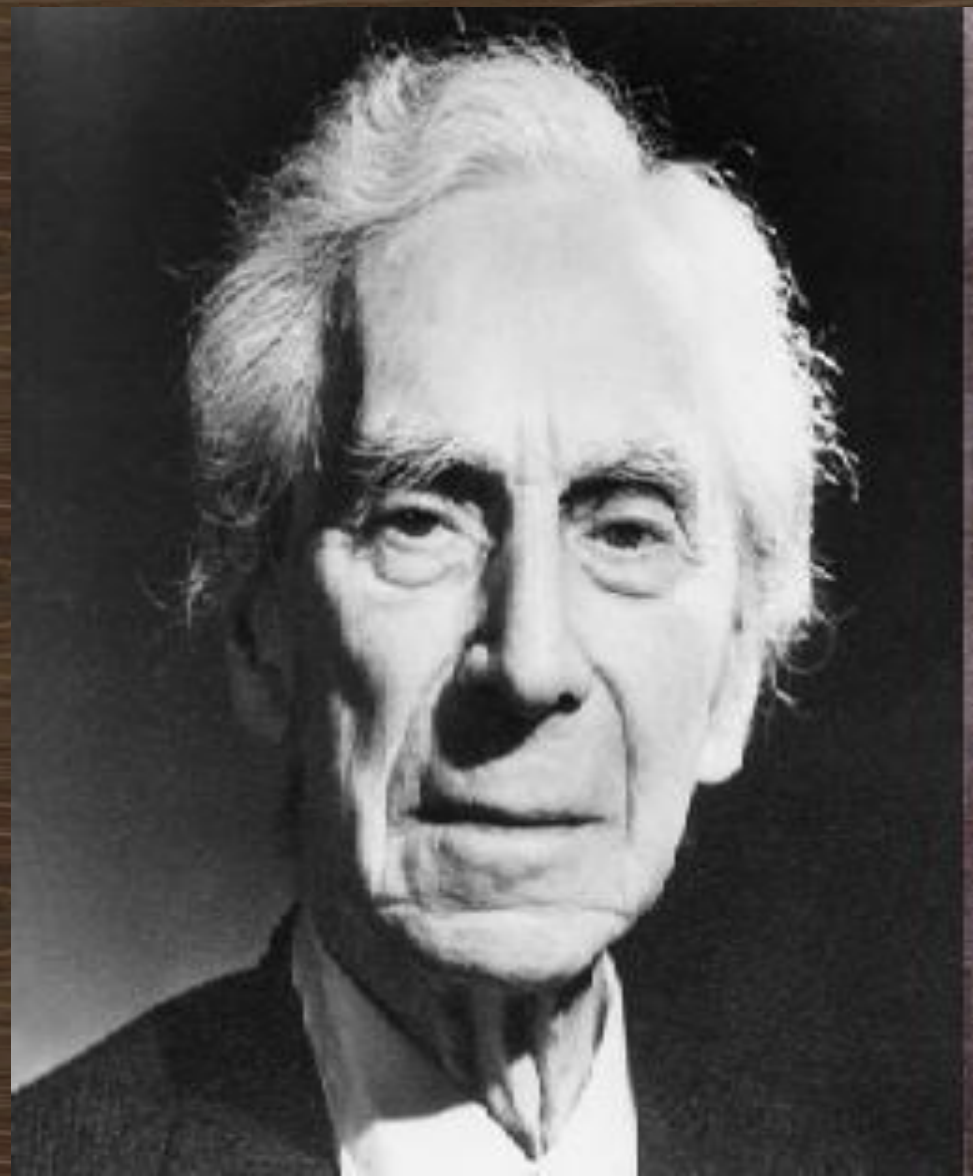
Programming Paradigms

Who are they ?



A Tale of two mathematicians

- Bertrand Russell and David Hilbert spear headed a plan to reduce entire mathematics to Logic.
- Hilbert’s 23 problems
- Bertrand Russell and Alfred north Whitehead’s Principia Mathematica.
- Barber Paradox – The Quagmire

