A brief history of CS

A mini-lecture series

CSE498 Collaborative Design - Secure and Efficient C++ Software Development

01/14/2025

Kira Chan

https://cse.msu.edu/~chanken1/

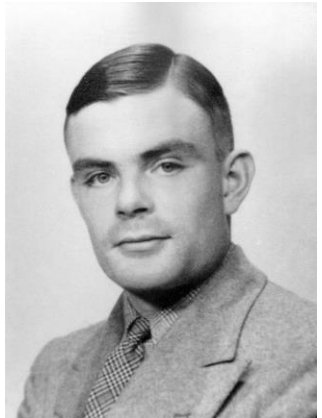
Mini lecture series

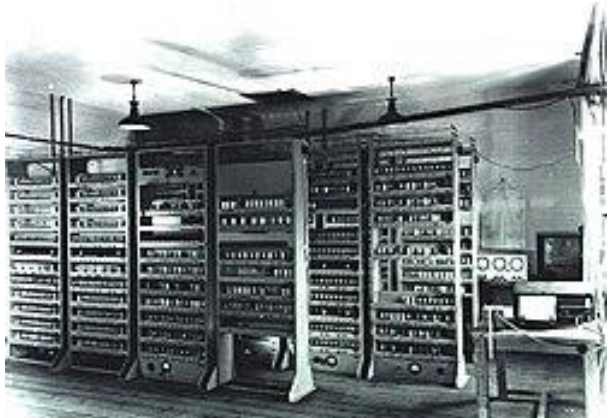
- Over the course of the semester
- Some selected topics on fun or useful information
- Range from application design theory, programming, security, other programming concepts, etc.
- Also include a famous computer scientist and their contributions

Very early programming languages

- 1843: Ada Lovelace writes the first algorithm
  - Note G – used to calculate Bernoulli numbers on the analytical machine
  - Lovelace translated seminar and added her own theories
  - Lovelace is often considered the first programmer

- 1936: Alan Turing propose the concept of a universal machine
- 1950-ish: Assembly languages, EDSAC machine completed



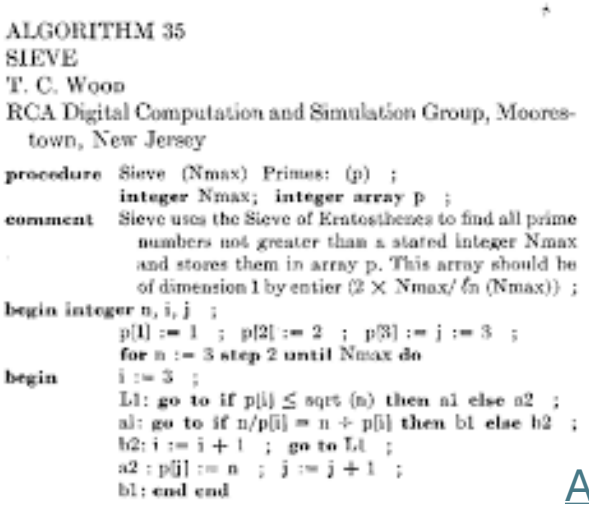


Very early programming languages

- 1957: FORTRAN introduced (scientific programming lang.)
- 1958: ALGOL – an algorithmic language (code blocks, functions)
- 1959: COBOL (Grace Hopper) and LISP
- 1964: BASIC
- 1969: B programming language (Bell labs) – Basic Combined Programming Language
- 1970: PASCAL
- 1972: Smalltalk, C, SQL
  - C was developed by Dennis Ritchie at Bell labs, successor to B

