Implementando soluções de Inteligência Artificial usando F#

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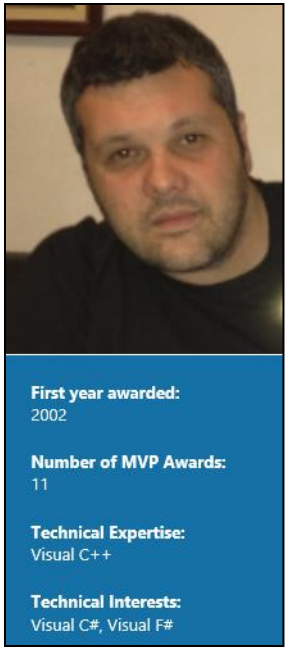
Microsoft Most Valuable Professional (MVP)

Visual C++

2014



F#

At the core of every functional-first language is this:

simple, correct, robust code for solving complex problems

"Functional-first programming is a general-purpose programming technique particularly suited to tasks where Time-to-deployment, Efficiency, Correctness and Taming Complexity dominate."

"Examples include ETL pipelines, general data-manipulation, calculation engines, service implementation, programmatic UIs and data science.

While these problems can be solved using other programming paradigms, they are particularly amenable to functional-first programming."

Functional-first programming uses functional programming as the initial paradigm for most purposes, but employs other techniques such as objects and state as necessary.

Ref.: http://www.slideshare.net/dsyme/fp-successv4redist

On Windows, Microsoft recommend F# and the Visual F# tools for your functional-first programming needs

Don Syme

Don Syme is an Australian computer scientist and a Principal Researcher at Microsoft Research, Cambridge, U.K. He is the designer and architect of the F# programming language, described by a reporter as being regarded as "the most origi... +

en.wikipedia.org

archive.oredev.org

Inventions: F#

Programação Funcional

- 1930s – Lambda calculus
  - Theoretical foundation of functional languages
  - Attempt to formalize all mathematics
- 1958 – LISP
  - First functional (computer) programming language
- 1978 – ML (meta-language)
  - Originally used in theorem proving systems
  - Useful as a general purpose language too!

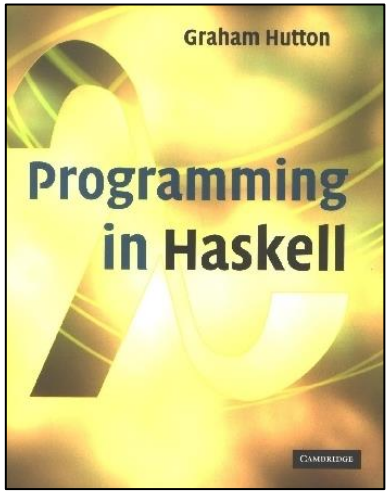
- 1990 – Haskell
  - Strict and lazy language, many advanced features
- 1996 – OCaml (based on ML)
  - Combines functional and object-oriented features
- 2002 – F# (based on OCaml)
  - Microsoft Research functional language for .NET
  - Now official part of Visual Studio 2010

Ref.: http://tomasp.net/materials/mff-fsharp-09/

What is a Functional Language?

Opinions differ, and it is difficult to give a precise definition, but generally speaking:

- Functional programming is style of programming in which the basic method of computation is the application of functions to arguments;
- A functional language is one that supports and encourages the functional style.



Ref.: http://www.cs.nott.ac.uk/~gmh/book.html

Inteligência Artificial

- Major AI researchers and textbooks define the field as "***the study and design of intelligent agents***", where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success. John McCarthy, who coined the term in 1955, defines it as "***the science and engineering of making intelligent machines***". Ref.: http://en.wikipedia.org/wiki/Artificial_intelligence

Basic Questions

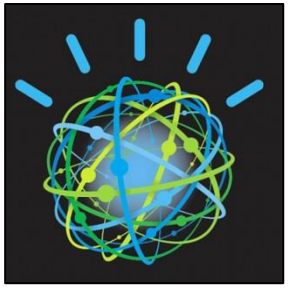
Q. What is artificial intelligence?

