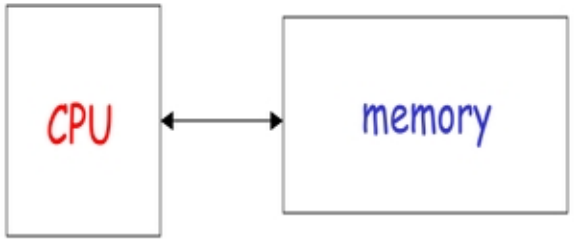
CNG280

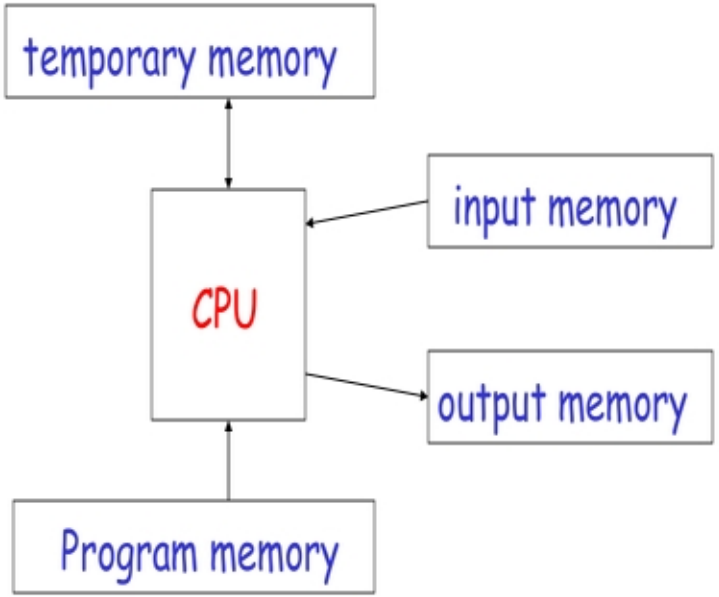
Formal Languages

&

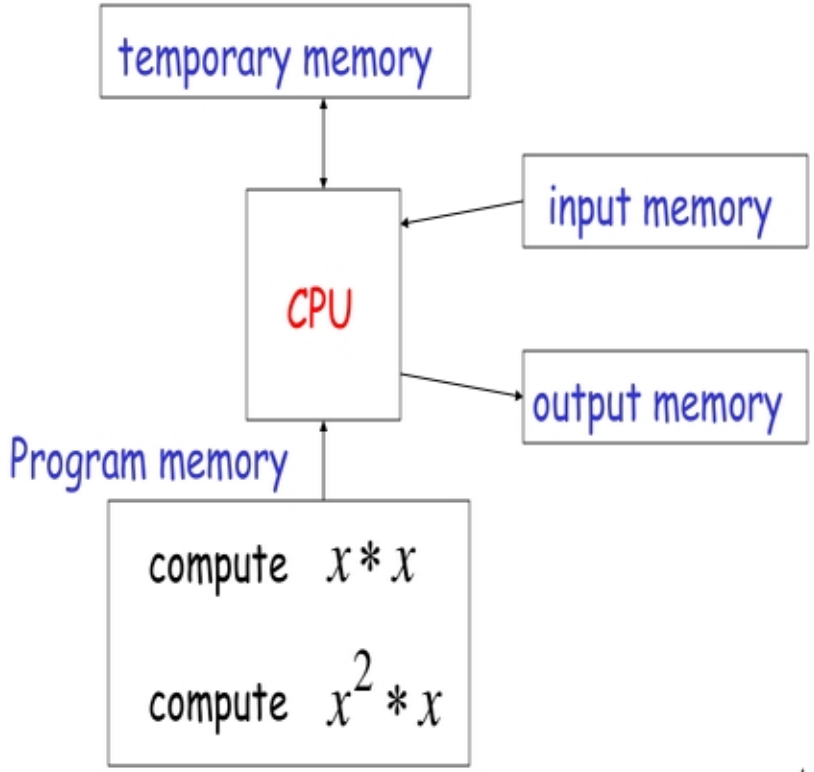
Abstract Machines

Computation

