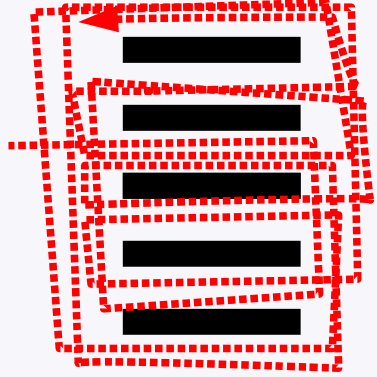
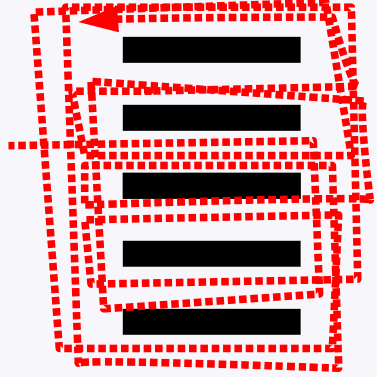


Ways to put code into actions (instructions)

Ways to put code into actions (instructions)



Ways to put code into actions (instructions)

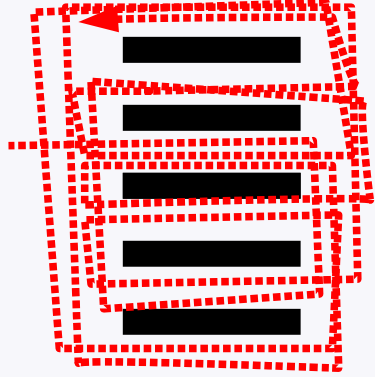


Interpreter

Immediately
runs

Not so efficient;
can run slow

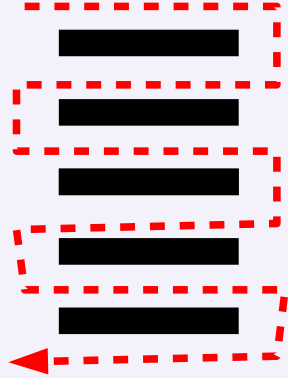
Ways to put code into actions (instructions)



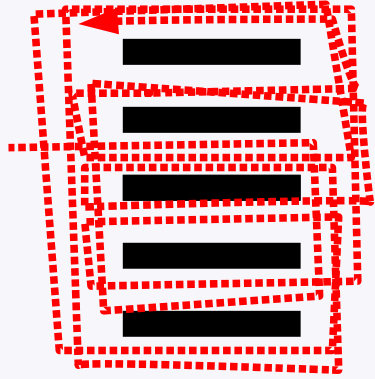
Interpreter

Immediately
runs

Not so efficient;
can run slow



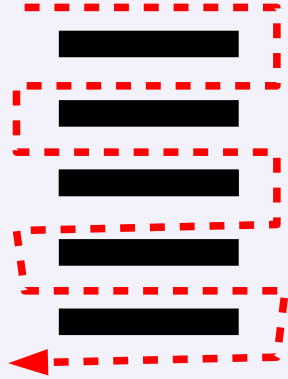
Ways to put code into actions (instructions)



Interpreter

Immediately
runs

Not so efficient;
can run slow

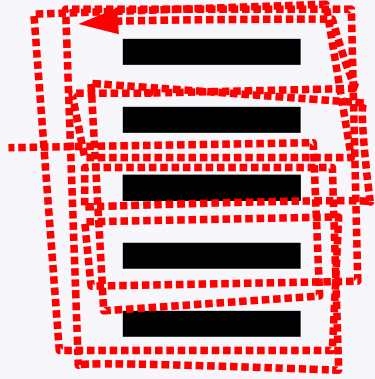


Compiler

Delay before
running

Runs efficiently

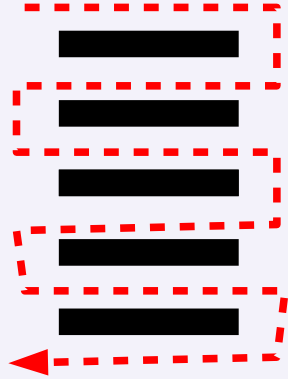
Ways to put code into actions (instructions)



