C Reload

Simple Computer

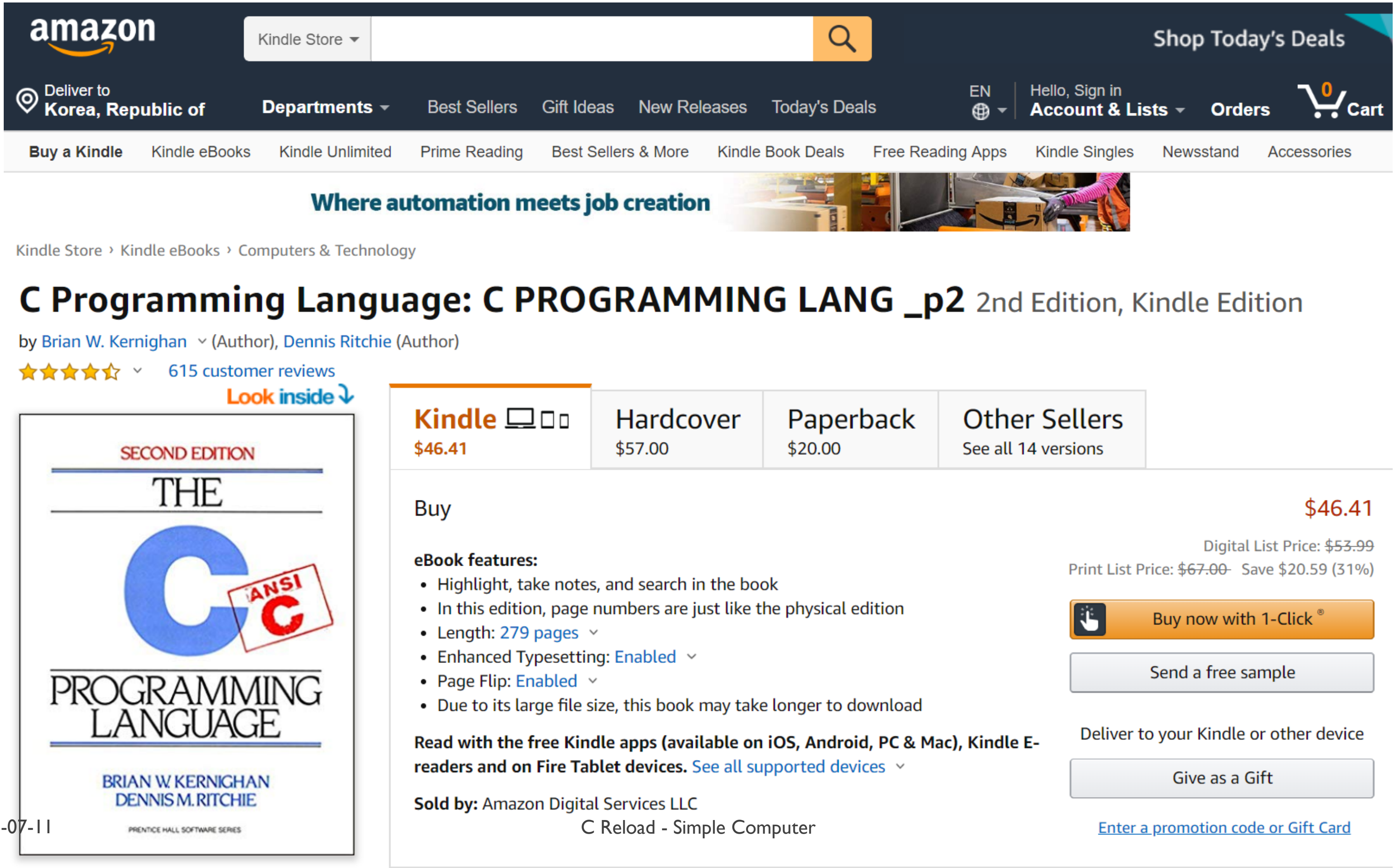
Shin Hong

Programming Environment

- Linux
  - http://peace.handong.edu:8000/register/
- Mac
  - Download and install Xcode from the Mac App store
- Windows
  - MinGW http://www.codebind.com/cprogramming/install-mingw-windows-10-gcc/
  - Download and install Ubuntu 16.04 LTS from the MS app store

Textbook

- The C Programming Language, 2/e, by Brian Kernighan and Dennis Ritchie



C Programming Language: C PROGRAMMING LANG _p2 2nd Edition, Kindle Edition

by Brian W. Kernighan (Author), Dennis Ritchie (Author)

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What is computing?

