

Philosophical Tools 4 Software Engineering

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A Word about me

Programmer at heart, Software Engineer by temperament and IT professional by Trade. I am currently designated as a Solutions “Architect” in a Company.

Architect (n) – Any person who has “fooled” around in the Software Industry for sizeable time (ever shrinking span) who is past his prime, as a Programmer Or Engineer, Systematically moved up in the hierarchy to obey “Peter Principle”.

I will try to make it Simple!

Prathikriya vaadhigalum
bhoorshvasigalum pradhama drishtya
agalchayyil aayirunenkilum avar
thammillulla andhardhara
kuravayyirunnu ennu venam
karudhan. adhannu nammal thottathu.

"MANASILLAYILLA"

Athayyathu vargadhipathyavum
colonialist chinthasaranigalum
radicalayya matamalla, ippol
manasillayyo.



എന്ത് കൊണ്ട് നമ്മൾ തോറ്റു, എന്ത് ലളിതമായി
പറഞ്ഞാലേന്താ? വെറുതെ confusion ഉണ്ടാക്കുന്നതെന്തിനാ ?

Some Uses of Philosophy

- A source to broaden our Intellectual horizon
- Every man has a Philosophy. Studying it, makes us to align our beliefs with some kind of standard. Helps communicate ideas better
- A Grammar for Thought (If we are looking for one)
- A great Emotional Shock Absorber
- Character Transformation through deliberate study of Philosophy
- Ability to articulate complicated and deep topics succinctly
- Study of Philosophy will make you a universal citizen.
- Ability to Study vast amount of topics
- “Unusual effectiveness” of Philosophy in Professional Life

Some Key ideas of Western Philosophy

- Epochs
 - Greek, Medieval, Renaissance (Modern), Post-Modern
- Branches
 - Metaphysics, Epistemology, Ethics, Aesthetics, Politics, Logic
- Fundamental Questions
 - Who am I?, What Can I Know?, What Should I do?
- Primary Methodology
 - Analytical, Reductionist
- Humanistic Traditions
 - Existentialism,, Phenomenology ,Nihilism , Dialectical Materialism (Marxian)
- Philosophy of Science Methods
 - Induction, Deduction ,Abduction,Falsificationism

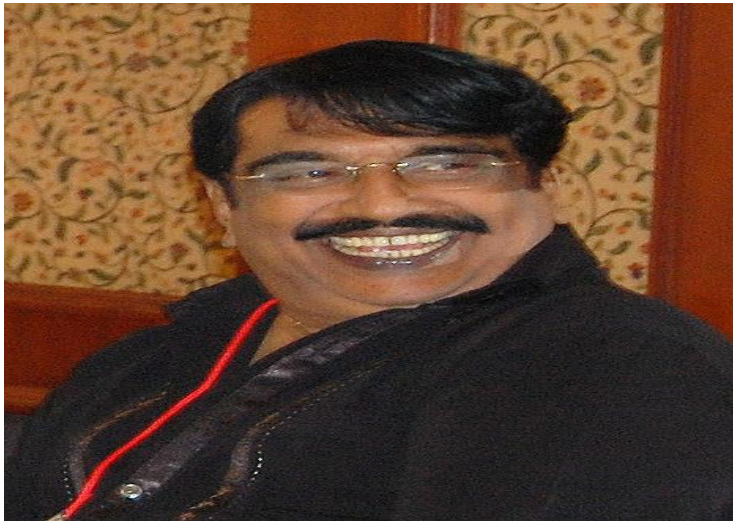
Some Key ideas of Indian Philosophy

- Vedas and Upanishads
 - Rig, Yajur, Sama, Atharva
 - Various Upanishads
- Main Schools
 - Heterodox (Veda not as a Testimony) , Orthodox (Veda as Testimony)
- Three Hetrodox Schools
 - Carvaka , Jaina , Budhist Traditions
- Six Orthodox Schools (Darshana)
 - {Nyaya, Vaisesika} , {Samkhya, Yoga}, {Mimamsa, Vedanta}
- Philosophical Methods
 - Holism and Intuitionistic, Experiential in nature
- Method of Philosophical Arguments (a form of Dialectic)
 - Purva Paksha (apriori) , Khantana (Refutations), Uttara Paksha (Conclusion)

Indian vs Western Philosophy ?