Interpreter

Immediately
runs

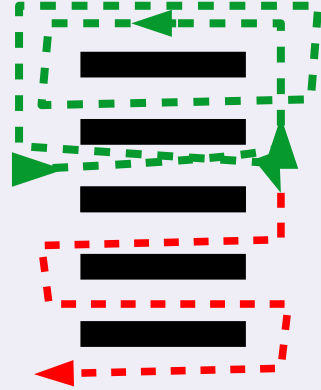
Not so efficient;
can run slow



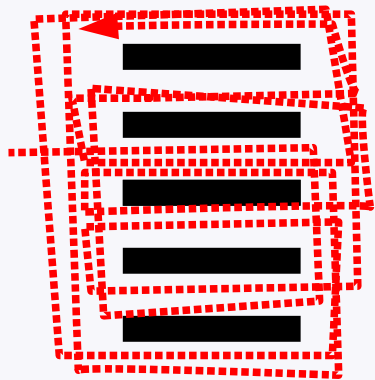
Compiler

Delay before
running

Runs efficiently



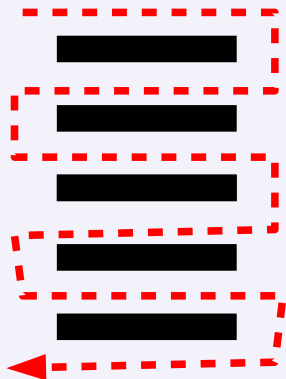
Ways to put code into actions (instructions)



Interpreter

Immediately
runs

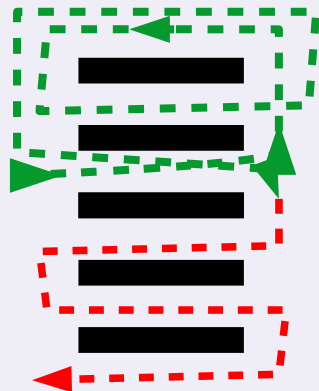
Not so efficient;
can run slow



Compiler

Delay before
running

Runs efficiently

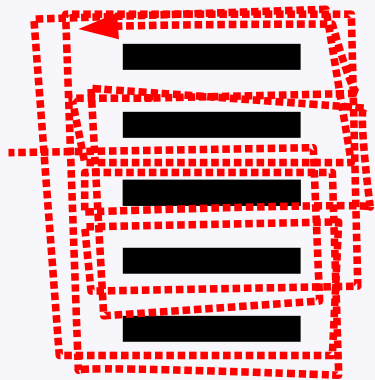


Just-in-time

Immediately
runs

Runs very efficiently
(all browsers 2008)

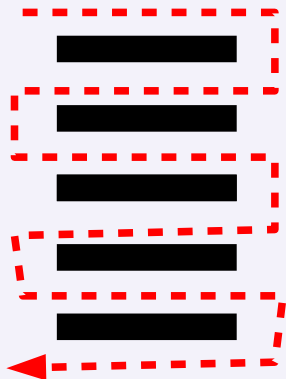
Ways to put code into actions (instructions)



Interpreter

Immediately
runs

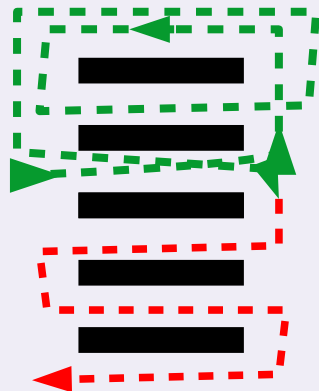
Not so efficient;
can run slow



Compiler

Delay before
running

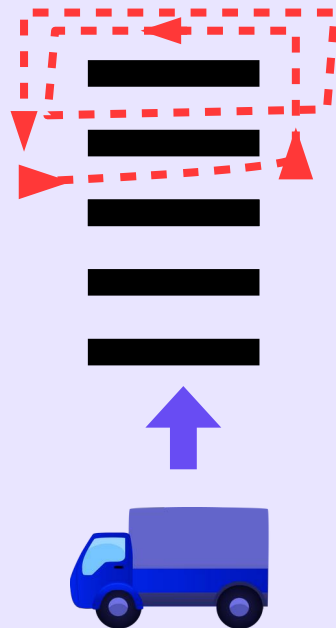
Runs efficiently



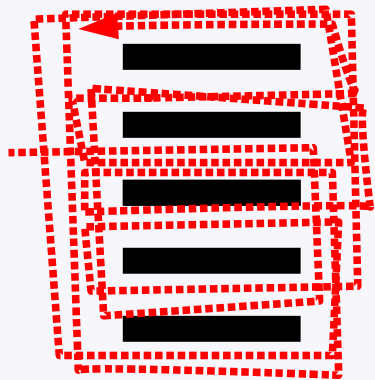
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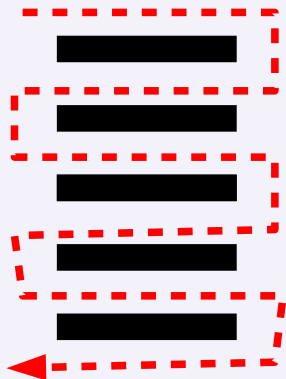
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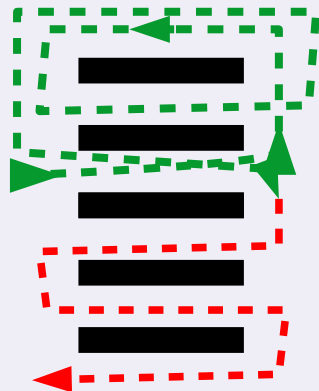
Not so efficient;
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Compiler