- What is programming?

George Boole

George Boole (1815--1864)

Formulate a calculus of reasoning

- Claim that logic should be considered as a branch of math, rather than a part of philosophy
- Argue that there are math laws to express the operation of human mind
- Showed that Aristotle's syllogistic logic could be rendered as algebraic equitation

A Brief History of Computing by G. O’Regan

Charles Babbage

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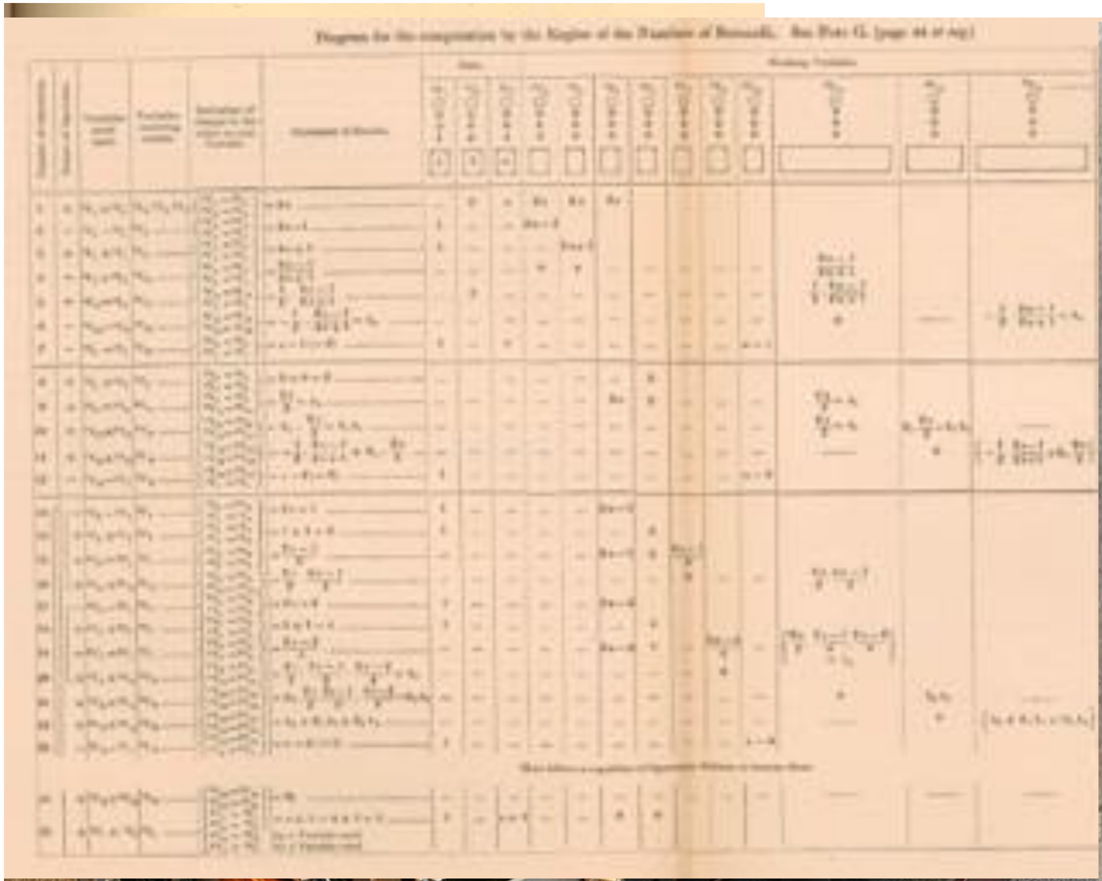
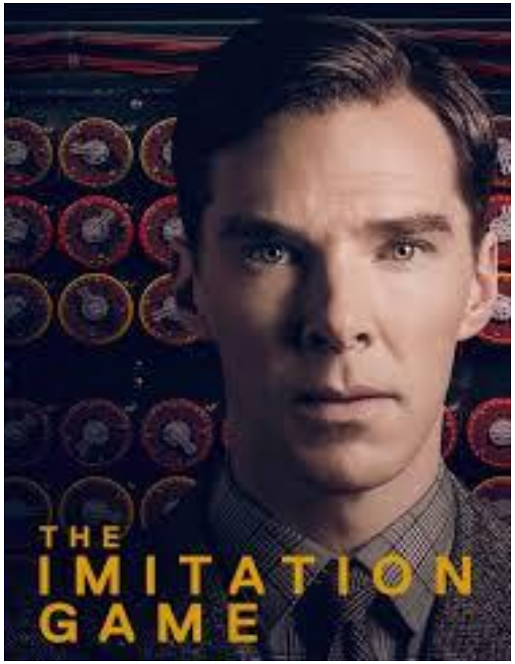
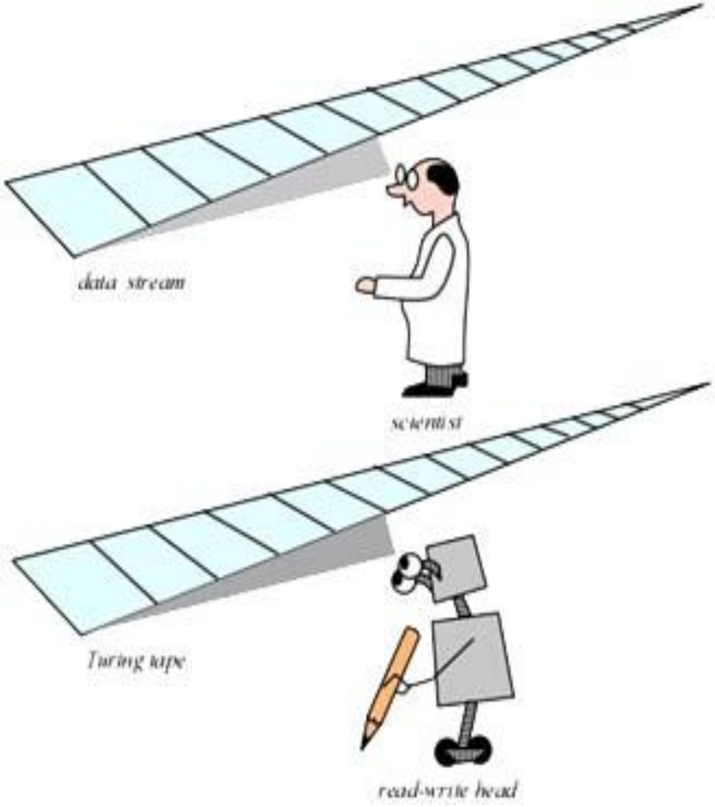


