CHITKARA UNIVERSITY

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DO YOU KNOW ?

The QWERTY keyboard was designed to slow you down

When typewriters were introduced, typing too quickly would jam the keys. To prevent this from happening, QWERTY was introduced which placed common alphabets at a distance from each other and slowed typists down.

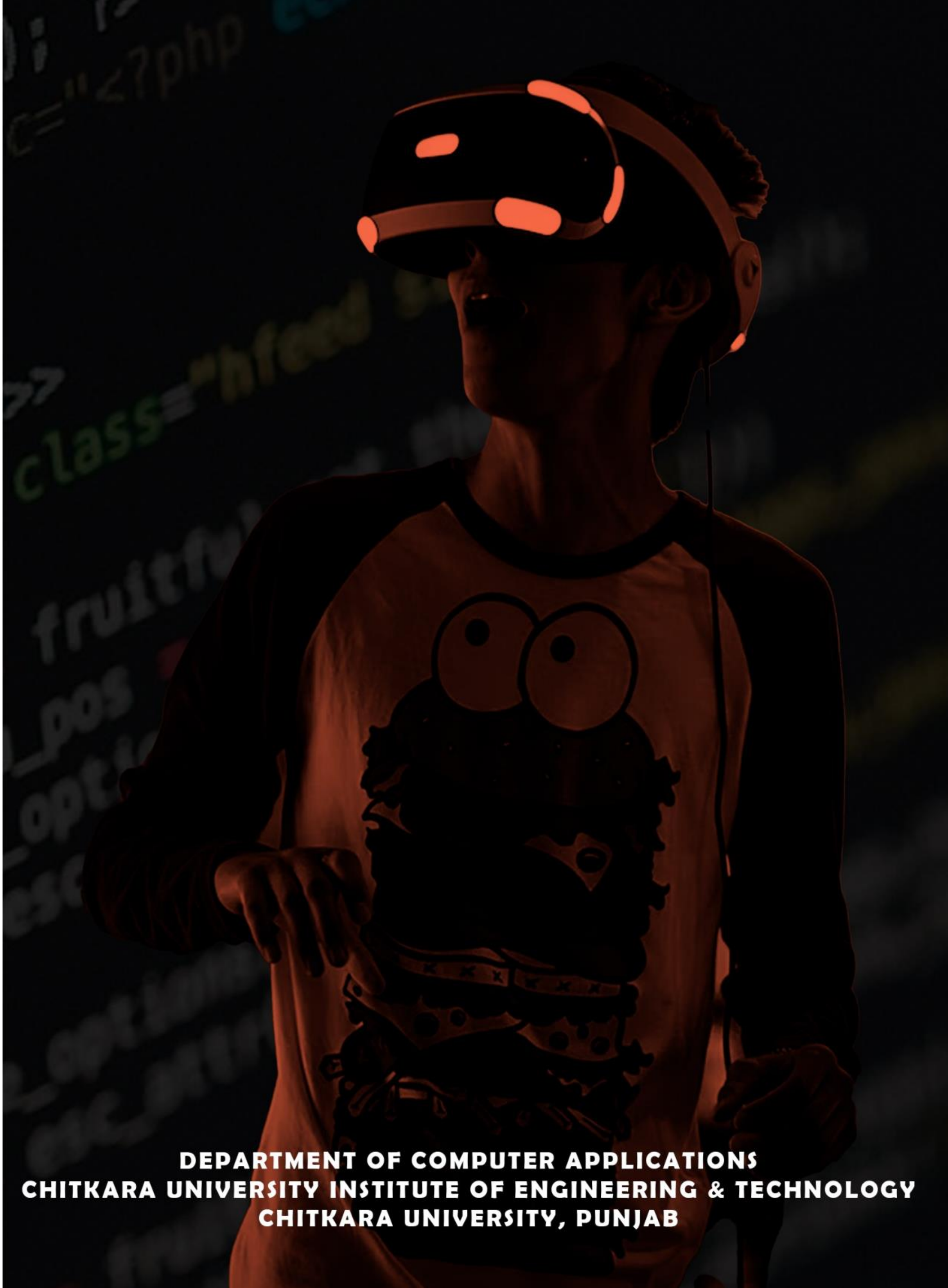
The Firefox logo isn't a fox

It's actually a red panda.
It's a common misbelief that the Firefox logo is a fox (I mean... it is in the name), but it is actually a red panda!