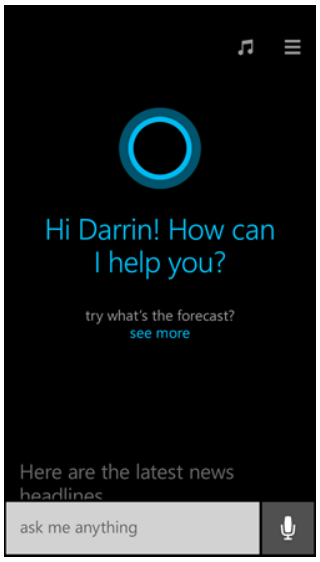
A. It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.

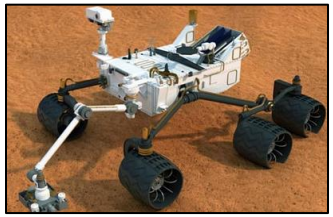
Q. Yes, but what is intelligence?

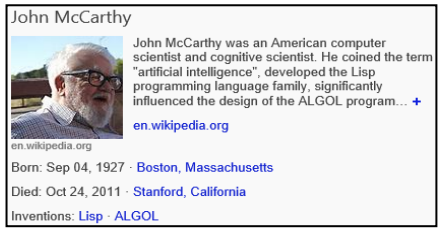
A. Intelligence is the computational part of the ability to achieve goals in the world. Varying kinds and degrees of intelligence occur in people, many animals and some machines.

Ref.: http://www-formal.stanford.edu/jmc/whatisai/node1.html

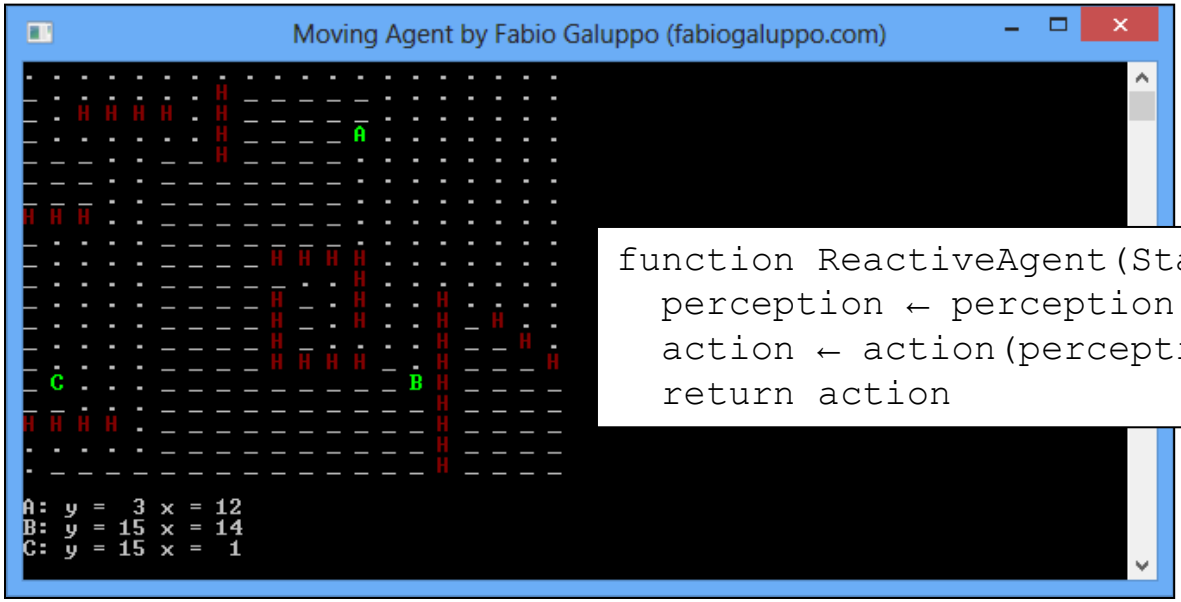




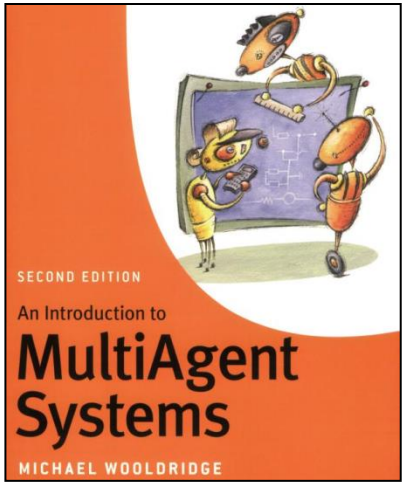




Agentes reativos




```
function ReactiveAgent(State) : Action
  perception ← perception(state)
  action ← action(perception)
  return action
```