Ala

Car or a Boat?



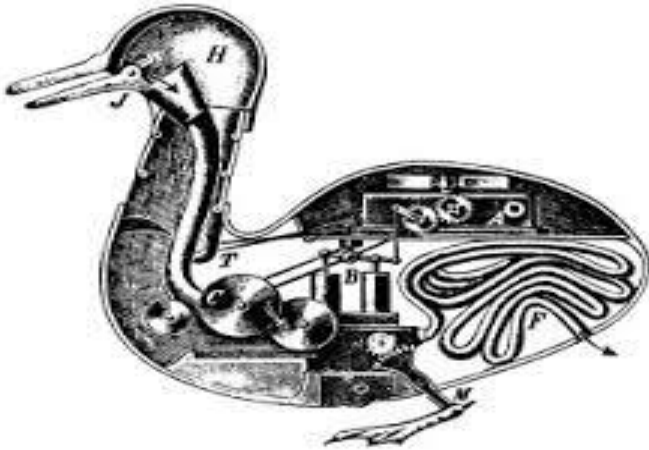
In India, it is like this, I do not know how it is in Punjab?

- Punjabi House

Some Tools

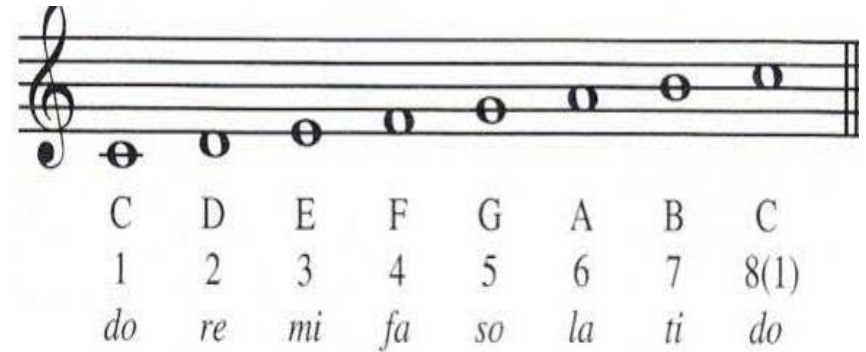
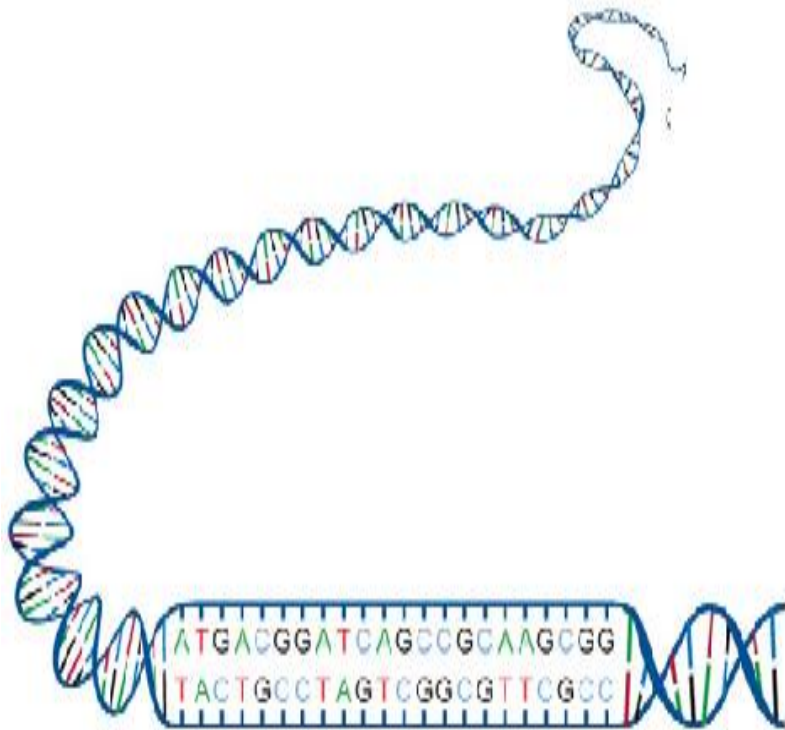
- Reductionism vs Holism
- Materialism vs Idealism, Empiricism vs Rationalism, Induction/Deduction/Abduction
- Logic vs Dialectic, Reductio Ad Absurdum
- Analysis/Synthesis vs Systems Thinking
- Occam's Razor (Induce less, Deduce more)
- Vale Neutrality and Social Sciences (Its problem)
- Ontology, Predicates and DSLs
- Jungian Archetypes
- SAPIR/WHORF Hypothesis
- Pitching Your Idea (Aristotle/Dev Dutt Patnaik way)
- Content Centric West vs Context Centric East
- Plato's Cave or Sankara's Maya

