The 5W1H of D Programming Language

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What is D?

What is D?

- Multi-Paradigm Language
  - Object-Oriented Programming
  - Generic Programming (via templates)
- Compiled
  - Native code
  - No VM, No Iterpreters
- Statically-Typed

What is D?

- Garbage Collected
- Unicode Based
- Binary Compatible with C

- Looks and Feels very much like C/C++

Code Example: Hello World

```
import std.cstream;

int main( char[][] args )
{
   dout.writefln( “Hello, World!” );
   return 0;
}
```

Code Example: Classes

```
interface Animal {
  char[] speak();
}

class Dog : Animal {
  char[] speak() { return “woof”; }
}

class Cat : Animal {
  char[] speak() { return “meow”; }
}
```

Code Example: Classes

```
int main()
{
  Animal[] animals;
  animals ~= new Dog();
  animals ~= new Cat();

  foreach( Animal a ; animals )
    dout.writeLine( a.speak() );
  return 0;
}
```

Class

- Encapsulation
  - public, protected, private
- Inheritance
  - Single Inheritance
    - Multiple Interfaces
    - Mix-in
  - ‘class Object’ at the root of the hierarchy

Pretty Much Like Java & C#! (except mix-ins)

Class

- Property (like C#)
  - Setter/Getter as if it were a field
- Operator Overloading (like C++,C#)
  - a+b ➔ a.opAdd(b)

Code Example: Templates

```
class Stack(T)
{
  private T[] data;
  public void push(T e) {
    data ~= e;
  }
  public T pop() {
    T e = data[$-1];
    data.length = data.length-1;
    return e;
  }
}
```

Code Example: Templates

```
int main()
{
  Stack!(int) s = new Stack!(int)();

  s.push(100);
  s.push(200);
  dout.writefln( s.pop() ); // 200
  dout.writefln( s.pop() ); // 100
  return 0;
}
```

Templates

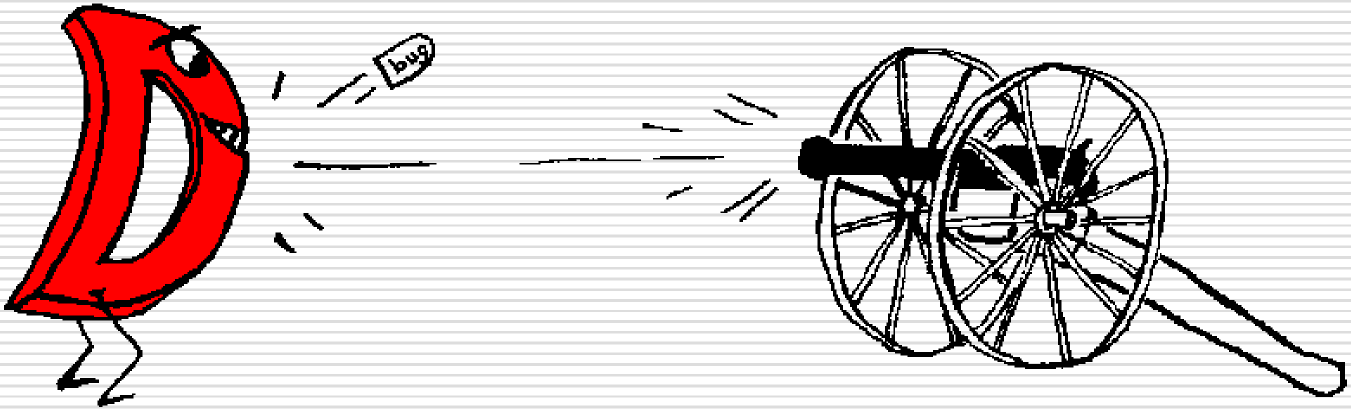
- Templates
  - Set of Parameterized Declarations
    - class
    - function
    - variable
    - typedef …

Similar to C++ Templates (more powerful)

What is D?

- Reengineering of C/C++
  - Naitive-code compiler
  - Binary Compatible with C
  - Familiar Look&Feel
- Incorporating many features of modern languages: Java, C#, ...
  - GC
  - Modules
  - OO Based on Single Inheritance
- ... And more!