Delay before
running

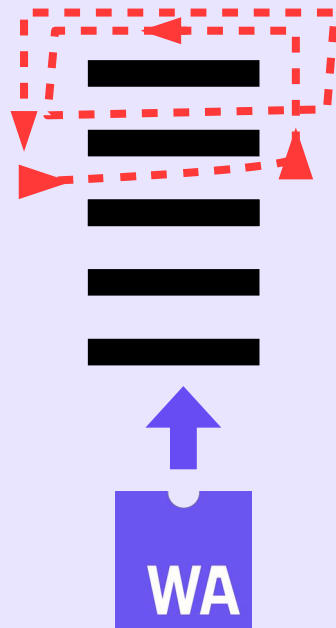
Runs efficiently



Just-in-time

Immediately
runs

Runs very efficiently
(all browsers 2008)



WebAssembly

Immediately
runs highly efficiently
(MVP 2017)

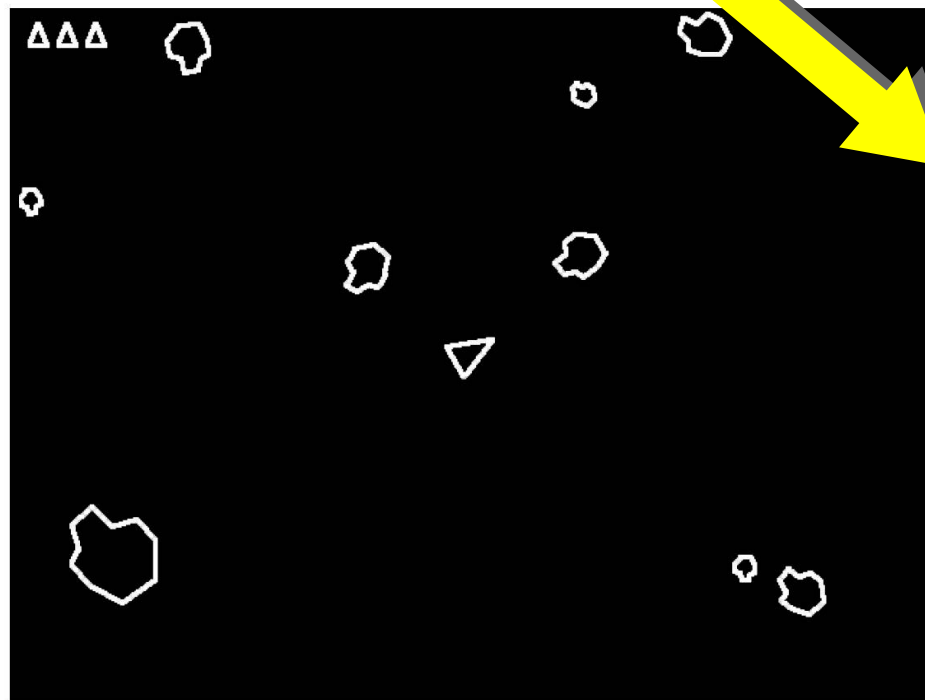
What is WebAssembly

Asteroids in WebAssembly

[Code on GitHub](#)

An [Asteroids](#) game ported from C to WebAssembly.

(Arrows to move; Spacebar to shoot)



**Written in
C NOT
JavaScript**

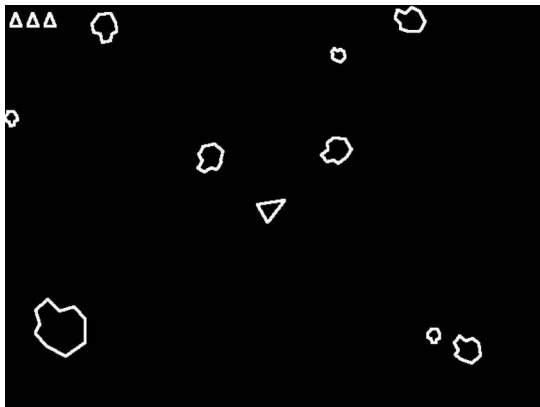
[levelupwasm.com
/apps/asteroids](http://levelupwasm.com/apps/asteroids)

What is WebAssembly

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Want to learn how to port games like this one to the web? Check out my book [Level Up with WebAssembly](#).

