

Application Layer/APL Research

Computer Networks Spring 2018



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Development of APL

How and why was APL developed?



A Brief History

1957

Iverson developed a mathematical notation for denoting array manipulations, made largely of symbols. It lent itself towards the synthesis and explanation of algorithms

1960

Iveson was hired by IBM three years after he developed his mathematical notation to further iterate upon it.

1962

Iverson released a book, *A Programming Language*, which would become the namesake of APL – detailing his notation further.



A Brief History: Continued

1966

The first implementation of APL to garner more widespread use externally from IBM was “APL/360,” built for the IBM System/360.

Today

Although known by a few people, APL hasn’t garnered much thought, attention, or consideration then it arguably deserves.

*It is the central thesis of this book that the descriptive and analytical power of an adequate programming language **amply repays** the considerable effort required for its mastery.*

- Kenneth Iverson, A Programming Language (1982)

“

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APL Language

What is APL? How do you use/write it?



Notation as a Tool of Thought

- read the “APL manifesto” [here](#)
- there is a theory, in terms of languages, that we are limited in thought by the languages we speak
 - Iverson thinks the same thing, but more on the level of coding
 - notation must allow for convenient expression of situations/problems arising from different circumstances





Try it Out Yourself!

- try out APL [here](#)
 - allows you to write your own APL without downloading anything
 - some basic tutorials
- try out an APL interpreter and development environment [here](#)
 - not free, but can try a trial version
 - has some comprehensive tutorials on APL



Research at Olin!

- code to develop an 'APL' keyboard working
- other code to further develop APL at Olin is in the works
 - see project not on Github, it's on Gitlab
- Ask us questions!

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Thoughts on APL

What is the perception on APL? What are some pros/cons of APL?



Main Thoughts on APL

Pros

Once people get used to the notation, APL is surprisingly easier and makes many algorithms/mathematical manipulations much easier to write than in other languages.

Cons

APL is a “write-only” programming language that requires unnecessary additional time and effort to not only learn the notation but to use its symbols.

APL is a **mistake**, carried through to perfection. It is the language of the future, for the programming techniques of the past; it creates a new generation of coding bums.

- Edsger Dijkstra

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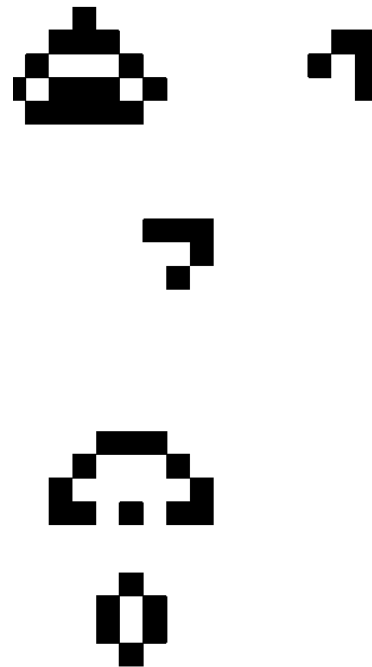
Example Uses of APL

How has APL been used? How can it be used?



Conway's Game of Life in APL

- Conway's Game of Life is a zero player cellular automation game that is a fairly standard coding project
- in APL, it can be coded in **one line**
- check out demo [here](#)
- check out the video explanation of the code [here](#)



*If you need more than one line of
APL, you do not fully understand
your problem.*

- Unknown

“



APL Text Editor and Composer

- process text interactively at a terminal
- APL functions included for entering, revising, composing, printing, and storing text
- can be used by secretaries, scientists, engineers, administrators or anybody else who needs to produce papers, letters, or written material
- encourages interactivity (much like other APL programs), providing a huge batch in productivity



Across all fields, the speed at which APL programs can be written makes it valuable for modeling and prototyping . . . One example: Around 1973, Continental Can needed an inventory system for its 21 manufacturing plants. Their team of FORTRAN programmers had worked for a year, with no success in sight. One STSC salesman, in one weekend, built a usable working model in APL Plus.

- Larry Breed



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Starmap in APL

- in 1973, Berry and Thorstensen of IBM wrote a set of APL functions to calculate and plot the positions of the stars and planets
- it uses Kepler's equations and a series of rotations in order to accurately map
- they released a short but surprisingly difficult to find [book](#)





Not to Mention . . .

- Interactive Business Game Simulation
- Zeros and Integrals in APL
- Interactive Graphics Package for APL\360
- Graphs and Histograms in APL
- APL Coordinate Geometry System,
- APL/PDTS
- A Critical Path Method system for Project Management
- APL Planning Systems: Econometric and Financial, etc.

And more . . .

*There are three things a man must do
before his life is done;
Write two lines in APL,
And make the buggers run.*

- Stan Kelly-Bootle, The Devil's DP Dictionary (1981)

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Application Layer

"Oh right, that thing!"



Application Layer

- the seventh layer of the OSI Model
- provides services to the software through which the user requests network services
- browsers, FTP clients, and mail clients are at this layer
- some of its protocol functionalities can be seen on the next slide
 - one famous protocol that runs on the application layer is bitcoin





Protocol Functionalities

Domain name service Protocol

Translates the domain names' IP addresses (we don't have to remember those pesky IP addresses).

Hypertext Transfer Protocol

HTTP; defines how messages are formatted and transmitter over the internet.

Simple Mail Transfer Protocol

SMTP; delivers an email from an email client to an email server or moves emails from one server to another.

Simple Network Management Protocol

SNMP; Internet-standard protocol for network management; collect, organize information about devices.

Telnet

login to remote server; exp. of client-server protocol and is based on a reliable connection-oriented transport.

BOOTP

booting up; system broadcasts BOOTP messages onto the network to request an IP address assignment



Thanks!

Any **questions** ?

Feel free to ask us!