An Introduction to MultiAgent Systems
by Michael Wooldridge
ISBN-10: 0470519460
ISBN-13: 978-0470519462

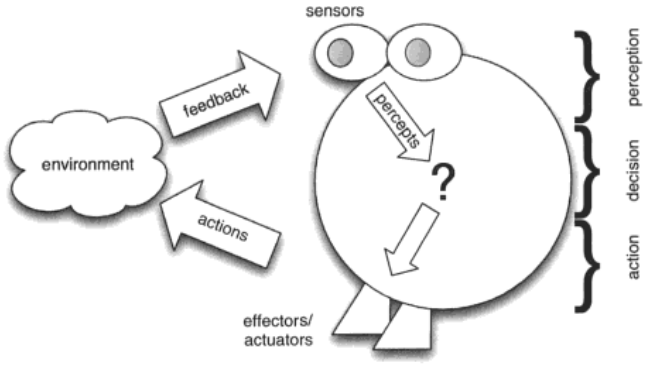


Figure 2.1: An agent in its environment (after [Russell and Norvig, 1995, p. 32]). The agent takes sensory input from the environment, and produces, as output, actions that affect it. The interaction is usually an ongoing, non-terminating one.

Agrupamentos de dados com *k-means*

Data Clustering

Detecting Abnormal Data Using k-Means Clustering

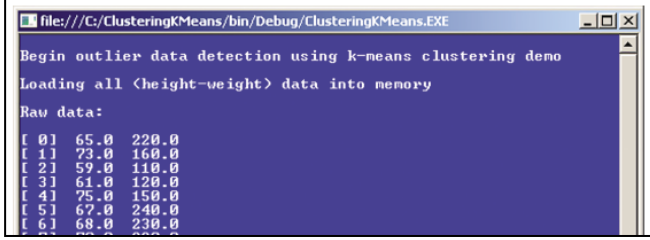
James McCaffrey

Download the Code Sample (VB Version)

Consider the problem of identifying abnormal data items in a very large data set, for example, identifying potentially fraudulent credit-card transactions, risky loan applications and so on. One approach to detecting abnormal data is to group the data items into similar clusters and then seek data items within each cluster that are different in some sense from other data items within the cluster.

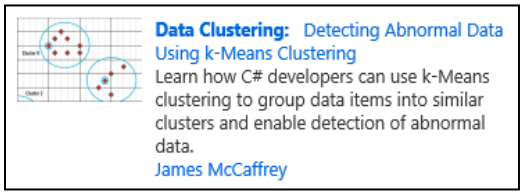
There are many different clustering algorithms. One of the oldest and most widely used is the k-means algorithm. In this article I'll explain how the k-means algorithm works and present a complete C# demo program. There are many existing standalone data-clustering tools, so why would you want to create k-means clustering code from scratch? Existing clustering tools can be difficult or impossible to integrate int a software system, they might not be customizable to deal with unusual scenarios, and the tools might have copyright or other intellectual property issues. After reading this article you'll be able to experiment with k-means clustering and have the base knowledge to add clustering functionality to a .NET application.