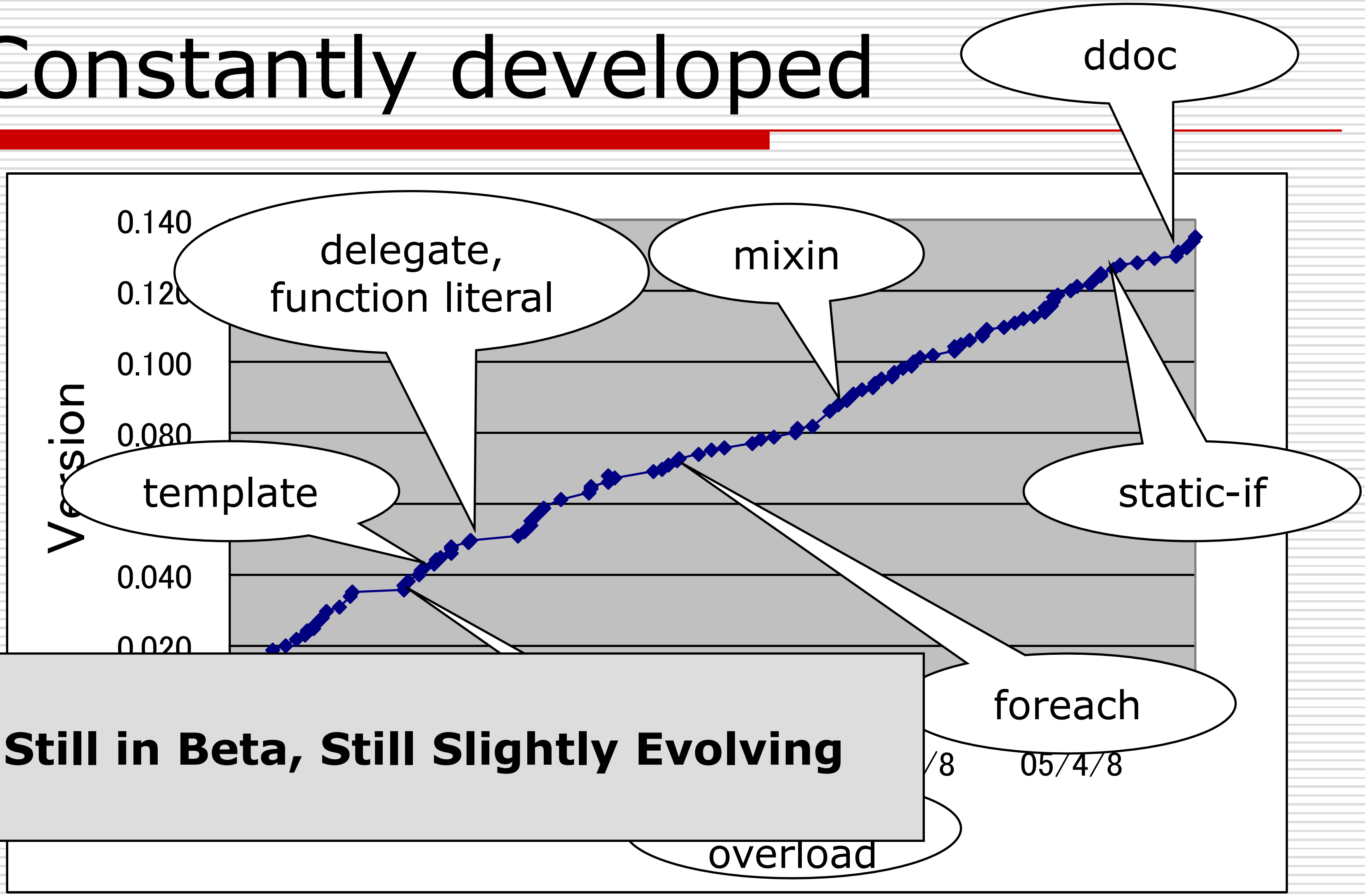
When was D born?



When was D born?