Nokia used to sell toilet paper

Before Nokia sold mobile phones, they manufactured a range of other items, such as; toilet paper, tires, computers, and other electronics

WALL FOR ALL



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Dear Readers

The nostalgic feeling that one experiences while sifting through the dusty old pages of the college magazine cannot be expressed in words. However, very few of us have retained those copies, and most of those precious articles that we wrote during those golden days with enthusiasm are lost forever. With the advent of e-books and other online media, the days of paper-bound college magazines are gone, and the digital platform has paved way to allow retention of such publications without much effort.

Wall-for-All, the e-Magazine published by the Department of Computer Applications, is one such effort that was started with an intent to provide a chance to all students and faculty members to share their thoughts and knowledge, and hone their skills in creative writing.

I am happy to see the enthusiasm of eminent members of the department to contribute to Wall *for All*. This shows the positive and creative energy of the contributors. However, it would be really wonderful if we can see the articles contributed by more students in the next editions, for this e-Magazine is intended to be a writing pad for each member of the department.

I proudly present the current edition of *Wall for All*.

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Evolution of Quantum Computing

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Introduction

Moore's law is going to stop soon because now, we need a new era of computing called quantum computing. For the last 100 years, now we have made much advancement after the invention of computers now we are getting smaller and better and powerful at the same time. But still, there are many problems which cannot be solved by our today's classical computers, we need a change.

Transistors which we are using in this generation of classical computing (basic units of memory units of computers) are now getting smaller to the atomic size. As classical computer use simple basic laws to work, but on the other hand quantum computers uses quantum mechanics principle like (superposition and entanglement) to solve the computational problems which are not solved by classical computers. Now, we should understand the systems working which requires in a different area of physics than we are similar which is Quantum mechanics.

On the level of atoms and subatomic particles, quantum mechanics examines matter and energy. When energy initially existed as discrete units Max Plarick represented the quantum theory.

Plarick named this units as 'Quanta', which gave us the theory. According to him this was he smallest possible unit of energy.

The concepts of classical information theory and quantum physics are combined in quantum computing. They play a significant role in physics. Quantum states are used to enable teleportation, also known as the secure and trustworthy transmission of quantum states. The exploitation of quantum entanglement as a resource is the overarching theme of all these rules and principles.

Weiner Heisenberg created a theory in 1927 that has come to be known as the "Uncertainty Principle." He asserts that it is impossible to quantify a subatomic particle's locations and momentum exactly. Simply said, the more information you have about a particle's location, the less information you have about its movement or its location.

It exists in all potential states and can function simultaneously until it is measured. Superposition is the name given to this concept.

Discovery of Quantum Principles

Information processing using quantum computing uses concepts from quantum physics, such as superposition and entanglement. Quantum computers are the tools used in quantum computing. They take use of subatomic particles' peculiar capacity to exist in several states simultaneously.

The all-encompassing quantum turning machine was defined by David Deutsch. Simon then creates the initial algorithms in 1997. This development increased the interest in the subject of quantum computing.

In contrast to conventional computers, which operate on binary bits, quantum computers operate on quantum bits, or Qubits, which conduct effective operations and analyze the state of the computer system for every 'm' bits of the system.

By combining the natural logs from both sides, we may determine that-

$m < 2n$

Ralph Hartley created this equation in 1927. This was the first time the quantity of information in a message has been measured. We can infer from this equation that bits can hold m distinct messages.

Shannon's Information theory started with this, and the next step is the Shannon's Entropy.

$$H(X) = -\Sigma_i \, p_i \log_2 p_i$$

A bit is the fundamental unit of information in a traditional computer, but a quantum bit, also known as a qubit, is the fundamental unit of QI.

Classical bits only exist in only two states, 0 and 1. But qubit exhibits a unique characteristic of existing in either of two discrete state @ and 1 or superposition. This unique feature Quantum computing will allow it to for more storage capability and at the same it time high computational power than the classical computers. For going successful quantum computation, QEC has to be performed repeatedly in the quantum computer which corrects the errors induced by decoherence and gate operations.

