Computational Abstract

Computation is a concept that has brought a number of fields together. Each field has its own interpretation of the concept. Some historical inventions were also attached to the meaning of computation. Some fields perceive it as step by step ways of implementing a task (algorithm). Another see it as a philosophical (accepted belief) analysis of what can be done in principle by a mechanism. There is also an idea that the concept is connected with the manipulation of symbols and representation using formal rules.

Introduction:

Computation is an idea that has ignited a lot of interest in today’s world that researchers from many disciplines have taken interest on the concept. In the area of scientific study of the mind and its processes (cognitive science), computation is the capacity of computers to process information. Hence cognitive psychologists (people that study mind and mental life) see the concept as cognitive functions and human brain as the computer that run these functions (programs).

Intuitive (natural) meaning of computation

The meaning from natural tendency connotes that it is not a single word and hence will mean a number of ideas connected together. Webster’s dictionary meaning of the word says that it was derived from a Latin word “com + putare”. This means to determine or calculate especially by means of mathematical means. This dictionary meaning is too restrictive since the use of the word cuts across a number of fields and hence may not be universally accepted.

Confusing meaning of computation

When defining computation as the execution of algorithms (some definite formal rules), we now have the burden of explaining and understanding the concept of algorithms and the execution of algorithms. Algorithm is a finite set of instructions that operate on a set of symbols. This can be implemented with some kind of mechanism. In order to execute an algorithm, the mechanism
involved will take a given input and apply the set of instructions on it step by step until the end has been encountered. However, nothing has been said emphatically about the nature of the mechanism to implement the algorithm. This mechanism can be an abstract or concrete one, natural or artificial. Depending on the environment, the mechanism can take different forms. If the mechanism is a computer, the algorithm will be expressed in some kind of programming language, When the mechanism is human, the algorithm (instructions) will be expressed in a kind of natural language.

**Historical meaning of computation**

Different meanings were also given to computation when delving into the history.

*Computation as a form of mechanization*

The history of computation started in the seventeenth century. During this period, hardworking philosophers thought about mechanical systems that could aid in performing calculations on their own without assistance. This led to the construction of the first mechanical calculators pioneered by Leibniz. Being mechanical device, it consisted of gears, cogs and other moving parts. The notion of Leibniz that calculations and logical reasoning could be mechanized formed the heart of the notion of computation as used in cognitive science today.

*Computation as a form of representation (mathematical)*

Another historical contribution to the meaning of computation is the idea that came up after the Leibniz invention that thinking involves representation. This is the mathematical practice of using marks and signs as representations in calculations. This was the view of Descartes, Hobbes, Locke and others. This made computation to be tied to mechanically manipulating representations. Although, efforts were made to build many mechanical calculators, their computing capacities were very limited up to the end of nineteen century (1997). However, twentieth century witnessed a remarkable progress in the computing capabilities of these machines.

*Effects of computation notions – (generation of computation devices)*

The development of thorough logical analysis of notions and algorithms coupled with the rapid development of engineering in electronic components have moved mechanical computation devices
from vacuum tubes technology to transistors technology, and from transistors to integrated circuits, from integrated circuits to others sophisticated devices.

Logicians (experts in reasonable meaning of things) meaning of Computation
In the 1930s, logicians laid the philosophical ground work of a well defined notion of computation as “effective calculability”. As logicians they were very concerned with the class of functions that can be effectively calculated in principle. This was according to Church (1936) in his thesis. This brought about the concept of “effective procedure or algorithm” and “function computed by algorithm”.

Realities from Turning Machine (TM) invention (limitations of human being in computational activities)
In 1936, Turning invented the first model of a “computer” known as Turning machine(TM). This machine captured the notion of “computable”. Turning also itemized five (5) limitations of the human sensory in performing automatic calculations as follows:
(i)Only a finite number of symbols can be written down and used for a computation
(ii)There is a finite bound on the size of object to be used for computation (e.g. scratch paper that a human being can use for a computation)
(iii)At any time a symbol can be written down or erased from the object used for computation (e.g. the scratch paper).
(iv)There is an upper limit to the distance between cells (quantity/value) that can be considered in two consecutive steps.
(v) There is a limit to the “states of mind” a human can be.

The common notions (intersection) between computation and philosophy
The various meanings given to ‘computation’ so far have property that made them independent from the physical. They are alienated from the physical systems that realize them.

Computation involving physical objects – (mechanical machines)
The first definition that incorporated physically motivated mechanical constrains was that given by Gandy (1980). Gandy formulated some conditions to determine whether any system is qualify to be called "mechanical machine”

**Components of computation**

The following are the aspects captured by computation:

(i) Formal symbol manipulation

(ii) Effective computability

(iii) Finite state machines

(iv) Information processing

(v) Interactive systems

(vi) Dynamic systems

**Summary**

(i) Computation does not have a single meaning.

(ii) The meaning of computation varies from one discipline to another.

(iii) For scientist, it is seen as executing an algorithm.

(iv) For logicians (natural reasoning specialists) and philosophers (accepted believe specialists), it was an act of blindly following some rules.

(v) It started as calculation which was tied to mechanical devices.