- 1999 Dec
  - Conceived by Walter Bright
- 2001 Aug
  - Language spec draft published
- 2001 Dec
  - First Alpha Version of D Compiler (DMD)
- 2004 Mar
  - GDC – D Front End for GCC

Constantly developed



Still in Beta, Still Slightly Evolving

Who created D?

Who created D?

- Walter Bright
  - The author of …
    - Northwest Software C
    - Datalight C
    - Zorland C
    - Zortech C++ (the first native C++ compiler)
    - Symantec C++
    - Symantec Visual Cafe for Java
    - Digital Mars C++
  - Genuine Compiler Hacker!

Who created D?

- Walter Bright – Compiler Hacker
  - Emphasizes the “Easiness of Compiler Implementaion” of D Language, which leads to…
    - Ultra-fast compilation time
    - Easiness for implementation of other tools
      - Syntax Hilighting
      - Code Completion
      - Refactoring tools

Why D?

Why D?

- □ What’s different from C/C++/Java/C#?
  - Powerful Built-in Arrays and Strings
  - Built-in Complex Numbers
  - ‘with’ statement
  - Nested Functions and Delegates
  - Mix-in
  - RAII, Contract Programming, Unittest

Array Slice, Concat, …

```
char[] s = “Hello”;
char[] t = s[1..3];  // “el”
char[] u = s ~ t;    // “Helloel”
u[4..$] = ‘_’;       // “Hell___”
```

Switch by Strings

```
int main( char[][] args )
{
  foreach( char[] arg ; args )
    switch( arg )
    {
    case “-h”:
    case “–help”: ... break;
    case “-i”:    ... break;
    default:      ... break;
    }
}
```

Built-in Associative Arrays

```
long[char[]] pfx;

pfx[“Kilo”] =              1_000;
pfx[“Mega”] =          1_000_000;
pfx[“Giga”] =      1_000_000_000;
pfx[“Tera”] = 1_000_000_000_000;

if( !(“Peta” in pfx) )
  pfx[“Peta”] = pfx[“Tera”]*1000;
```

‘with’ statement

```
with(dout)
{
  writefln(“Hello”);
  writefln(“World”);
}
```

Nested Function

```
void f()
{
   int x=0;
   void g() { ++x; }
   g(); g(); g();
}
```

Delegates

```
OutputStream delegate(...) p =
  &dout.writefln;

p(“Hello”);
p(100);
p(-5.3+4i);
```

Anonymous Delegates

```
void loop(int n, void delegate() s)
{
  for(int i=0; i<n; ++i)
    s();
}

loop( 10,
  delegate{dout.writefln(“Hi!”);} );
```

Anonymous Delegates

```
void loop(int n,
          void delegate(int i) s)
{
  for(int i=0; i<n; ++i)
    s(i);
}

int x=0;
loop( 10, delegate(int i){x+=i;} );
```

Mix-in

```
template Debug() {
  void whoAmI() {
    TypeInfo t = typeid(typeof(this));
    dout.writefln( t, “ – “, this );
  }
}

class Dog {
  mixin Debug!();
  char[] toString() {
}
```

```
Dog d = new Dog(“Pochi”);

d.whoAmI(); //Dog – Pochi
```