Entscheidungsproblem

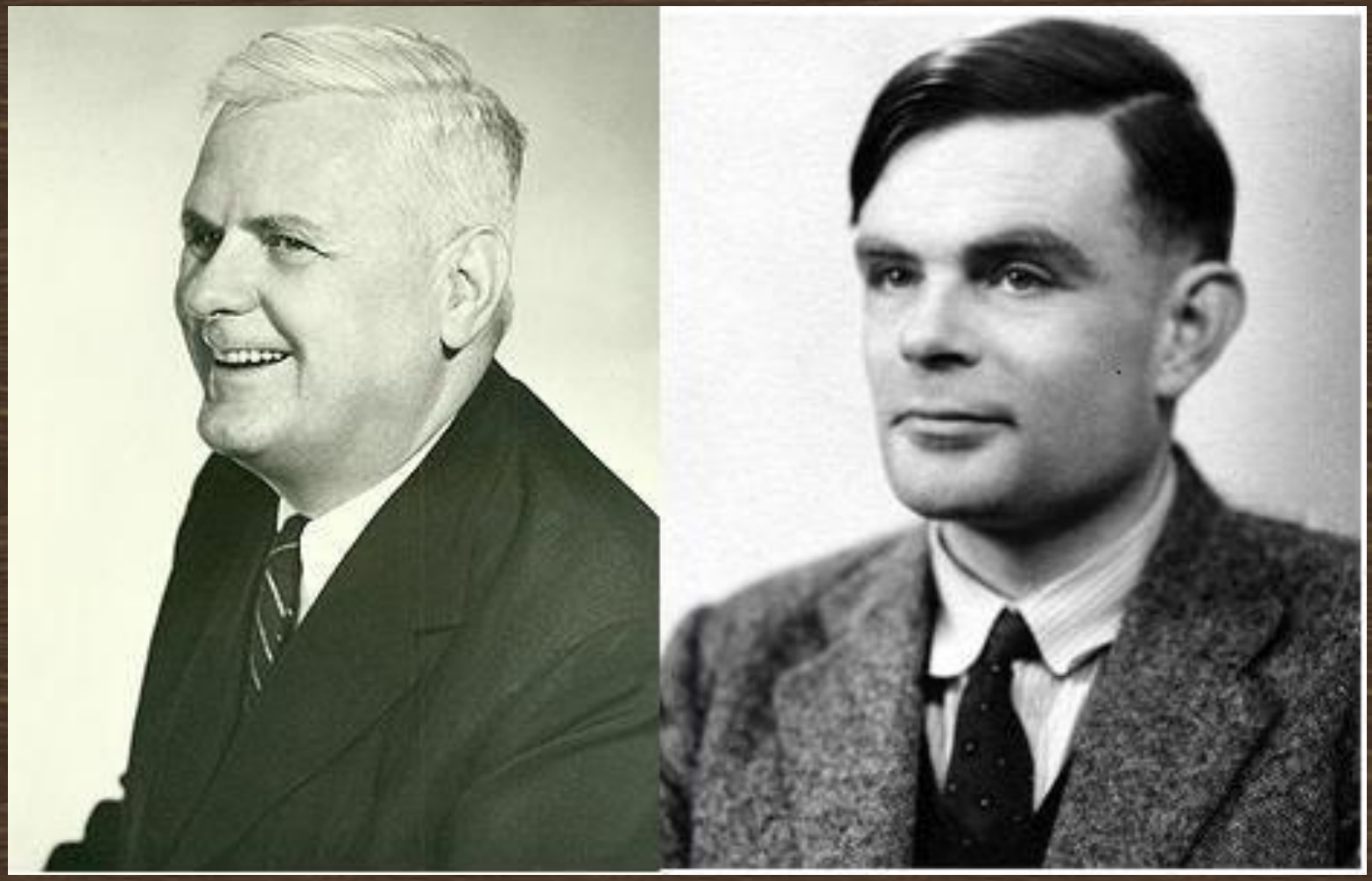
- Decision problem
- The problem of algorithmically determining whether a First Order Logic statement is universally valid
- First Order Logic – Propositional Calculus + Predicate Calculus

Who are they ?

KURT GODEL

- Austrian Logician who proved the incompleteness theorem
- Mathematics is not consistent ?
- Demoralizing for the whole world
- Return of the “GOD” ?

Hilbert's Scheme got broken



The BY-PRODUCT

- Alonzo Church invented Lambda Calculus
- Turing came up with the concept of Turing Machine
- They were trying to solve the decision problem in the Predicate Calculus
- Both Failed in finding an algorithmic procedure for the decision problem.

  (Some stuff is not computable !)

Why Should I care ?

- Turing Machine , Lambda Calculus and Predicate Logic forms the basis of three widely used programming paradigms in the world.
- All paradigms are getting converged in modern programming languages like C# and Java.

A Tale of two friends

- Ashok =>“Dude , How many programming languages u know ?”
- Ajay =>“I know C/C++,Pascal,Fortran,Cobol,C#,Java , Perl and Visual Basic.”
- Ashok=>“So,U know one programming language.”
- Ajay=>“??????????”

Three Programming Paradigms

- Imperative Programming using C/C++,Java,C#,Perl and Visual Basic etc.

  Turing Machine is the foundation.
- Functional Programming using LISP,Scheme,ML,Haskell,Miranda etc.

  Lambda Calculus is the foundation
- Logic Programming using Prolog.

  Based on Predicate Calculus

Imperative Programming

- Command Oriented Programming.
- Statement Oriented
- Function is what u evaluate for it’s value and statement is what u execute for it’s effect.
- X= X + 1 can give shiver to any person when he encounters it for the first time.

Functional Programming

- Function as the unit of computation.
- Functions can be composed arbitrarily
- How can I write programs without Loop ?
- Recursion is a good substitute.
- Referential Transparency of the functions
- Controlled manipulation of state is necessary for the real world.

Logic Programming

- Declarative Model of computation
- Logical Deduction is a medium for computation.
- Has got good support for parallelism.
- Heavy use of recursion and Depth first search.
- Used in writing Huerisitics based programs.

Where is the state of the art ?

- The ideas from Functional Programming is systematically introduced to Traditional programming languages.
- C# has got support for Lambda Functions which forms the basis of Language Integrated Query (LINQ)
- LINQ has taken ideas from SQL and DataLog (subset of prolog used for querying databases)

Concurrent Programming

- The Stateless Functional Programming model forms the basis of Google's MapReduce Distributed processing system.
- PLINQ and TPL from Microsoft