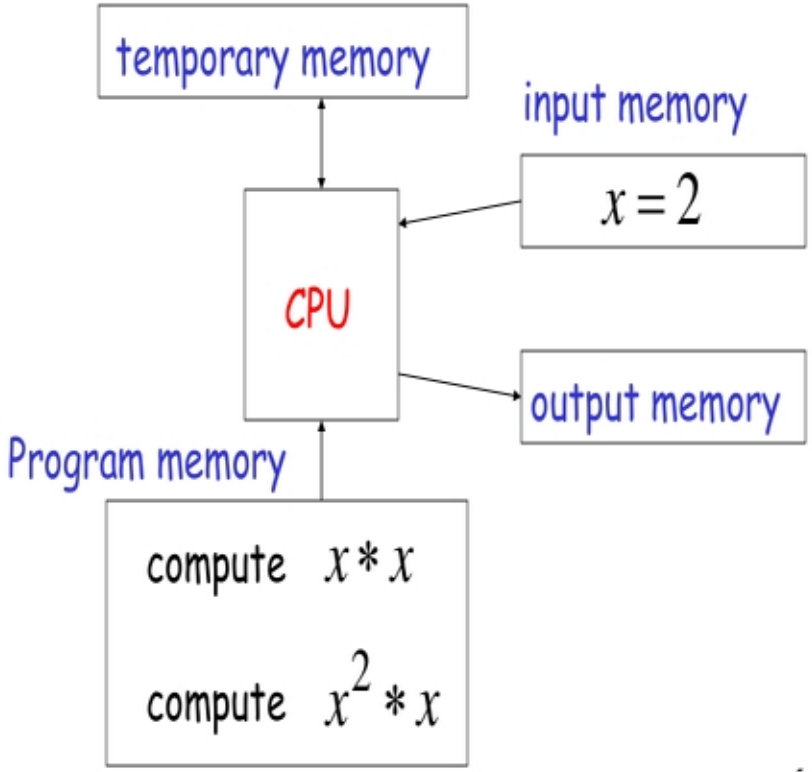




Example: $f(x) = x^3$



$f(x) = x^3$

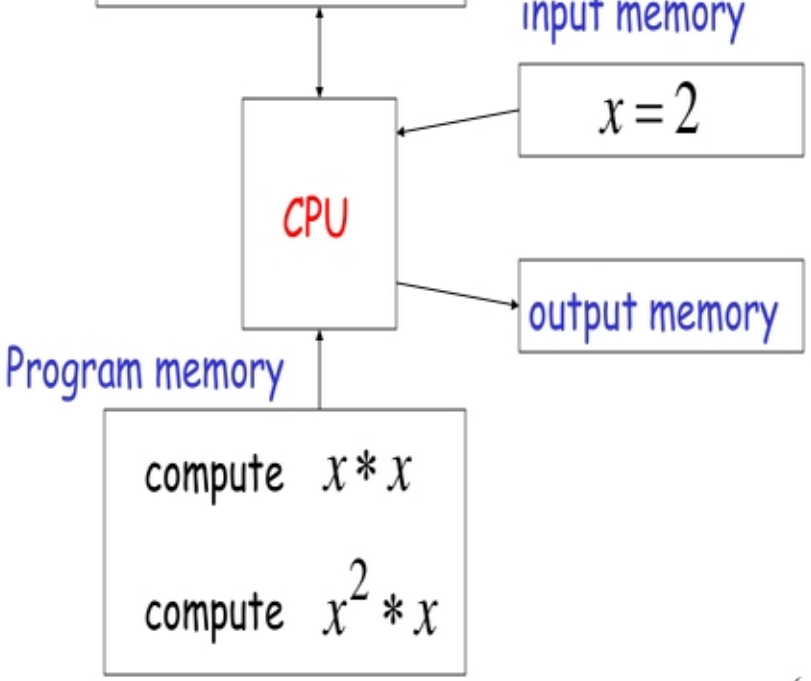


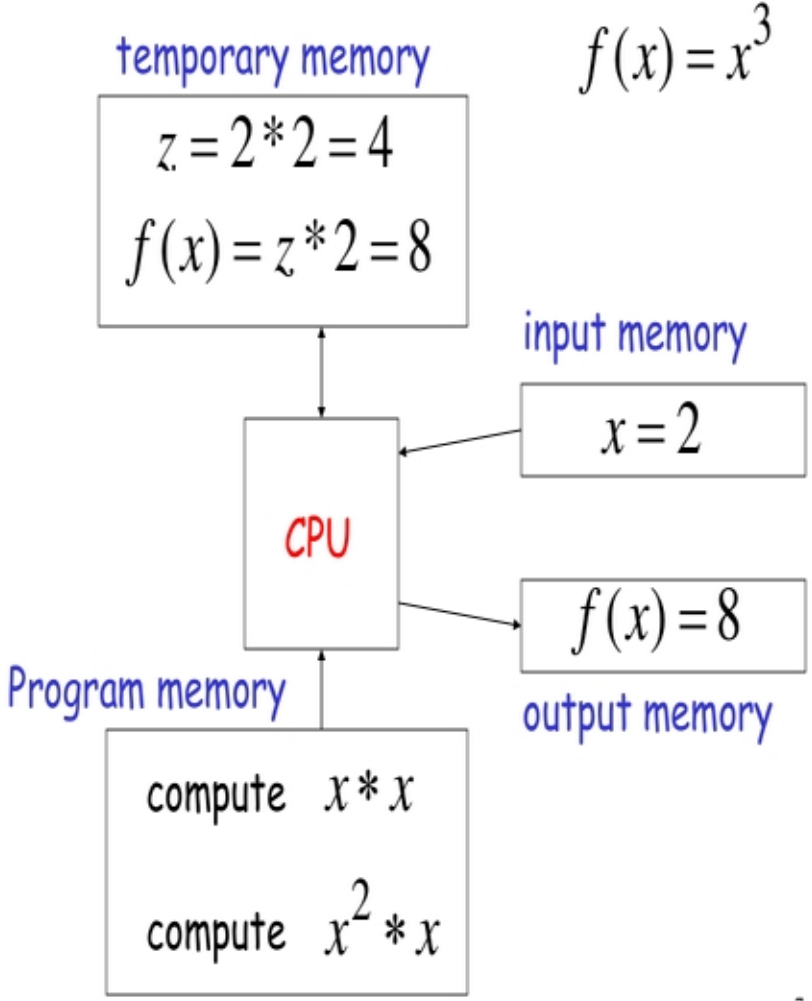
temporary memory

$z = 2 * 2 = 4$