Contract Programming

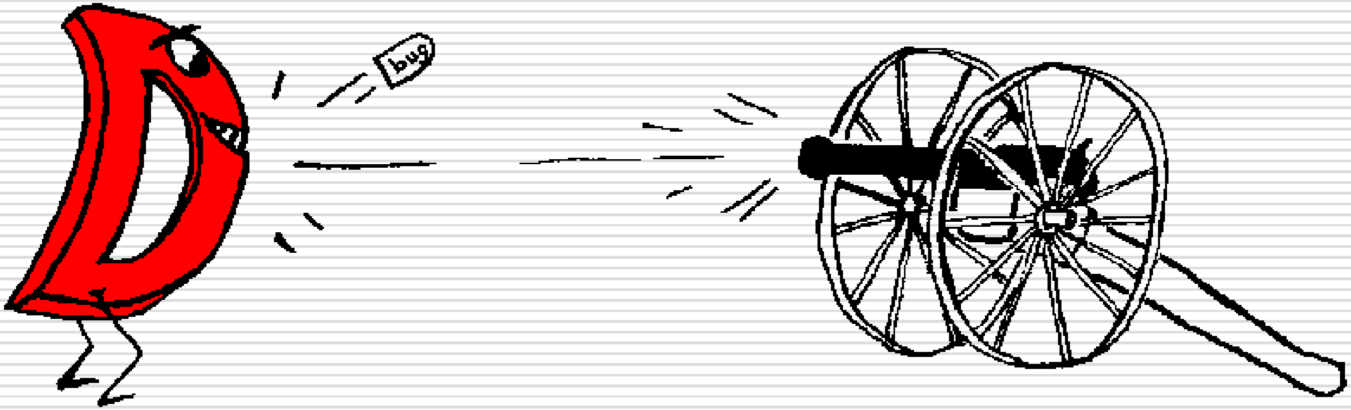
```
double sqrt( double x )
  in
    { assert( x>=0 ); }
  out(r)
    { assert( abs(r*r-x)<0.0001 ); }
  body
    {
      ...
    }
```

Builtin Unittests

```
char toUpper( char c ) {
  return ‘a’<=c && c<=‘z’
             ? c-’a’+’A’ : c;
}

unittest {
  assert( toUpper(‘a’) == ‘A’ )
  assert( toUpper(‘T’) == ‘T’ )
}
```

Where is D used?



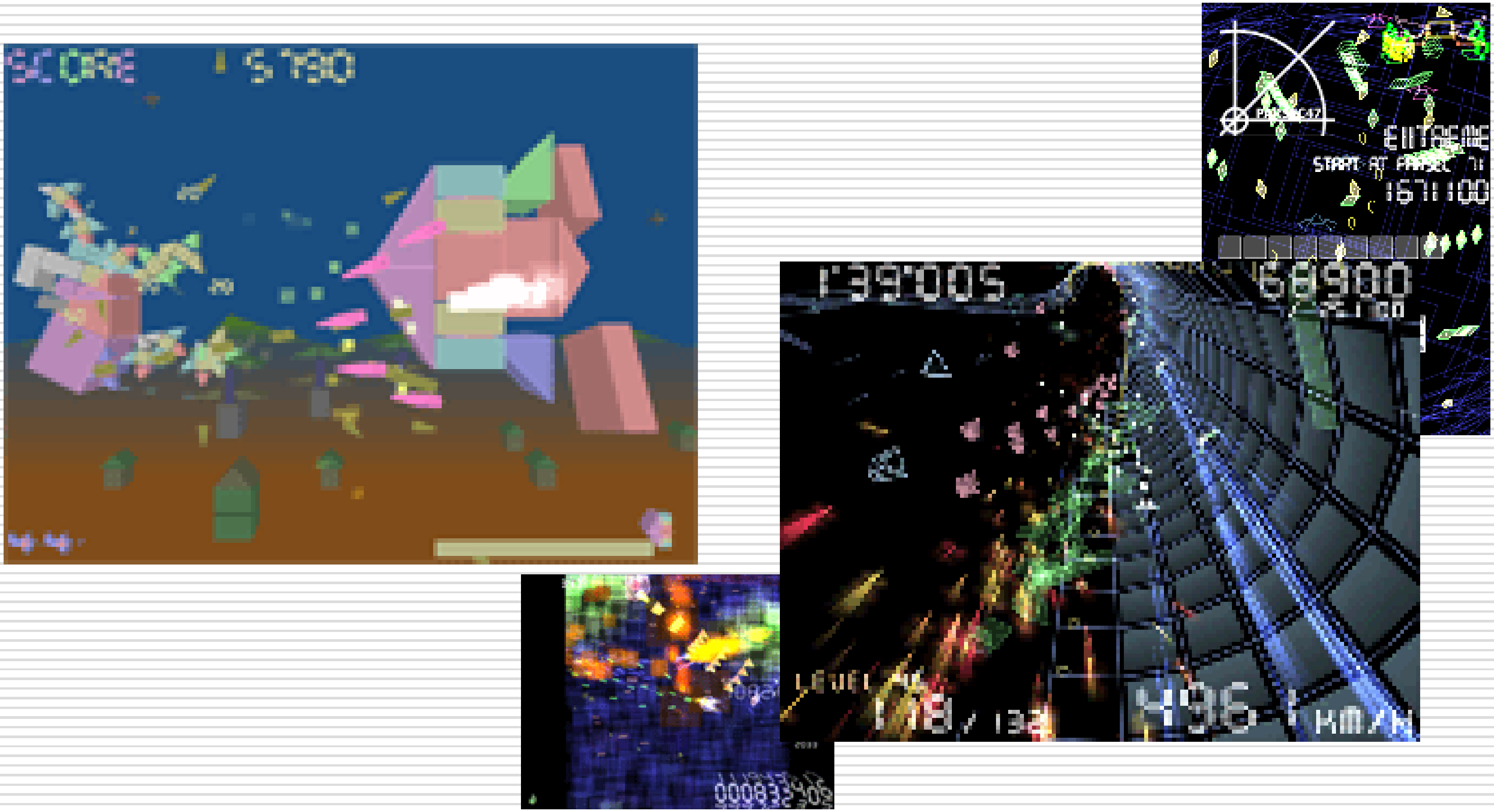
Where is D used?