TOOL #1 (Understand the Gist of the world and also see the Big Picture)



REDUCTIONISM and HOLISM

Reductionism in Life & Music



What has Regular Expression, SQL
Query and Functional Composition has
in common?

CLOSURE

Closure in RE

$\text{Re}(\text{NULL}) \Rightarrow \text{NULL}$

$\text{Re}("") \Rightarrow ""$

$\text{Re}([a-z]) \Rightarrow [a-z]$

$\text{Re.Re} \Rightarrow \text{Re}$

$(\text{Re} \mid \text{Re}) \Rightarrow \text{Re}$

$\text{Re}^* \Rightarrow \text{Re}$

The above stuff defines Re (Recursive definition)

What about R^+ ?

$\text{Re}^+ = \text{Re.Re}^*$

Closure in SQL

Data is stored in a data structure called Relation
Relations can be combined using Rel Ops

$\text{CartesianProduct}(\text{Rel1}, \text{Rel2}.. \text{Reln}) \Rightarrow \text{Rel}$

$\text{Restrict}(\text{Rel}, \text{Predicate}) \Rightarrow \text{Rel}$

$\text{Project}(\text{Rel}, \text{fieldlist}) \Rightarrow \text{Rel}$

$\text{Rename}(\text{Rel}) \Rightarrow \text{Rel}$

$\text{SetOperators}(\text{Rel1}.. \text{Reln}) \Rightarrow \text{Rel}$

$\text{Group}(\text{Rel}, \text{Pred}) \Rightarrow \text{Rel}$

And so on....

Closure in FP

$$A = F(G(H(x)))$$

Functional Composition works because of
Closure of Operations

Other instances of Reductionism

- Dance Forms
- Photo Plotters
- LISP interpreter
- Digital Gates and Computer Construction
- Programming Languages (SEQUENCE, Branching, Iteration, Recursion)
- Gesture based UX (A set of primitive Gestures)
- The List Goes on

Limits of Reductionism

- Assumes Sum of Parts is Equivalent to the whole
- Cannot Model Emergent Behavior due to the Inter-dependence of parts
- Limits of Machine Learning – A case study

Holism

- Whole is more than sum of parts
- Models Emergent Behavior
- Successful in Evolutionary Biology, Social Sciences and Systems Modelling
- Software Requirement Analysis
- Design of UX
 - Mental Model of the Users
 - Considering the User Value System (Culture)

TOOL #2 (Organize your thought with greater Discretion)

- Materialism vs Idealism (Metaphysics)
- Empiricism vs Rationalism (Epistemology)
- Induction, deduction and abduction (Method of Science and Thinking in General)