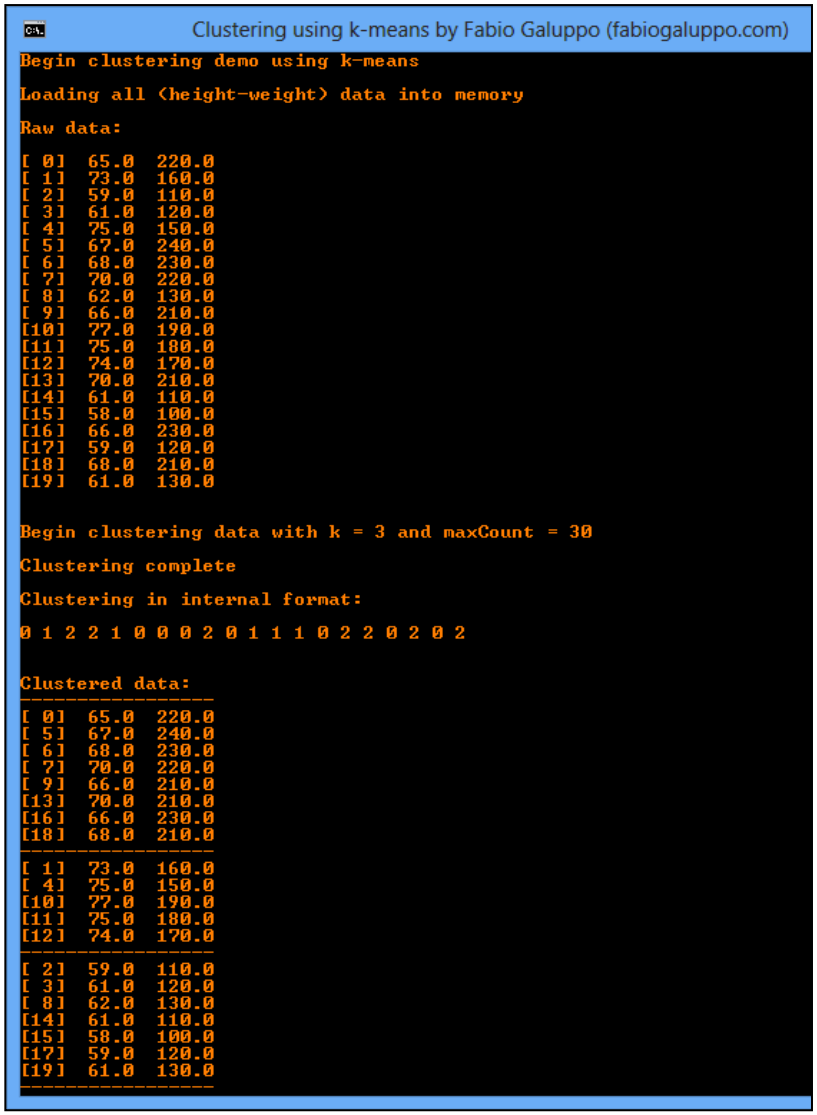
The best way to get a feel for what k-means clustering is and to see where I'm headed in this article is to tak a look at **Figure 1**. The demo program begins by creating a dummy set of 20 data items. In clustering terminology, data items are sometimes called tuples. Each tuple here represents a person and has two numeric attribute values, a height in inches and a weight in pounds. One of the limitations of the k-means algorithm is that it applies only in cases where the data tuples are completely numeric.



MSDN Magazine – February 2013

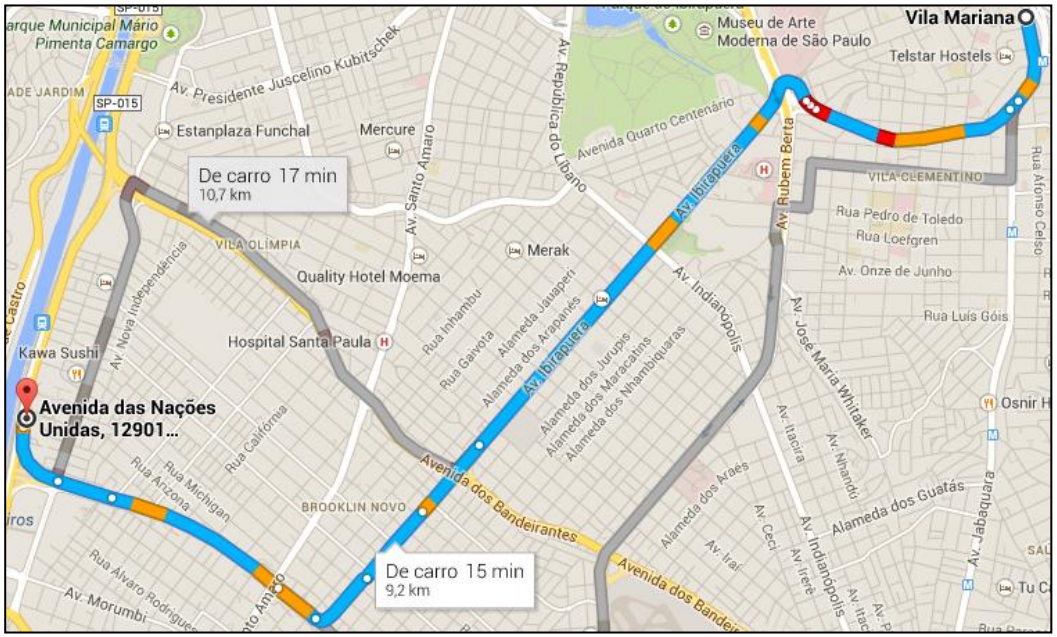
Ref.: http://msdn.microsoft.com/en-us/magazine/jj891054.aspx

