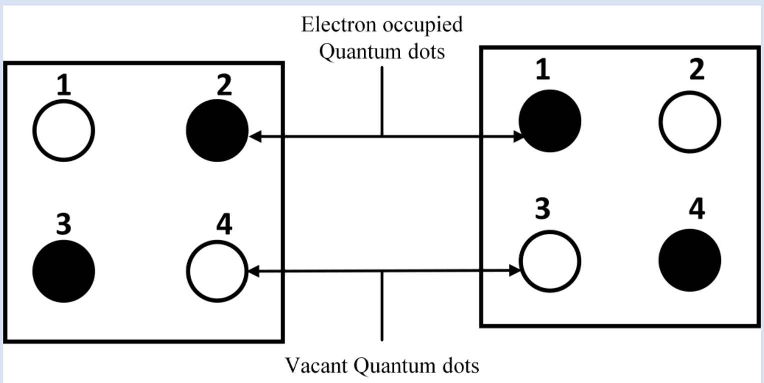
Quantum Dot Cellular Automata – an alternative approach to MOSFET

According to Moore's law, the number of transistors on a chip doubles every 18 months. However, this trend faces serious challenges such as physical scalability limits, leakage current, ultra-thin gate oxide, and short channel effects. These recent challenges have led to the development of new alternative approaches to MOSFET technology that can perform the same function of switching or amplifying electrical signals, but without using transistors or complementary metal-oxide-semiconductor (CMOS) fabrication processes.

Some possible alternatives to CMOS include:

- Spintronic devices
- Single-electron transistor (SET)
- Quantum-dot cellular automata (QCA)
- FinFET
- High-electron-mobility transistor (HEMT)

Among all of these devices, QCA depends on different physical phenomena (such as Columbic interactions). QCA is an attractive alternative to the conventional CMOS technology and it is suitable for designing a circuit at Nano-scale level. QCA not only gives solution at Nano-scale level, but it also provides a new method of computation and information transformation. QCA is purely operated by columbic interaction. Each QCA cells consist of four quantum dots that are positioned at corners of the square, and it has two free electrons, that can tunnel between the ‘dots’ due to columbic interaction. This way, information can be transferred and processed without any current flow. The quantum dots in a QCA are arranged in a grid-like pattern, and their position of electrons in quantum dots are used to represent the binary values of ‘0’ and ‘1’. Unlike in CMOS design, QCA logic states are stored as position of individual electrons rather than the voltage levels.



P = -1(logic 0) P = +1 (logic 1)

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Where 1, 2, 3 and 4 represents the position of Quantum dot, in which when the electron is present the weight of the position is turned to be one otherwise it is zero. By applying the position weight in the below equation we can obtain logical '1' and logical '0'.

$$P = \frac{(\rho_1 + \rho_3) - (\rho_2 + \rho_4)}{\rho_1 + \rho_2 + \rho_3 + \rho_4}$$

QCAs have several advantages over traditional transistor-based computing technologies, including:

- **Ultra-low power consumption:** QCAs consume orders of magnitude less power than transistors, making them ideal for battery-powered devices and other applications where power is a critical concern.
- **Very high switching speed:** QCAs can switch states much faster than transistors, making them suitable for high-speed computing applications.
- **Small size:** QCAs are much smaller than transistors, which could lead to the development of more compact and powerful electronic devices.

However, QCAs also have some challenges that need to be addressed before they can be widely adopted. These challenges include:

- **Fabrication:** QCAs are more difficult to fabricate than transistors, which could limit their commercial viability.
- **Noise immunity:** QCAs are more sensitive to noise than transistors, which could make them less reliable in some applications.
- **Limited functionality:** QCAs can only perform a limited set of logic functions, which could limit their use in some applications.

Despite these challenges, QCA technology is still under development and there is a lot of potential for its future use in computing applications. If the challenges can be overcome, QCAs could eventually replace transistors as the dominant technology for digital circuits in future.

-Prof. Senthilnathan S.

