ANALOG COMPUTING

Our vision of making very powerful computers is limited by the amount of energy capacity that we have in our hand. A Digital Computer requires about 50 transistors to perform addition of 2 8-bit numbers and about 1000s of transistors to perform multiplication of same two numbers.

But an Analog Computer can help us achieving addition using two currents and a resistor in addition to achieve multiplication. Analog computers are very powerful in nature, have ability to process data at a very fast rate and are energy efficient.

Analog computer is a model for a certain problem that can used to solve that particular problem by means of simulating it.

Analog computers use continuous variation of voltage to achieve computation unlike digital ones that uses 0s and 1s. Analog computers are designed for specific purposes and can be used to solve whole lot of complex computation ranging from utterly difficult differential equations to improper integrals. Analog computers use wires to put on the physical connection to solve a particular real life problem and just mere switching of wires can help us solve a entirely different problem. The output of Analog computation can be converted to digital format by Analog to Digital converter and then results can be visualized on Digital Oscilloscope or can be acted upon by digital processing techniques.

Analog computation requires initial boundary conditions that you set according to the requirement of the problem. Early Analog computers were just mechanical contraptions containing rotating wheels and gears. For example- a hose and a bucket can be used to perform integral calculus. We need to fix the rate of water flowing so that it matches the function that we want. Amount of water collected in the bucket gives the required solution.

Despite excellent problem solving capability provided by Analog computers it is limited due to its single purpose use. Analog computation uses continuous variation of voltage so exact value can never be given so its pretty inexact in its nature and repeating the same calculation can have different results.

After evolution of digital computers in 1960s Analog computers became highly limited but recent advancements in transistor technology has put on a challenge to tackle the quantum problems coming as the size of transistors is approaching the size of an atom.

The speed at which these Analog computers operate makes it the starting point for tackling the upcoming challenge of super advanced computers and marks the age of new technology.

ARTIFICIAL INTELLIGENCE AT CENTRE OF ANALOG COMUTING

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The modern Artificial Intelligence challenges sets the stage for analog computers to takeover.

AI is about training the machine to mimic the human instinct like identification. AI uses millions of neural networks that perform matrix multiplication and that requires huge amount of power. A digital computer fetches the data from storage device for performing calculation and that requires considerable amount of power. We can avoid the wastage of power by using that power to process the data by using analog computational techniques.

Our goal is to make much advanced computational machine that operates at lower power. Our brain is the most advanced computer known till date. It uses neurons that fires and this the key to human functioning and it is generally digital in nature but we are able to think continuously despite firing of neurons indicates towards the fact that our brain must be analog in nature. Our brain uses just 20 watts of power to function.

Taking all these facts into account our goal to make energy efficient analog computers is strengthened.