Page

Filesystem

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⋮

index.html x

loading.gif

asteroids.js

▼ top

▼ www.levelupwasm.com

▼ apps/asteroids

index.html

asteroids.js

loading.gif

▶ stackpath.bootstrapcdn.com

▶ wasm

1 <!doctype html>

2 <html lang="en">

3 <head>

4 <meta charset="utf-8">

5 <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">

6 <meta name="description" content="Asteroids game ported from C to WebAssembly">

7 <meta name="author" content="Robert Aboukhalil">

8 <title>Asteroids Game in WebAssembly</title>

9

10 <!-- Bootstrap core CSS -->

11 <link href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css" rel="stylesheet">

12

13 <style>

14 body { padding-top: 5rem; }

15 .starter-template { text-align: center; }

16 canvas { display: block; margin: 0 auto; }

17 </style>

18 </head>

19 <body>

20 <nav class="navbar navbar-expand-md navbar-dark bg-dark fixed-top">

21 Asteroids in WebAssembly

22 <button class="navbar-toggler" type="button" data-toggle="collapse" data-target="#navbarCollapse">

23

24 </button>

25

26 <div class="collapse navbar-collapse" id="navbarCollapse">

27 <ul class="navbar-nav mr-auto">

28 <div>

29 Level Up with WebAssembly

30 </div>

31 </div>

32 </nav>

33

34 <div class="starter-template">

35 <p class="lead">

36 An Asteroids game ported from C to WebAssembly.

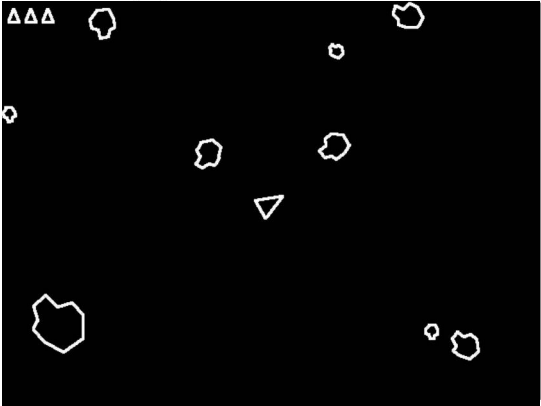
37 <small>(Arrows to move, Spacebar to shoot)</small>

What is WebAssembly

Asteroids in WebAssembly

Code on GitHub

An [Asteroids](#) game ported from C to WebAssembly.
(Arrows to move; Spacebar to shoot)



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Elements Console Sources Network Performance Memory Application Security Audits

Page Filesystem >> ⋮

- top
 - www.levelupwasm.com
 - stackpath.bootstrapcdn.com
 - wasm
 - wasm-0053561a
 - 0600
 - wasm-0053561a-693
 - wasm-0053561a-694
 - wasm-0053561a-695
 - wasm-0053561a-696
 - wasm-0053561a-697
 - wasm-0053561a-698
 - wasm-0053561a-699
 - 0700
 - 0800
 - 0900
 - 1000
 - 1100
 - 1200
 - 1300
 - 1400
 - 1500
 - 1600
 - 1700

wasml-0053561a-694 wasml-0053561a-696 wasml-0053561a-698 x >>

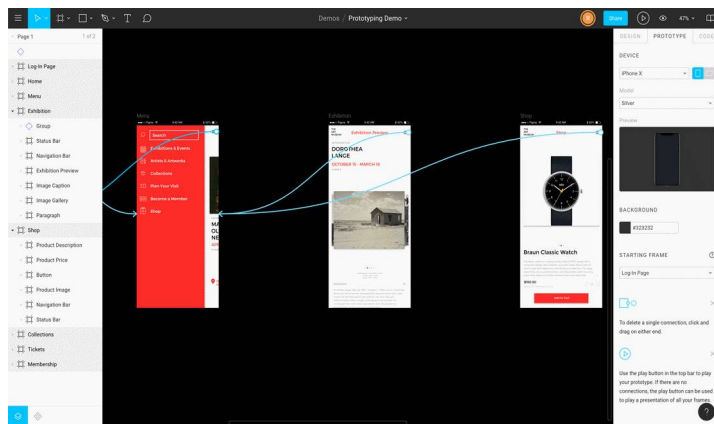
```
1 func (param i32 i32)
2 (local i32 i32 i32 i32 i32 i32 i32 i32 i32 i32 i32 i32 i32 i32 i32 i32
3   global.get 18
4   local.set 58
5   global.get 18
6   i32.const 32
7   i32.add
8   global.set 18
9   global.get 18
10  global.get 19
11  i32.get_s
12  if
13    i32.const 32
14    call 1
15  end
16  local.get 58
17  i32.const 8
18  i32.add
19  local.set 53
20  local.get 58
21  local.set 54
22  local.get 0
23  local.set 12
24  local.get 1
25  local.set 23
26  i32.const 0
27  local.set 34
28  i32.const 0
29  local.set 45
30  local.get 53
31  i32.const 23368
32  i64.load offset=0 align=4
33  i64.store offset=0 align=4
34  i32.const 0
35  local.set 34
36  loop
37    block
38      local.get 34
39      local.set 55
40      local.get 23
```