Assistant Professor
ECE department

EVENTS

Highlights of the Month

- Technical talk organized on the topic “Sensors, Automation and Robotics” by Dr. Gaurab Sen, University of Massey held on 15-04-2023.
- Organized ECE Department’s Association, CUESTIC-2023 Valedictory programme and delivered valedictory speech on “Current and Future Trends in Industrial Automation” by the Chief Guest of the program, Mr. Ankanadh N, General Manager, TOMRA held on 17- 04-2023.
- Students of 6th semester ECE under the guidance of Dr. Vinay Jha Pillai, conducted an orientation session about various government schemes for woman and child development in nearby village on 03-04-2023.
- Department Faculty meeting with the primary agenda on academic related matters held on 10-04-2023.
- Dr. Gokuraju Thriveni awarded the certificate of appreciation from IEEE International Conference on Contemporary Computing and Communications (InC4) held on 12-04-2023.
- Prof. Shashikumar D. delivered an invited talk in the online workshop “Antenna design for 5G applications” organized by St. Anne’s College of Engineering and Technology, Chennai on 18-04-2023.
- Dr. Vikash Kumar has been appointed as Assistant Professor in the Department of ECE during the academic year 2022-2023.
- Dr. Neethu P S published an article titled “Generative Paraphrasing And Predictive Sentimental Analyser Using Novel Restbert Framework” in Scandinavian Journal of Information Systems, April 2023.
- Dr. Harimurthy published an article titled “Acute Behavior of the Ink Physics in Inkjet Printers” in International Journal of Science and Research (IJSR), April 2023.

STUDENT CONNECT

Unveiling Earth's Secrets: The Art and Science of Satellite Imaging

In the vast theatre of the cosmos, where stars twinkle and galaxies whirl, a remarkable performance unfolds. Above our blue planet, a symphony of technology, innovation, and artistic vision has been orchestrating an unparalleled ballet: the dance of satellite imaging. With these celestial performers as our guides, we have been granted an awe-inspiring perspective, enabling us to decode the mysteries and intricacies of Earth from a vantage point once reserved for the realm of dreams.

The Technological Overture:

As the curtain rose on the era of satellite imaging, it was the resonating hum of Sputnik 1 that heralded the dawn of a new age. In the ensuing decades, these technological maestros have transformed into virtuosos, each with their own instrument and unique repertoire. Landsat 1 emerged as a luminary, capturing Earth's evolving landscapes with remarkable precision. Yet, this was just the opening note, as subsequent satellites expanded the symphony's range, from the radiant brushstrokes of optical imagery to the melodious echoes of radar's microwaves.

Harmonies of Discovery:

Each satellite's sensor plays a vital role in composing the grand symphony of Earth's secrets. With optical elegance, we witness Earth's changing attire, from sprawling urban expanses to the verdant tapestries of forests. Radar's rhapsody pierces through the enigma of clouds and darkness, mapping terrains and unearthing the Earth's geological symphony. The infrared sonata reveals the invisible dance of heat, casting light on wildfires, volcanic eruptions, and subtle temperature variations. Meanwhile, the multispectral harmonies paint a vivid portrait of Earth's composition, revealing its mineral riches and capturing the heartbeat of vegetation health.

Unveiling the Tapestry:

The performance of satellite imaging transcends mere spectacle, casting its brilliance across a multitude of disciplines. Geophysics finds a vital tool in these celestial dancers, unraveling the Earth's geological ballad and deciphering seismic whispers. In the meteorological opera, satellites compose intricate arias of atmospheric dynamics, guiding weather forecasts and disaster response. On the agricultural stage, satellite-guided precision becomes a rhythmic pas de deux, ensuring sustainable growth and bountiful harvests.

STUDENT CONNECT

Conclusion:

As the final act of this grand cosmic drama approaches, challenges and promises lie ahead. The vast torrents of data flowing from these celestial dancers demand delicate choreography, and innovative algorithms are the conductor's baton. Collaboration and celestial etiquette are essential to prevent orbital cacophony and debris, ensuring that Earth's stage remains pristine. The symphony's crescendo, however, is yet to reach its peak. Technological innovations, driven by the harmonious blend of artificial intelligence and machine learning, promise a deeper resonance from the data's melody. Miniature yet powerful satellites poised for their debut are set to usher in a new era, where higher resolutions and real-time performances will illuminate Earth's stage with unprecedented brilliance.

In this celestial ballet of exploration, satellite imaging stands as humanity's magnum opus. A testament to human ingenuity, it unveils Earth's most captivating narratives, inspiring us to marvel at the beauty of our planet, protect its delicate rhythms, and embark on a journey of continuous discovery and wonder.

-Jerin Joseph
5BTELCS 2021-25 Batch

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Kindly share your thoughts and research experiences via e-mail to our team, and be featured in next month's is