TOOL #3 (Understand the Contextual truth)

Dialectics , Logic & Reductio Ad Absurdum

Dialectics vs Logic

Laws of Logic

- Law of Identity ($A = A$ or $A \leftrightarrow$ something else)
- Principle of Non Contradiction (A and not $A \Rightarrow$ false)
- Law of Excluded Middle (Things should be True or False, not in between)

Laws of Dialectics

- Process of Change
 - Reality is modelled as a process of change. What is true can become false in the future
- Principle of Contradiction
 - Since change is constant , Contradiction being the dynamic underlying change is also constant
- Principle of Relationship
 - Parts are Meaningful only in the relationship to the whole (context)

Reductio Ad Absurdum

- Also known as Proof by Contradiction
- Useful when a constructive proof is time consuming and economically not viable
- Rather than trying to prove something as correct, we assume what we are trying to prove is correct and find contradictions, if it were true
- Successfully used in Mathematics, Arguments and in Courts

TOOL #4 (Think Comprehensively!)

Analysis/Synthesis vs Systems Thinking

Analytical vs Systems Thinking

- The Art, Craft and Science of Analysis
- Analysis/Synthesis Model of Problem Solving
- A Top Decomposition of the Problem into Parts to a granular level , until we have reached a state where we cannot decompose parts further or it has become fine-grained to be amenable for studying it.
- A Bottom up process of Synthesis
- In Western Philosophy and Science, Rene Descartes is regarded as the father of modern Analysis
- Reductionism vs Holism – Analytic Thinking vs System Thinking
- Assumption of Independence of Variables and Interdependence of Variables
- Additive factors (Linear) vs Non Linear Factors
- Systems are Simulated as it cannot be mathematically modelled correctly, if not non-linear

TOOL #5 (What Exists in a world and how entities,relationship,processes can be enumerated and associated computation be done?)

Ontology

Ontology

- The Study of What Exists out there
- Entities, Relationships, processes, context information are captured
- Logic is applied in the context of an Ontology

TOOL #6 (Keep Things Simple to make it easy!)

Occam's Razor

Occam's Razor

- Also called “Law of Parsimony”
- Do not Add Entities Unnecessarily
- The Idiom behind “Keep it Simple Stupid”
- Minimizes Error from Inductive Reasoning

Tool #7 (More Languages you know, the Better)

SAPIR WHORF HYPOTHESIS

SAPIR WHORF HYPOTHESIS

- Also called “Linguistic Determinism”
- Formulated by Ed Sapir & Benjamin Whorf
- It is not yet a theory (in strict scientific sense)
- Statistically significant confirmation is there
- Seems to work in the case of Programming languages
- Learn Each language which is based on Turing Machine, Lambda Calculus and Predicate Logic

Be a Polyglot!



Tool #8 (Pitch Your Idea better)

LOGOS,ETHOS,PATHOS and MYTHOS

LOGOS,ETHOS,PATHOS and MYTHOS

- Aristotle's Rhetoric strategies
- “MYTHOS” from Dev Dutt Patnaik

Tool #9 (Archetypes as a structuring mechanism for SE)

- CARL GUSTAV JUNG's notion of Archetypes
- Business Archetypes by Arlow/Neustadt
- "Enterprise Patterns and the MDA" book by Arlow/Neustadt

LOGOS,ETHOS,PATHOS and MYTHOS

- Aristotle's Rhetoric strategies
- “MYTHOS” from Dev Dutt Patnaik

Tool #10 => Reality is always distorted

- Plato's Cave
- Sankara's Maya



Which Tool is more important? – something which I did not mention here



Aaj mere paas building(C++) hai,
property(C#) hai ,
bank balance (Java) hai,
bungla(Python) hai,gaadi hai(Ruby)
Kya hai, Kya hai tumhare paas?