- Supported Systems
  - DMD – Digital Mars D Compiler
    - Windows, Linux on x86
  - GDC – GNU D Compiler
    - Linux, FreeBSD, MacOSX, Cygwin, AIX, ...

Where is D used?

- Applications written in D
  - Games!
  - Demos!
    - SDL (Simple DirectMedia Layer)

ABA



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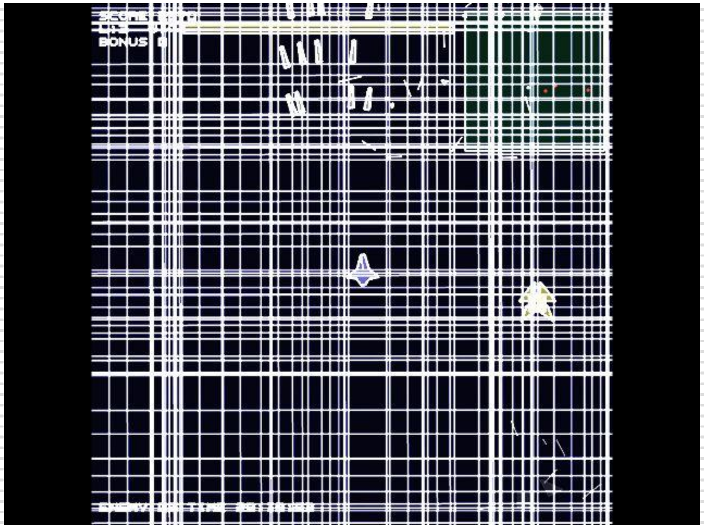
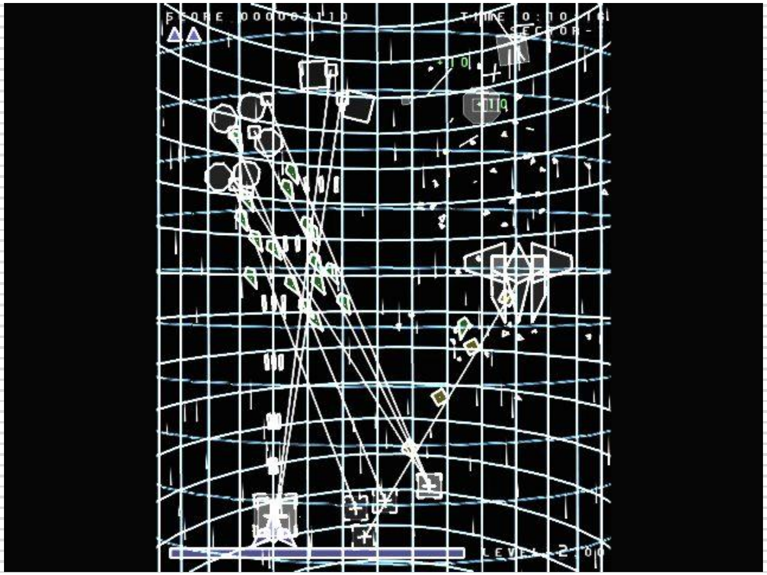
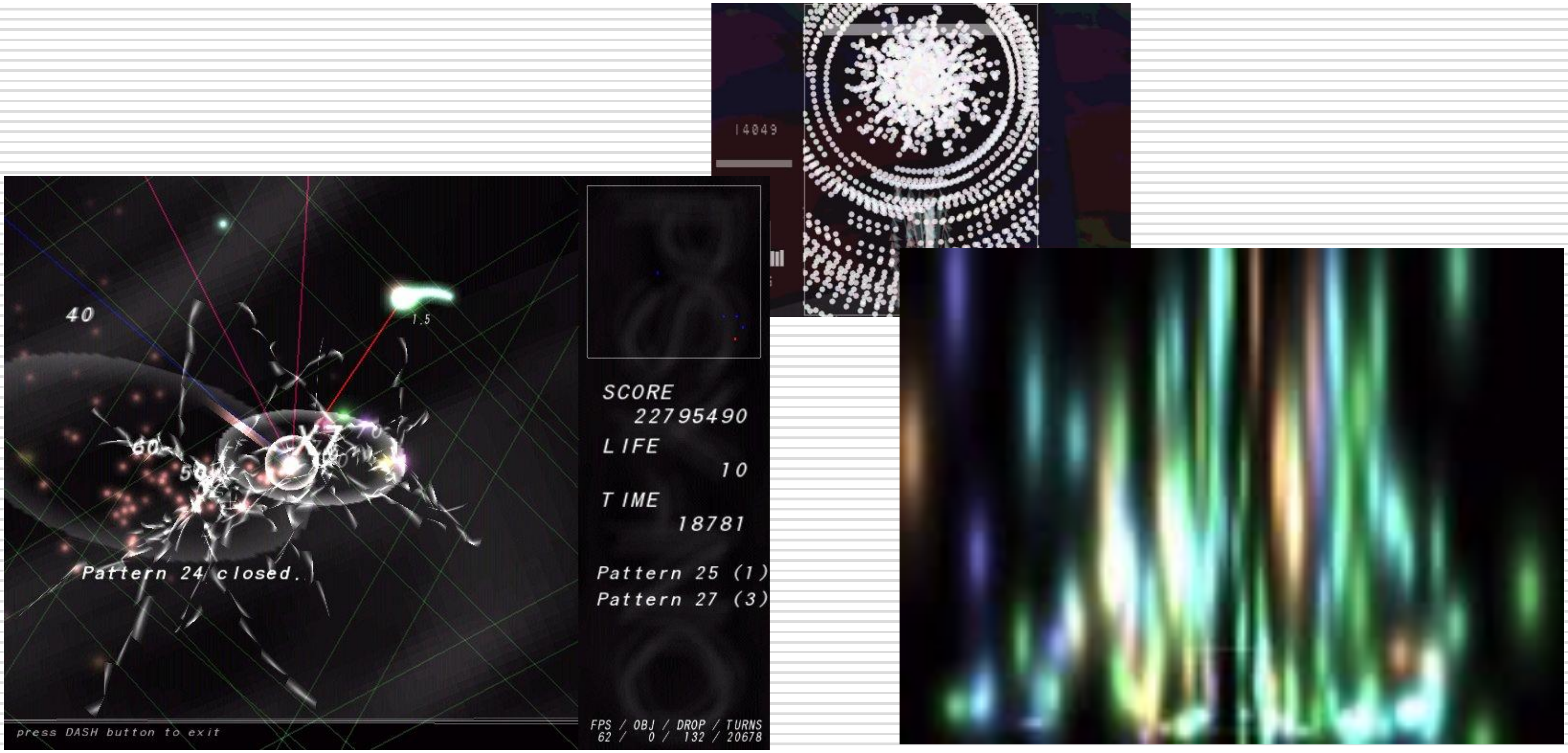




shinichiro.h



Pattern 24 closed.

