Objects and Classes

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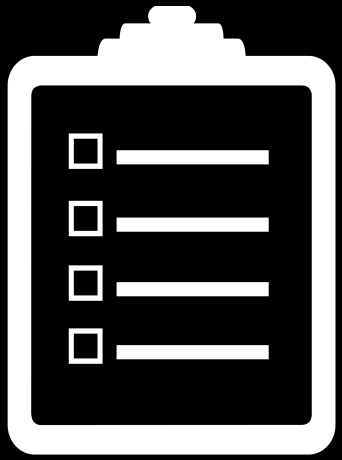
Game Plan



Recap

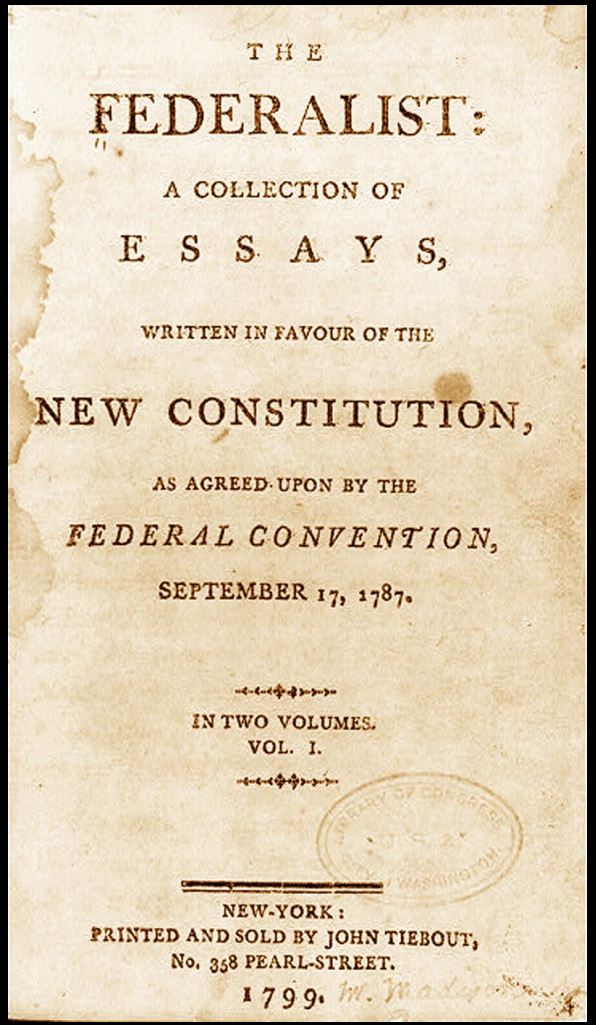
Representing Complicated Types

Classes

Structs

Announcement

Recap



THE

FEDERALIST:

A COLLECTION OF

ESSAYS,

WRITTEN IN FAVOUR OF THE

NEW CONSTITUTION,

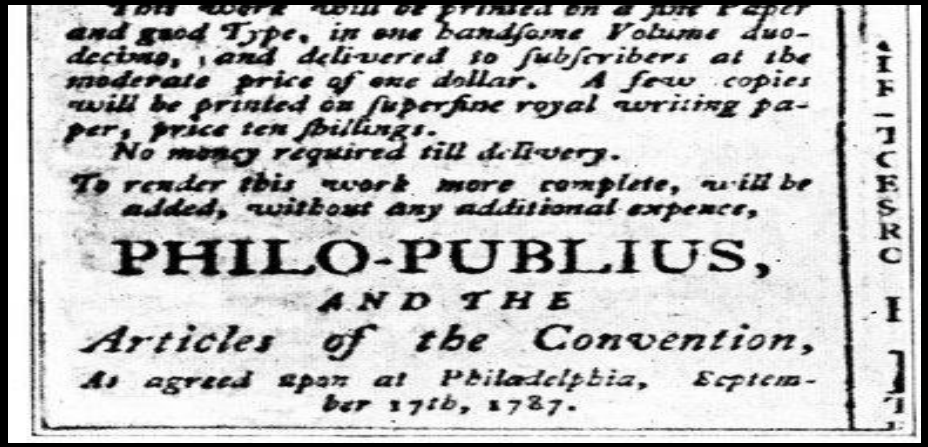
AS AGREED UPON BY THE

FEDERAL CONVENTION,

SEPTEMBER 17, 1787.