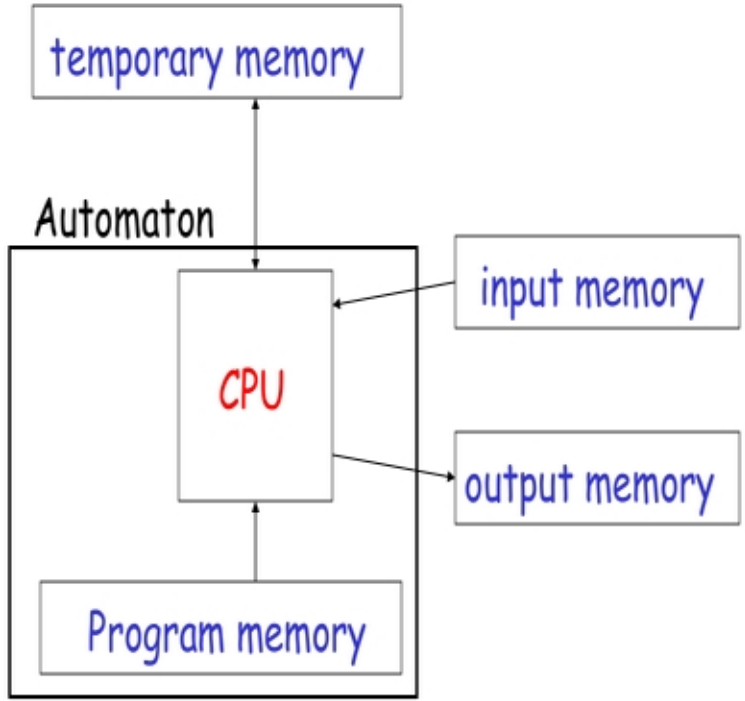
$f(x) = z * 2 = 8$

$f(x) = x^3$




temporary memory
$f(x)=x^3$
$z=2*2=4$
$f(x)=z*2=8$
input memory
$x=2$
CPU
$f(x)=8$
Program memory
output memory
compute $x*x$
compute x^2*x