press DASH button to exit

SCORE 22795490
LIFE 10
TIME 18781

Pattern 25 (1)
Pattern 27 (3)

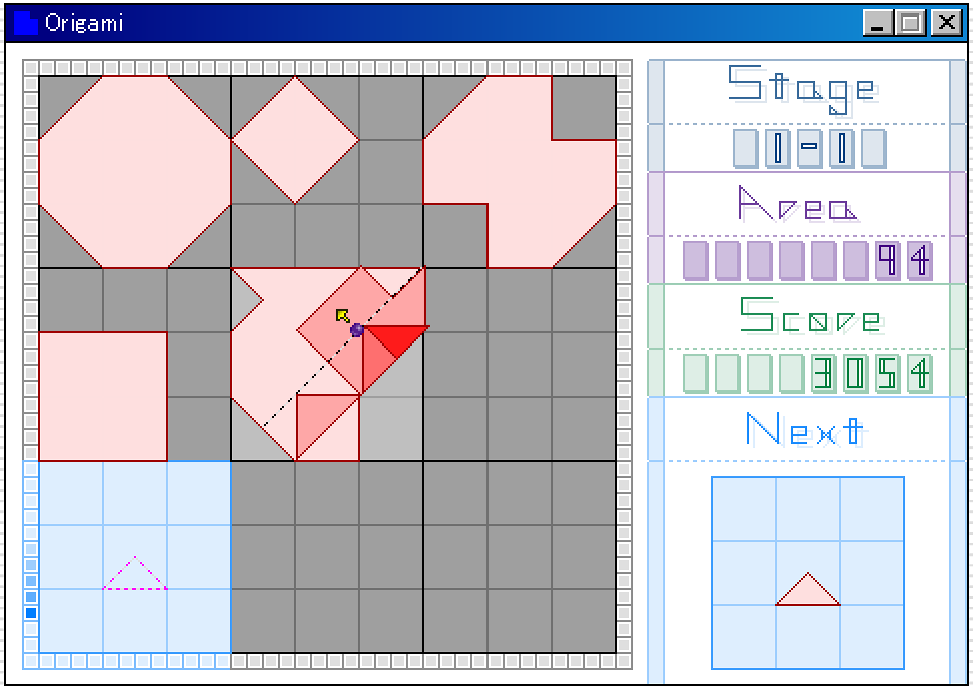
```
FPS / OBJ / DROP / TURNS
 62 /   0 /  132 / 20678
```