IN TWO VOLUMES.
VOL. I.

NEW-YORK:
PRINTED AND SOLD BY JOHN TIEBOUT,
No. 358 PEARL-STREET.
1799.



and good Type, in one handſome Volume duodecimo, and delivered to ſubſcribers at the moderate price of one dollar. A few copies will be printed on ſuperfine royal writing paper, price ten ſhillings.

No money required till delivery.

To render this work more complete, will be added, without any additional expence,

PHILO-PUBLIUS,

AND THE

Articles of the Convention,

As agreed upon at Philadelphia, September 17th, 1787.

The FŒDERALIST, No. 10.

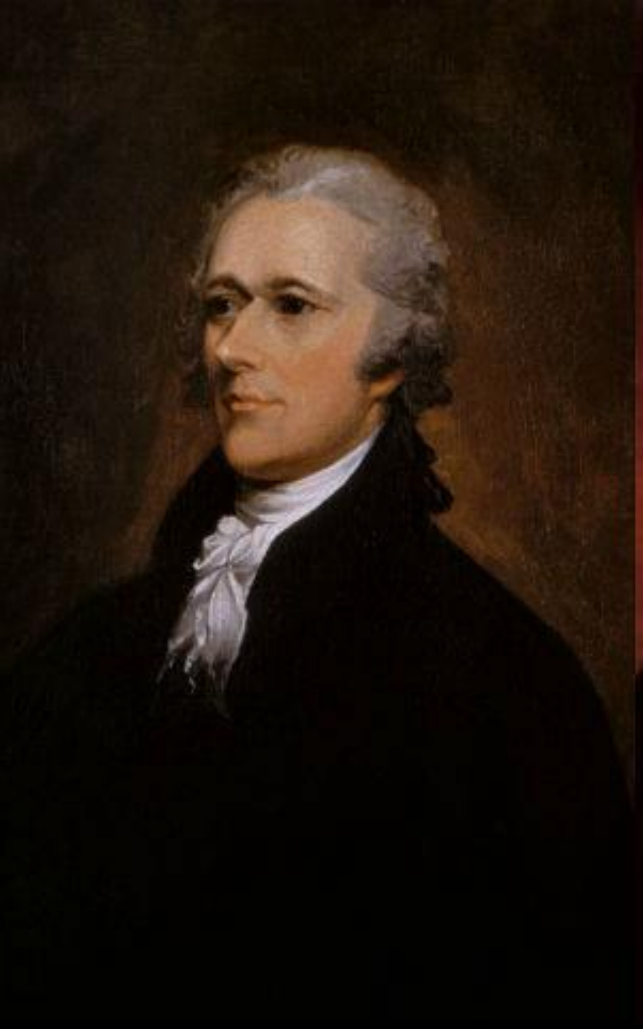
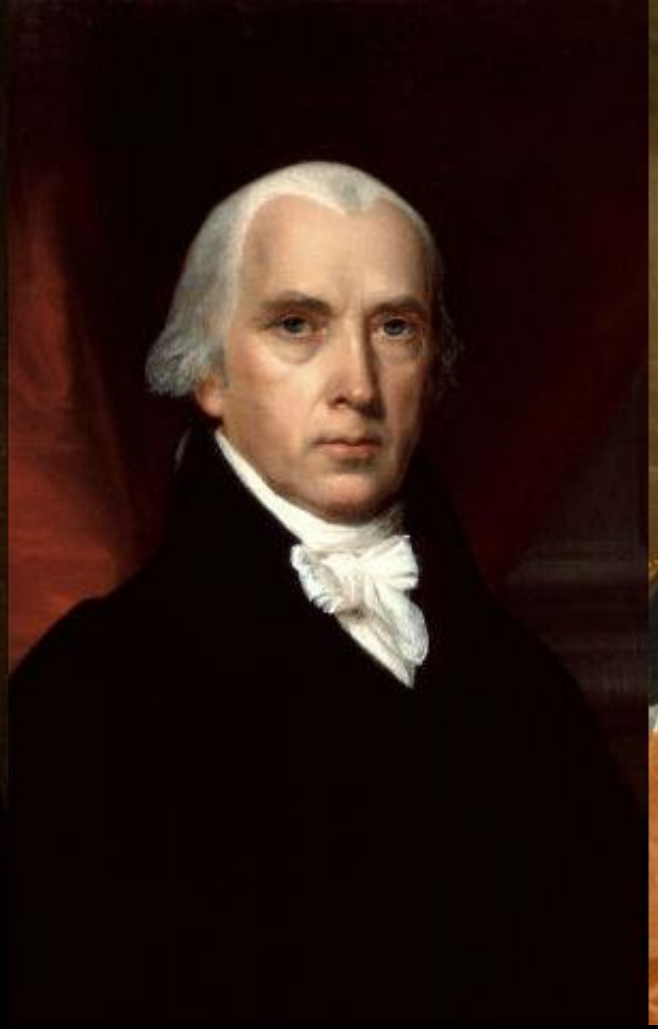
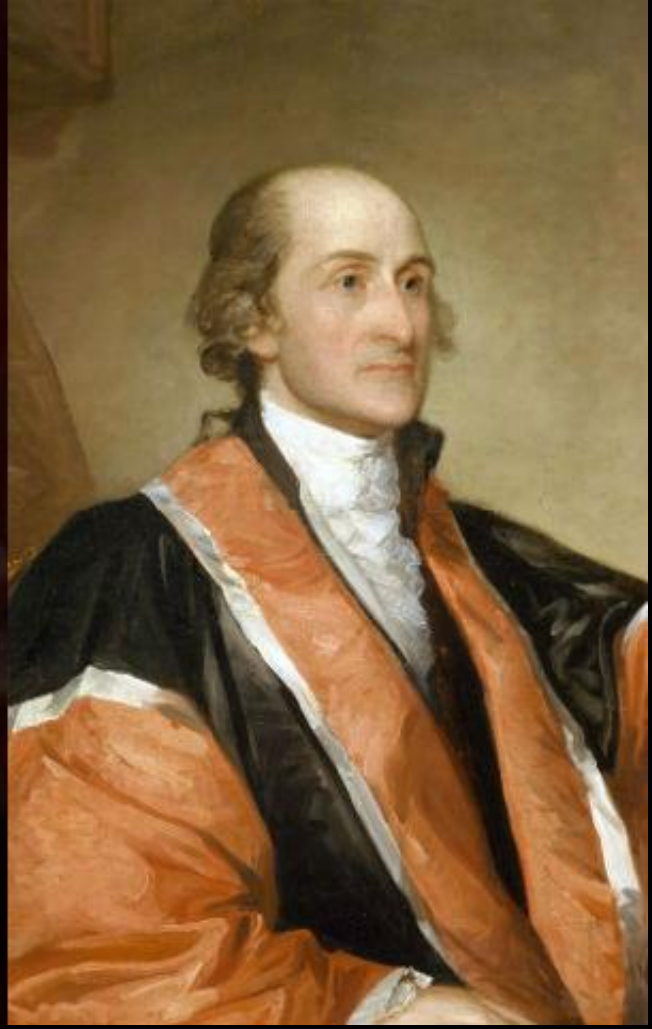
To the People of the State of New-York.