....Mere Paas Maa (JavaScript) hai

Philosophy in My Professional Life (Software Engineering)

- Reductionism as a Tool for Learning Vast Amount of Subjects
 - Regular Expressions, SQL Query, Functional Programming are variants of Closure (Reductionism)
 - Design of Primitives while writing Software Engines
 - Turing Machine , Lambda Calculus and Predicate Logic as foundations for Paradigms
- KISS Principle is a solution for “Problem of Induction”
 - Party Idiom in Entity Management (Customer, Vendor, Government body, NGOs)
 - Define a Core, Rest should be Deduction from the Core
 - Functional Core of a Functional Programming language
- Philosophical Ontology
 - Ontology is study of what exists out there. Useful for defining Vocabulary for Systems and Implementation of Domain Specific Languages
 - Wrote a Paper titled, “An Ontology and Its Realization on Mobile Devices – a HealthCare Case Study)
 - Software Design and Enterprise Ontology
- Entity Archetypes as a structuring mechanism (Arlow/Nuestadt)
- Holism for Designing UX
- Limitations of Analytics (Analytic Reduction vs Systems Thinking)

Q&A

- Any Questions ?

Appendix

Nyaya Philosophy

- Analysis of Logic and Epistemology
- Detailed work on Anumana (“Inference”)
- Right knowledge for “Liberation” (from suffering)
- perception (pratyaksha), inference (anumana), comparison (upamana), and sound/testimony (shabda) are source of valid knowledge
- Invalid knowledge involves memory, doubt, error, and hypothetical argument.
- Aligned with Vaisheshika (Merged with it)
- Cause as an invariable and un-conditional precedence for effect. (an effect does not pre-exist in it’s cause)
- Three kinds of causes
 - Material (Inherent) cause - The substance out of which an effect is produced
 - Non-Inherent cause - helps in the production of a cause,
 - Efficient cause - the power that helps the material cause produce the effect
- God is not the material cause of the universe.

Samkhya System

- A Dualistic Philosophy – Matter (Prakriti) and Eternal Spirit (Purusha)
- Right knowledge comes from separation of Purusha and Prakriti
- Four higher level functions of Purusha are
 - Buddhi (“consciousness”)
 - Ahamkara(“I-consciousness”)
 - Manas (“Mind”)
 - Prana (“Breath”)
- Infinite Purusha and Prakriti is enough (No God). Prakriti springs to action when Purusha gets connected to it.
- Purusha impinges on Prakriti to form Consciousness (Budhi) and next to evolve is Ahamkara, which deludes Purusha to think, Ego is the center of its Objective Existence.
- Ahmkara can be divided into
 - Five Gross Elements (Water, Air, Space, Earth , Fire) - Tanmatra
 - Five Fine Elements (Touch, Sound , Sight, Taste, Smell) - Mahabuthas
 - Five Organs of Perception (Skin,Ear,Eyes, Tongue, Nose) - Janendriya
 - Five Organs of Activity (Speak, Grasp, Move, Procreate,Evacuate) - Karmendriyas
 - Mind (Controller of Senses)
- Three Primal Qualities of Matter (Gunas) make up prakirti
 - Tamas (Obscurity, Ignorance,Inertia) – Darkness (InAction)
 - Rajas (Activity, Passion, Intensivity) - passion (Action – but, fails often)
 - Satvik (, Purity, Dispassion, Light) – Goodness (Equanimity)

Carvaka System (Materialist)

- Also called Lokayata (Earthly Philosophy)
- Rejects Vedas, Karma, Moksha , Immortality of Self
- Direct Perception as Source of Knowledge (Anubhava or Experience). Rejects Anumana, Upamana and Shabd as source of knowledge
- Everything in this world is some kind of Accident (Akasmika Vada or Accidentalism)
- A Materialist School of Thought
- Make merry in this world. Tomorrow, Does it Exist?
- Some Believe, Kautilya's Arthashastra could be written in a Carvaka context