Quantum Bits

A qubit (or quantum bit) is a type of memory component that is extremely similar to the idea of a conventional "bit.", $\alpha|0> +\beta\ |1>$.

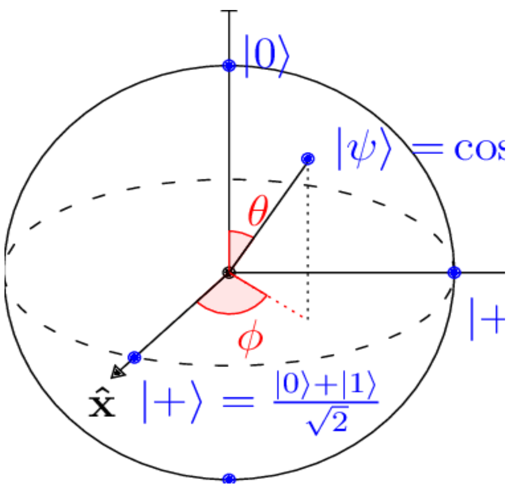

Figure 1: Pure state |ψ = α |0 + β |1 is represented by a point on the sphere surface, with α= cos ϑ 2 Source: Research Gate

Quantum State

Mathematical concept in quantum research that offers distribution probability for the results. A quantum state is a collection of quantum states that occurs repeatedly. Pure quantum states are those quantum states that cannot be expressed as combinations of other states, whereas all other quantum states are referred to as quantum states. The state of a standalone quantum system is described by this phrase. A quantum state contains the result of every potential measurement made on the system.

Quantum Superposition

A quantum superposition describes an atom it can be in two places at once. Every quantum particle in the universe is subject to the state supercomputers. It is dependent on the quantum principle of superposition, which is used to run a lot of computations at once on the same physical object.

Quantum Entanglement

The possibility of correlated fates for entities was already predicted by quantum theory. When an entangled photon or an atom is measured.

During the measurement of a coupled photon or atom.

Consider that 2 coins could become entangled to better understand what we mean by "correlated results." Think about throwing a coin. The results are about split between "HEADS" and "TAILS," according to meticulous records, but all of us know that every given outcome is unpredictable. However, interestingly, the records of both the coin tosses reveal a connection after flipping! Tossing another coin yields similar, random outcomes. whenever one-coin shows heads and the other shows tails.

We may now claim that the two coins' states are intertwined. In this case, we cannot know in advance what each coin will perform, but the outcomes will be connected.

Quantum Teleportation

Quantum teleportation is a method for moving entangled states and quantum information from one location to another.

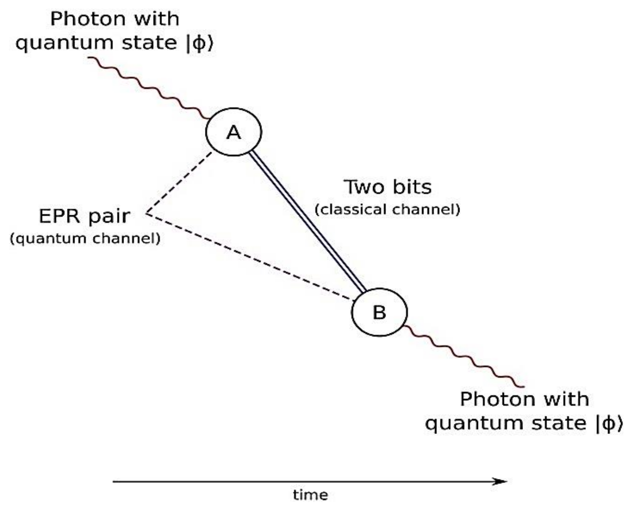

Figure 2: Diagram for quantum teleportation of a photon
Source: ScienceDirect.com

Entanglement during the Bell condition (EPR pair) is specifically employed in quantum teleportation to convey any arbitrary quantum state |ψñ between two apart observers A and B. (often called Alice and Bob).