AMONG the numerous advantages promiſed by a well conſtructed Union, none deſerves to be more accurately developed than its tendency to break and control the violence of faction. The friend of popular governments, never finds himſelf ſo much alarmed for their character and fate, as when he contemplates their propenſity to this dangerous vice. He will not fail therefore to ſet a due value on any plan which, without violating the principles to which he is attached, provides a proper cure for it. The inſtability, injuſtice and confuſion introduced into the public councils, have in truth been the mortal diſeaſes under which popular governments have every where periſhed; as they continue to be the favorite and fruitful topics from which the adverſaries to liberty derive their moſt ſpecious declamations. The valuable improvements made by the American Conſtitutions on the popular models, both ancient and modern, cannot certainly

The influence of factious leaders may kindle a flame within their particular States, but will be unable to ſpread a general conflagration through the other States: A religious ſect, may degenerate into a political faction in a part of the confederacy; but the variety of ſects diſperſed over the entire face of it, muſt ſecure the national Councils againſt any danger from that ſource: A rage for paper money, for an abolition of debts, for an equal diviſion of property, or for any other improper or wicked project, will be leſs apt to pervade the whole body of the Union, than a particular member of it; in the ſame proportion as ſuch a malady is more likely to taint a particular county or diſtrict, than an entire State.

In the extent and proper ſtructure of the Union, therefore, we behold a republican remedy for the diſeaſes moſt incident to republican Government. And according to the degree of pleaſure and pride, we feel in being Republicans, ought to be our zeal in cheriſhing the ſpirit and ſupporting the character of Fœderaliſts.

PUBLIUS.

The Idea

Let’s imagine our language only has 3 function words:

`[I, the, there]`

Deep into that darkness peering, long I stood there, wondering, fearing, doubting, dreaming dreams no mortal ever dared to dream before.

- Edgar Allan Poe

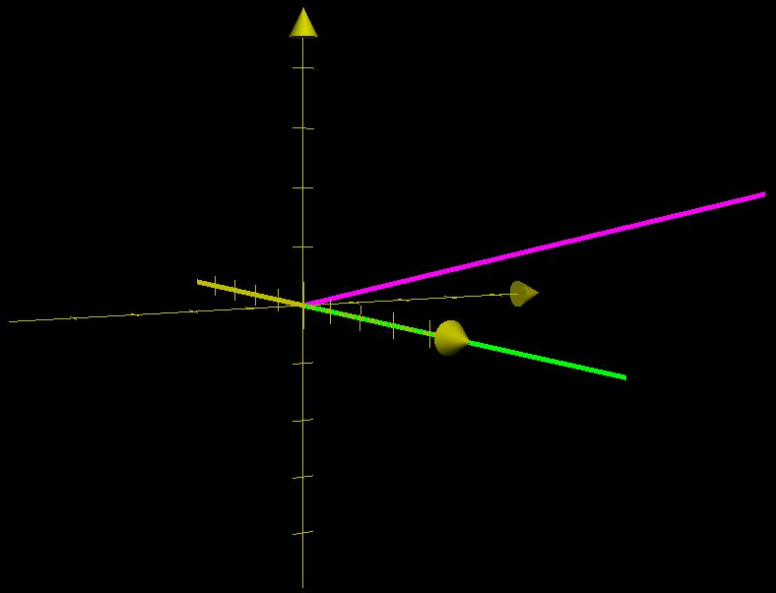
I first met Dean not long after my wife and I split up. I had just gotten over a serious illness that I won’t bother to talk about, except that it had something to do with the miserably weary split-up and my feeling that everything there was dead.