Automaton

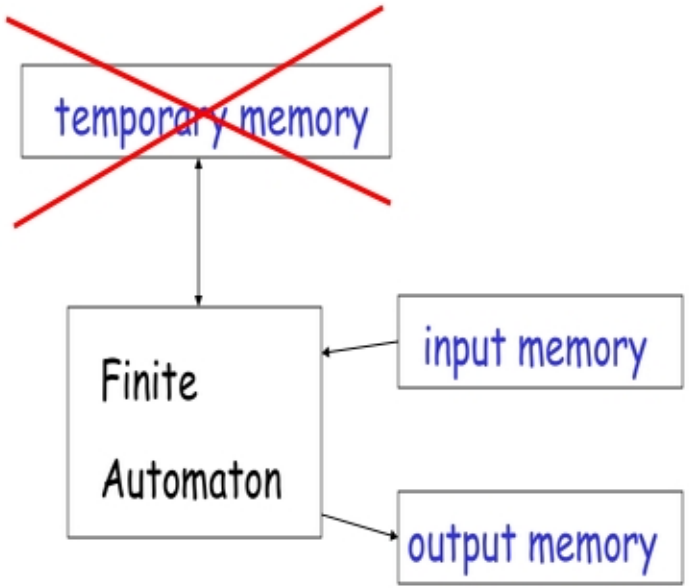

temporary memory
Automaton
input memory
CPU
output memory
Program memory

Different Kinds of Automata

Automata are distinguished by the temporary memory

- **Finite Automata:** no temporary memory
- **Pushdown Automata:** stack
- **Turing Machines:** random access memory

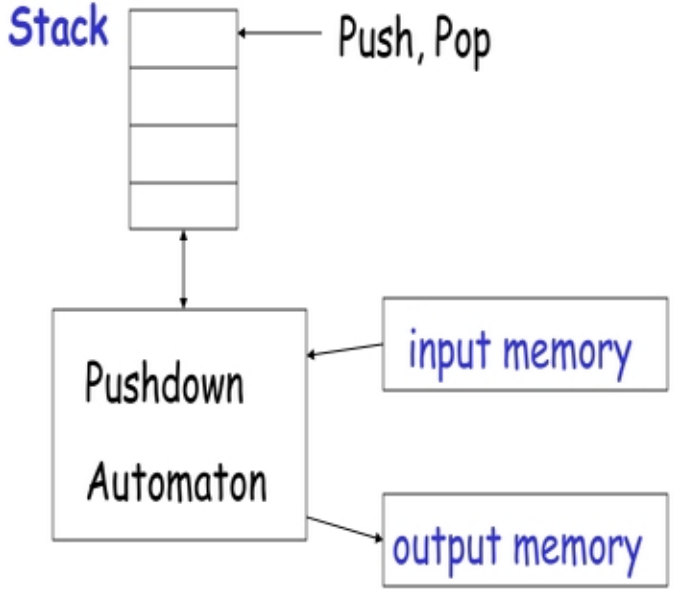
Finite Automaton



Example: Vending Machines

(small computing power)

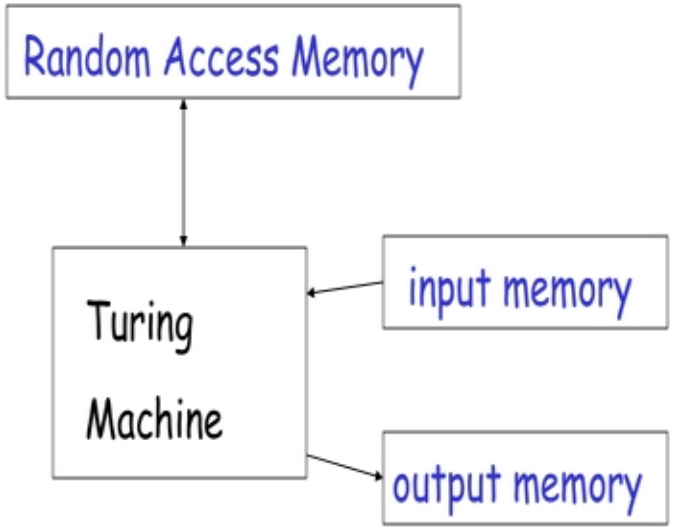
Pushdown Automaton



Example: Compilers for Programming Languages

(medium computing power)

Turing Machine



Examples: Any Algorithm

(highest computing power)

Power of Automata

Less power ⟶ More power

Solve more

computational problems