The quantum teleportation process utilizes three qubits: qubits 2 and 3 are in the Bell state |B00 = (|00+ |11)/2, while qubit 1 is an indeterminate state that may be transported. The working theory is shown for a complete |x| with x=0,1. may use Shor's algorithm, a quantum algorithm, to determine the initial parameters of a huge number. IBM has successfully developed 5-qubit, 16-qubit, and a 50-qubit quantum system prototype. IBM performed a common one on a quantum computer without entangled qubits, and the result was a failure rate of 5%. The second time they ran it, it had a 2.5% inaccuracy.

Currently, quantum computers really aren't powerful or large enough to really perform tasks superior than a classical computer, but this is about to change. As a result, the pharmaceutical industry spends billions and trillions of dollars trying to guess and investigate body issues.

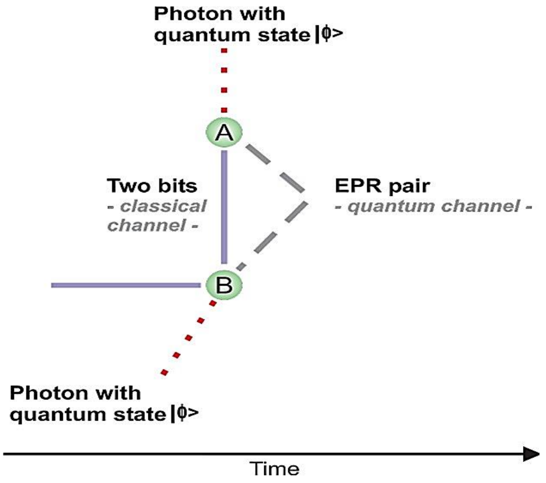

Figure 3: Qubit transmitted from one location to another
Source: scienceDirect.com

Quantum Turing Machines (Qtm)

The impact of a quantum computer is abstracted by a QTM, also known as a universal quantum computer. It offers a very straightforward paradigm that fully utilizes the capabilities of quantum computing. Whatever QA can be explicitly represented as a specific QTM. Such Turing machines were first suggested in a 1985 article by "Oxford University physicist David Deutsch" who suggested quantum gates might operate similarly to conventional binary logic gates in digital computing.

Why Do We Need Quantum Computing?

Prior to the early 2000s, IC clock rates increased significantly quickly. In order to sustain the speeds of ICs, which were attained at levels for which cooled the Integrated circuits prohibited the clock speed, they boosted the calculation power, shrunk the size of the transistors, and added more cores The status is ON or 1 if it permits current flow; otherwise, the state is OFF or 0. If quantum computing becomes a reality, the entire notion of today's computers will be obsolete, in my opinion.

Current State of Quantum Computers

Advancement of quantum computers right now People unconsciously expect that quantum computers would eventually surpass traditional computers in performance. A quantum computer may use Shor's algorithm, a quantum algorithm, to determine the initial parameters of a huge number. IBM has successfully developed 5-qubit, 16-qubit, and a 50-qubit quantum system prototype. IBM performed a common one on a quantum computer without entangled qubits, and the result was a failure rate of 5%. The second time they ran it, it had a 2.5% inaccuracy.

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दुआ

नफरतें दिल से मिटाओ तो कोई बात बने,
प्यार की शमयें जलाओ तो कोई बात बने।

आज इंसान खुदा खुद को समझ बैठा है,
उसको इंसान बनाओ तो कोई बात बने।

तीरगी बढ़ने लगी अपनी हदों से आगे,
मशाले दिन में जलाओ तो कोई बात बने।

हो जहां अदल ए मयस्सर सबको।
इक जहां ऐसा बनाओ तो कोई बात बने।

धर्म के नाम पे खून कितना बहाओगे मियां,
प्यार के जाम लुढ़ाओ तो कोई बात बने।

मसले खून खराबे से निपटते कब है,
प्यार से उनको मनाओ तो कोई बात बने।

हो जो दुनिया के लिए अमनो सुकूं का जामन,
ऐसा पैगाम सुनाओ तो कोई बात बने।

जिन होठों से हसीं छीन ली दुनिया ने,
उन को सीने से लगाओ तो कोई बात बने।

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