- Jack Kerouac

The Idea

```
[ 1 ,  0 ,  0 ]
```

```
[ 4 ,  1 ,  1 ]
```



The Idea

```
[ 1 ,  0 ,  0 ]
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[ 4 ,  1 ,  1 ]
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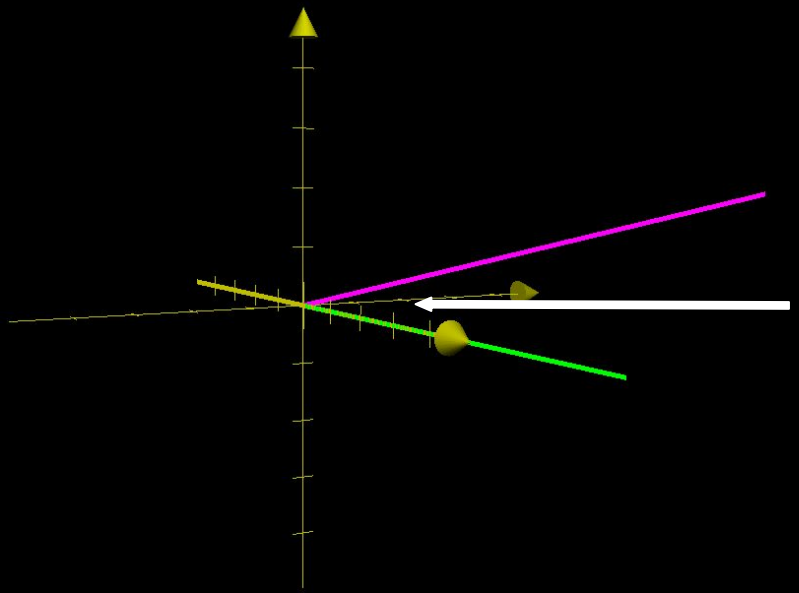
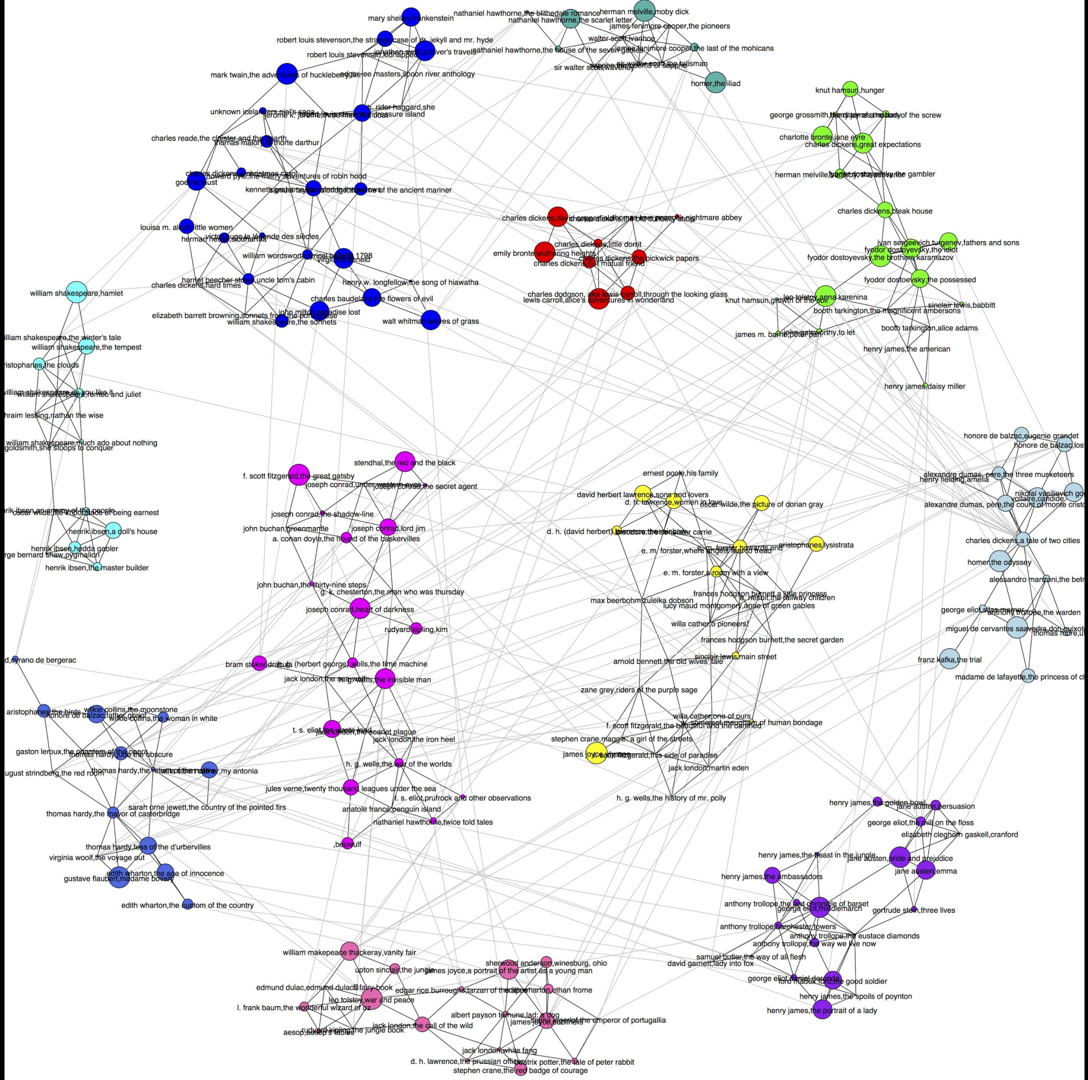


The closer this angle, the more similar the texts



mary shelley,frankenstein
robert louis stevenson,the strange case of dr. jekyll and mr. hyde
mark twain,the adventures of huckleberry finn
edgar lee masters,spoon river anthology
charles reade,the cloister and the hearth
goethe,faust
louisa m. alcott,little women
victor hugo,la légende des siècles
harriet beecher stowe,uncle tom's cabin
charles dickens,hard times
henry w. longfellow,the song of hiawatha
charles baudelaire,the flowers of evil
elizabeth barrett browning,sonnets from the portuguese
william shakespeare,the sonnets
walt whitman,leaves of grass
john milton,paradise lost
nathaniel hawthorne,the blithedale romance
nathaniel hawthorne,the scarlet letter
herman melville,moby dick
james fenimore cooper,the pioneers
walter scott,ivanhoe
james fenimore cooper,the last of the mohicans
nathaniel hawthorne,the house of the seven gables
homer,the iliad
knut hamsun,hunger