WebAssembly code (Wasam)

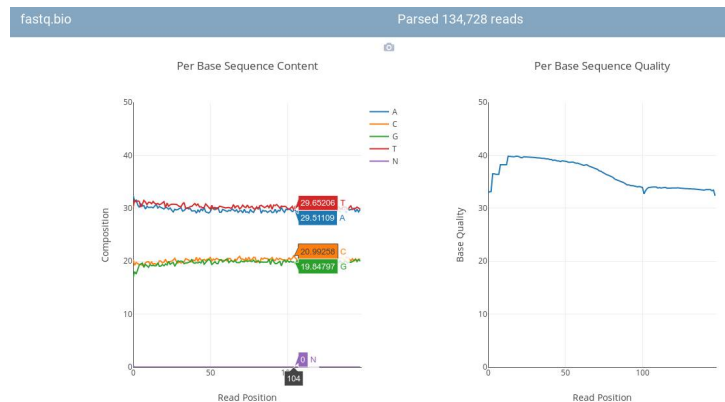
Compiled
(converted) from C
to WebAssembly to
run directly in the
browser

Why is WebAssembly important?

*Faster than
JavaScript*



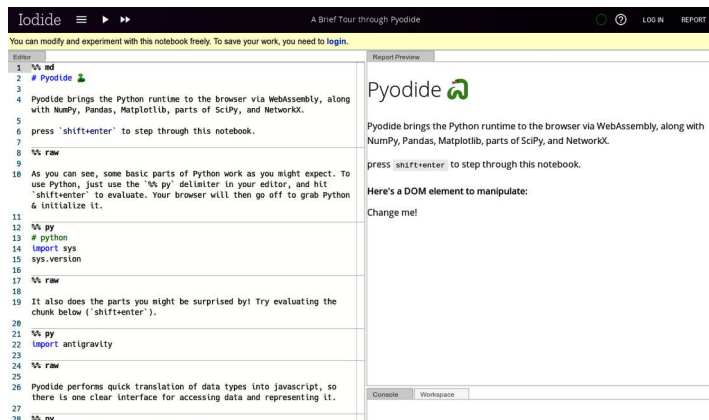
Figma 3X faster



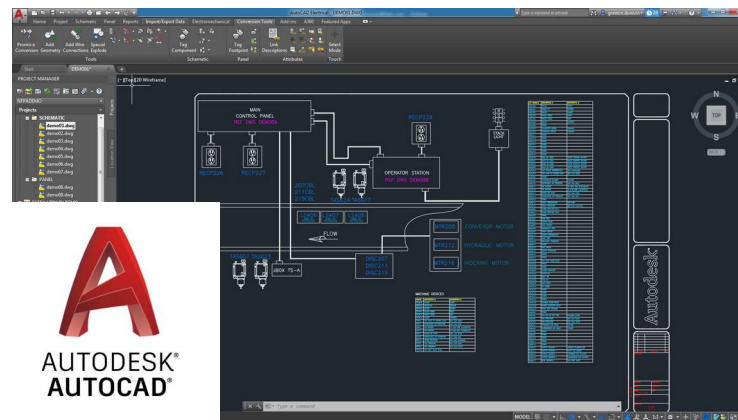
*fastq.bio DNA
sequencer 20X faster*

Why is WebAssembly important?

Run established codebase



Pyodide is Python running on the browser via webAssembly for scientific and AI



AutoCAD web version uses identical codebase as desktop - C

TL;DR

WebAssembly Code is 'shipped in'
via a binary blob

Allows faster execution than
JavaScript

Allows established non JavaScript
code via compiler to run on the web