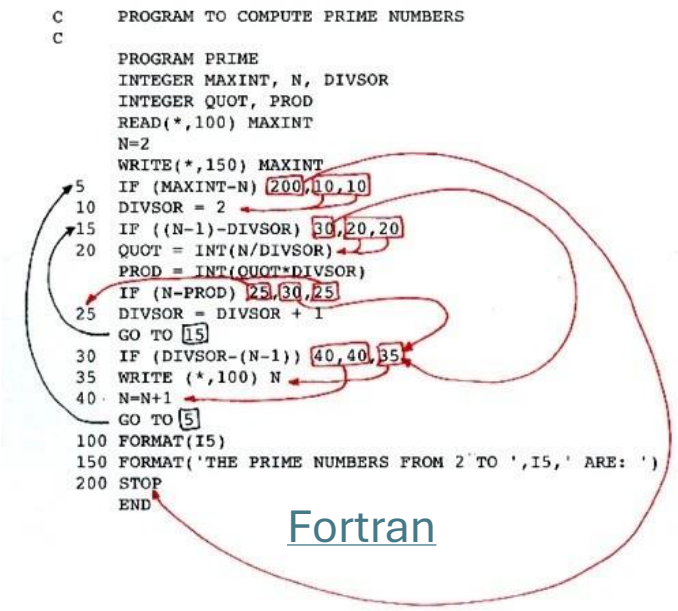
Legacy languages

- How many of you have worked with legacy systems
- Oldest file?
- What is a common “thing” that these files did?
  - Goto statements and labels
  - Spaghetti code



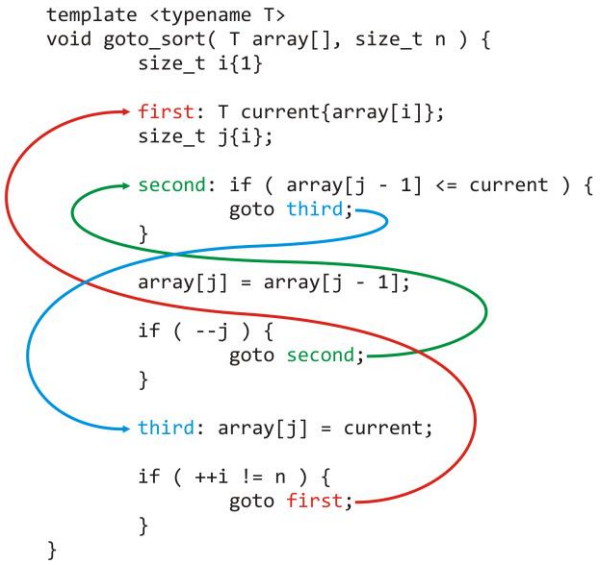
```
ALGORITHM 35
SIEVE
T. C. Wood
RCA Digital Computation and Simulation Group, Moores-
  town, New Jersey
procedure  Sieve  (Nmax)  Primes:  (p)  ;
           integer Nmax;  integer array p  ;
comment    Sieve uses the Sieve of Eratosthenes to find all prime
             numbers not greater than a stated integer Nmax
             and stores them in array p. This array should be
             of dimension 1 by entier (2 × Nmax/ ln (Nmax)) ;
begin integer n, i, j  ;
           p[1] := 1  ;  p[2] := 2  ;  p[3] := j := 3  ;
           for n := 3 step 2 until Nmax do
begin      i := 3  ;
           L1: go to if p[i] ≤ sqrt (n) then a1 else a2  ;
           a1: go to if n/p[i] = n ÷ p[i] then b1 else b2  ;
           b2: i := i + 1  ;  go to L1  ;
           a2 : p[j] := n  ;  j := j + 1  ;
           b1: end end
```

ALGOL



```
C     PROGRAM TO COMPUTE PRIME NUMBERS
C
      PROGRAM PRIME
      INTEGER MAXINT, N, DIVSOR
      INTEGER QUOT, PROD
      READ(*,100) MAXINT
      N=2
      WRITE(*,150) MAXINT
5     IF (MAXINT-N) 200,10,10
10    DIVSOR = 2
15    IF ((N-1)-DIVSOR) 30,20,20
20    QUOT = INT(N/DIVSOR)
      PROD = INT(QUOT*DIVSOR)
      IF (N-PROD) 25,30,25
25    DIVSOR = DIVSOR + 1
      GO TO 15
30    IF (DIVSOR-(N-1)) 40,40,35
35    WRITE (*,100) N
40    N=N+1
      GO TO 5
100   FORMAT(I5)
150   FORMAT('THE PRIME NUMBERS FROM 2 TO ',I5,' ARE: ')
200   STOP
      END
```