Diagram for the computation by the Engine of the Numbers of Bernoulli. See Note G. (page 44 et seq.)



THE
IMITATION
GAME



data stream
scientist
Turing tape
read-write head

Computer Model

- Memory is a map from addresses to values
- A memory address is a non-negative integer
- A value is either a number or instruction
    - number: 0 to 255
    - instruction
        - receive an input
        - produce an output
        - evaluate an expression over memory addresses
        - assign a value to a memory address
        - jump to a memory address
        - finish
- A processor loads and executes instructions from address 0

Simple Computer Example

- Memory addresses: 0, 1, ..., 29
- Instruction
  - READ [m] Receive a new input and write it on address m
  - WRITE [m] Print out the number at address m
  - ASSIGN [m] [c] Put a number c to address m
  - MOVE [md] [ms] Put the value at address ms to address md
  - ADD [md] [mx] [my] Put the add of values in memory addresses mx and my to md
  - MINUS [md] [mx] [my] Put the minus of values in memory addresses mx and my to md
  - MOD [md] [mx] [my] Put the modulo of values in memory addresses mx and my to md
  - EQ [md] [mx] [my] Put 1 to md if the value at mx is equivalent to the value at my. Otherwise, put 0 to md.
  - LESS [md] [mx] [my] Put 1 to md if the value at mx is less than the value at my. Otherwise, put 0 to md.
  - JUMP [m] [c] Jump to address m if the value at c is not zero
  - TERM Finish the program execution

Exercise 1. Prime Number

- Write a program for the simple computer model that checks whether or not a given positive number is prime
  - Construct a map/table of the 30 memory addresses
  - Ex. check whether a given number is even

```
0: READ 21
1: EQ 23 21 22
2: JUMP 23 10
3: JUMP 24 7
4: ASSIGN 24 20
5: MINUS 21 21 20
6: JUMP 1
7: ASSIGN 24 22
8: MINUS 21 21 20
9: JUMP 1 20
10: PRINT 24
11: TERM
```

```
...
20: “1”
21:
22: “0”
23:
24: “1”
```