yaneurao

3978470, 3978470

nekokaneko

Blacker

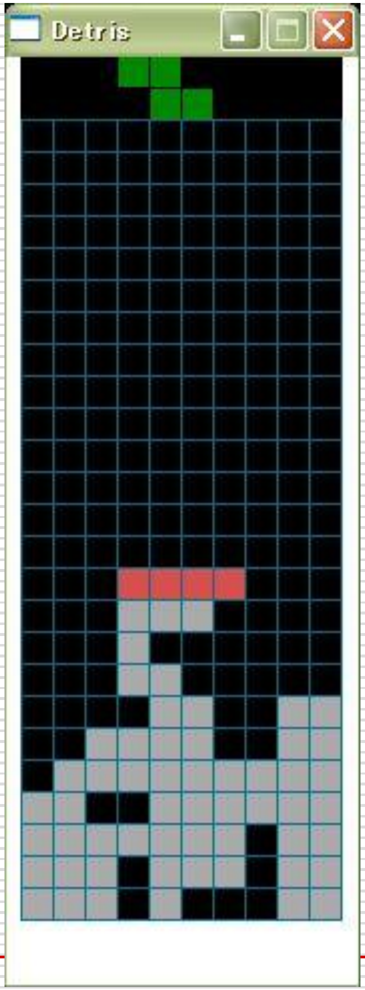


Stage 1-1

Area 94

Score 3054

Next



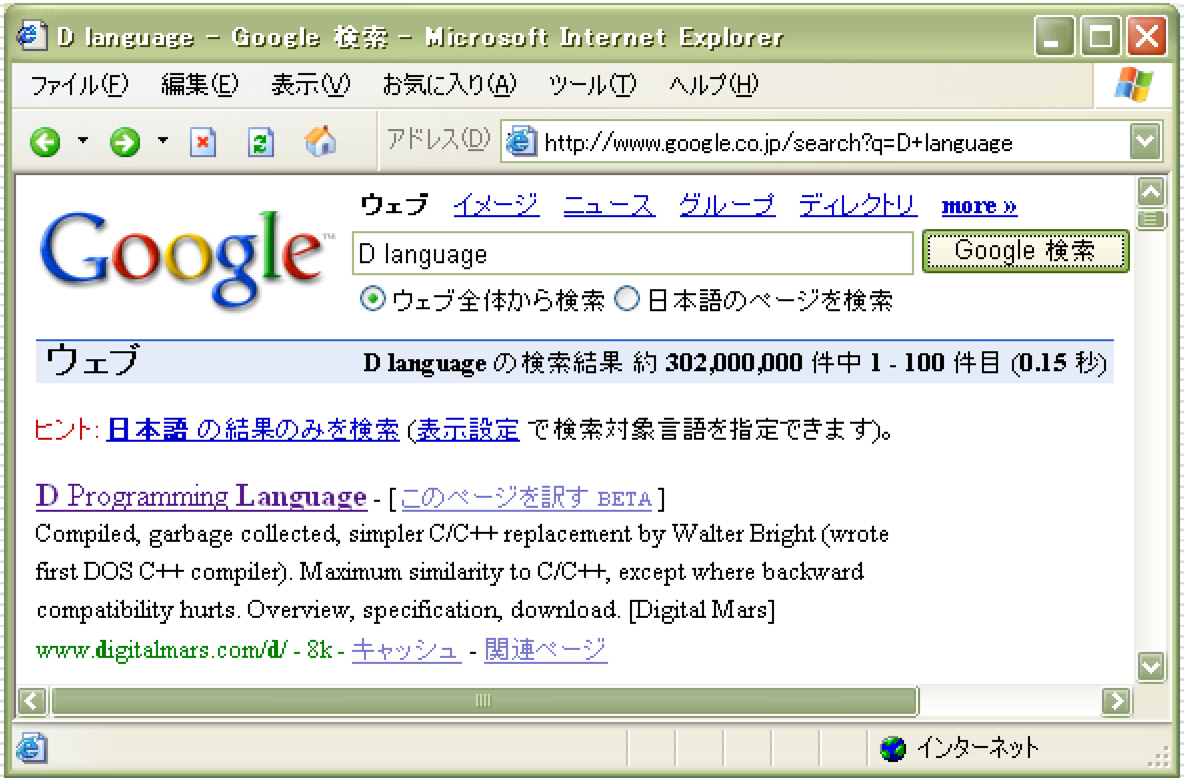
Where is D used?

- Other Applications written in D
  - akIDE
    - An IDE targetting D and written in D
  - attoHttpd
    - Simple Http Server
  - delmail
    - Spam-mail killer
  - Diki
    - Simple wiki engine
  - DMDScript
    - ECMAScript intepreter

How to get D?

How to get D?

- Just Google it! ☺


D language - Google 検索 - Microsoft Internet Explorer
ファイル(F) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H)
アドレス(D) http://www.google.co.jp/search?q=D+language
ウェブ イメージ ニュース グループ ディレクトリ more »
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インターネット

D language

◉ ウェブ全体から検索 ○ 日本語のページを検索

ウェブ **D language** の検索結果 約 **302,000,000** 件中 **1** - **100** 件目 (**0.15** 秒)

ヒント: 日本語 の結果のみを検索 (表示設定 で検索対象言語を指定できます)。

D Programming Language - [このページを訳す BETA]
Compiled, garbage collected, simpler C/C++ replacement by Walter Bright (wrote first DOS C++ compiler). Maximum similarity to C/C++, except where backward compatibility hurts. Overview, specification, download. [Digital Mars]
www.digitalmars.com/**d**/ - 8k - キャッシュ - 関連ページ

How to get D?

- Or, use package systems
  - FreeBSD: /usr/ports/lang/gdc
  - Cygwin: Devel >> gcc-gdc

Thank you for listening!