Fortran

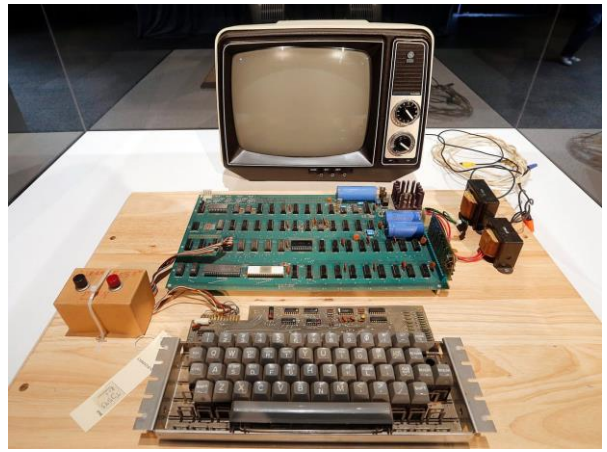


```
template <typename T>
void goto_sort( T array[], size_t n ) {
        size_t i{1}

        first: T current{array[i]};
        size_t j{i};

        second: if ( array[j - 1] <= current ) {
                goto third;
        }

        array[j] = array[j - 1];

        if ( --j ) {
                goto second;
        }

        third: array[j] = current;

        if ( ++i != n ) {
                goto first;
        }
}
```

C/C++

“Modern programming languages”

- 1972: Smalltalk, C, SQL
  - C was developed by Dennis Ritchie at Bell labs, successor to B
- 1972: Software Crisis!
  - Introduction of modern-day structured programming
- 1976: Steve Wozniak completes the first Apple 1
- 1983: Bjarne Stroustrup extends the C language to C++ to include classes, support for OOP
  - Backwards compatible with C
- 1990-ish: Bill Gate vision for Personal Computers
- 1991: Python and Visual Basics
- 1995: Java, JavaScript, PHP



C++ timeline

- 1979: Development while Stroustrup was working on his Ph.D.
- 1983: First version released
- 1998: First standardized version of C++ released
- 2011: C++11 released
  - Considered a significant evolution with powerful features
  - Auto, Lambda, range-based for loops, smart pointers, move semantics, …
- 2014: C++14
  - Generic Lambda, return type deductions, variable templates, …
- 2017: C++17
  - Std::optional, structured bindings, std::any, if constexpr

Very modern C++

- 2020: C++20
  - Another big milestone, especially for generic programming
  - Concepts, ranges, coroutine, spaceship operator (<=>)
- 2023: C++23
  - Std::expected, std::mdspan, std::reflections
- 2026: C++26

Some cool facts

- Your modern smartphone has 5000x the processing power as the world's most powerful super computer in the 1980s
  - More compute power than the whole NASA in 1970s
- 1980 is the first AI boom
  - Why did it "fail"?

Key takeaways

- Our field is relatively “young” compared to other science fields
- Majour advancements in the last 50~ish years
- C++ is an extension to C, adding classes, OOP concepts, etc.
  - Largely motivated by the software crisis in the 70s
- C++ is constantly being updated with new powerful features
- C++ is a low-level language
  - Control is given to programmer
  - Can hurt yourself if you are not careful

Person of the day
Bjarne Stroustrup

- Developed the C++ language
- Still active in the scene
  - Appears in Cppcon
- “C makes it easy to shoot yourself in the foot; C++ makes it harder, but when you do it blows your whole leg off.”