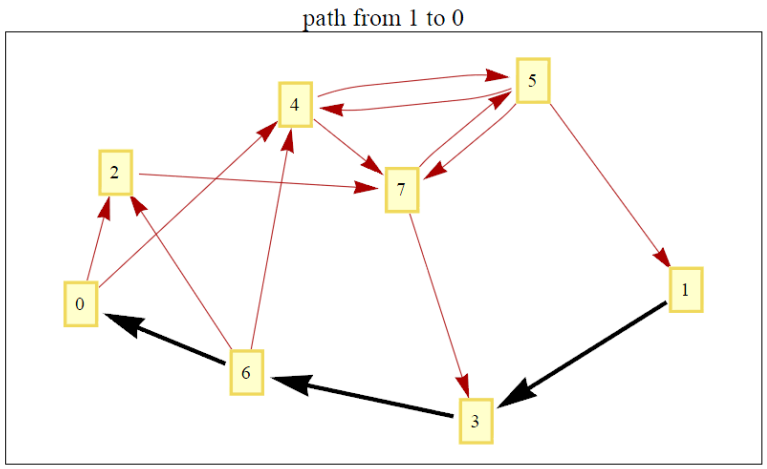




Algoritmo do caminho mais curto

- Algoritmo de Dijkstra





Edsger W. Dijkstra

Edsger Wybe Dijkstra was a Dutch computer scientist. He received the 1972 Turing Award for fundamental contributions to developing programming languages, and was the Schlumberger Centennial Chair of Computer ... +

en.wikipedia.org

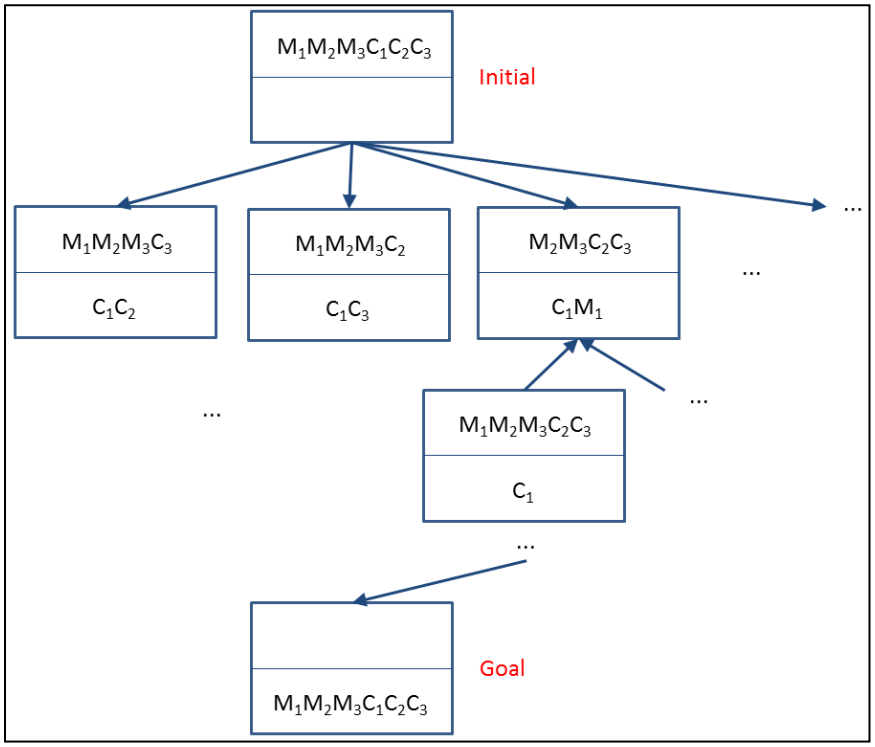
tecnorapia.blogspot....

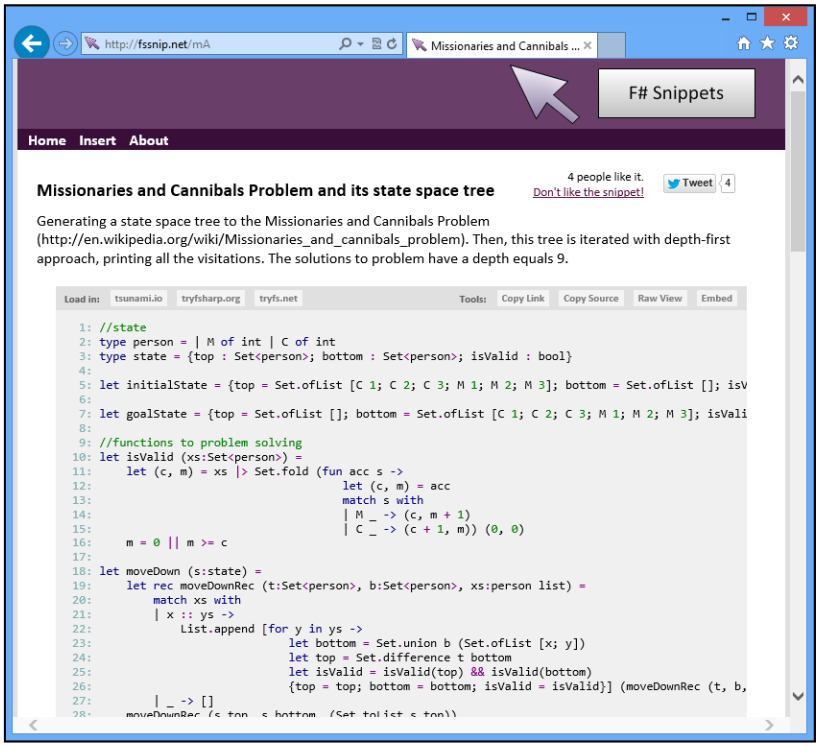
Born: May 11, 1930 · Rotterdam, Netherlands

Died: Aug 06, 2002 · Nuenen, Netherlands

Explorando o espaço de estados

- Problema dos canibais e missionários
  - *Puzzle* clássico da Inteligência Artificial
    - http://pt.wikipedia.org/wiki/Problema_dos_canibais_e_mission%C3%A1rios

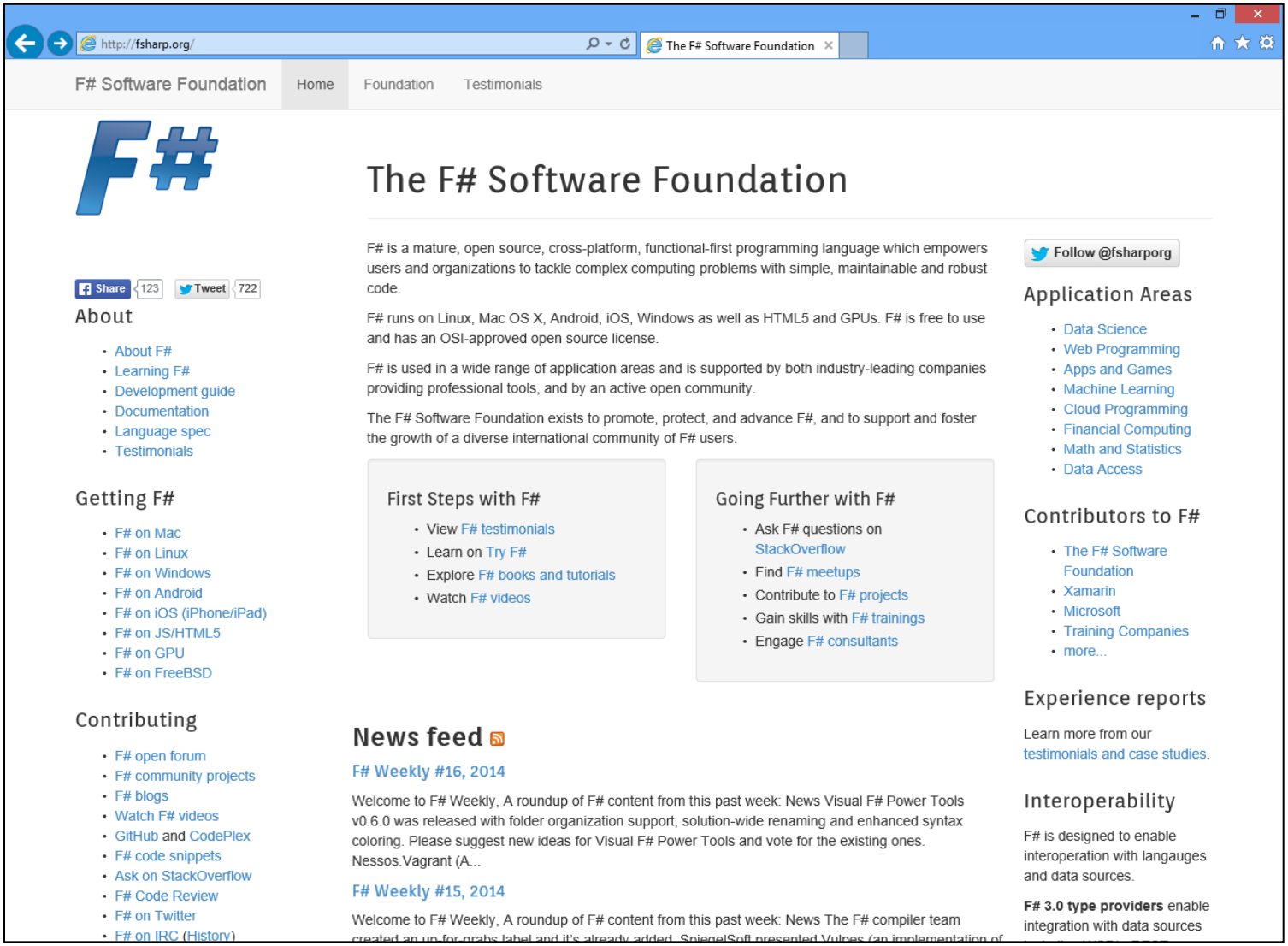




Ref.: http://fssnip.net/mA

F# Software Foundation

http://fsharp.org/



It’s all about Polyglot Programming!

C++ supports systems programming. This implies that C++ code is able to effectively interoperate with software written in other languages on a system. The idea of writing all software in a single language is a fantasy. From the beginning, C++ was designed to interoperate simply and efficiently with C, assembler, and Fortran. By that, I meant that a C++, C, assembler, or Fortran function could call functions in the other languages without extra overhead or conversion of data structures passed among them.

http://www.youtube.com/watch?v=NvWTnIoQZj4

Bjarne Stroustrup: The 5 Programming Languages You Need to Know

“Nobody should call themselves a professional if they only knew one language.”

...C++, of course; Java; maybe Python for mainline work... And if you know those, you can't help know sort of a little bit about Ruby and JavaScript, you can't help knowing C because that's what fills out the domain and of course C#. But again, **these languages create a cluster** so that **if you knew either five of the ones that I said, you would actually know the others**...

“Inclua a esta lista F#, Scala, Haskell, Erlang, Clojure, Lua e/ou Racket” – Fabio Galuppo

Implementando soluções de Inteligência Artificial usando F#

Fabio Galuppo, M.Sc.

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Microsoft Most Valuable Professional (MVP)

Visual C++

2014