charlotte bronte,jane eyre
charles dickens,great expectations
charles dickens,bleak house
ivan sergeevich turgenev,fathers and sons
fyodor dostoyevsky,the idiot
fyodor dostoyevsky,the brothers karamazov
fyodor dostoevsky,the possessed
sinclair lewis,babbitt
booth tarkington,the magnificent ambersons
booth tarkington,alice adams
henry james,the american
henry james,daisy miller
charles dickens,little dorrit
emily bronte,wuthering heights
charles dickens,the pickwick papers
charles dickens,our mutual friend
lewis carroll,through the looking glass
lewis carroll,alice's adventures in wonderland
william shakespeare,hamlet
william shakespeare,the winter's tale
william shakespeare,the tempest
william shakespeare,much ado about nothing
henrik ibsen,a doll's house
henrik ibsen,hedda gabler
henrik ibsen,the master builder
stendhal,the red and the black
f. scott fitzgerald,the great gatsby
joseph conrad,the secret agent
joseph conrad,the shadow-line
john buchan,greenmantle
joseph conrad,lord jim
a. conan doyle,the hound of the baskervilles
john buchan,the thirty-nine steps
g. k. chesterton,the man who was thursday
joseph conrad,heart of darkness
rudyard kipling,kim
h. g. wells,the invisible man
jack london,the iron heel
h. g. wells,the war of the worlds
jules verne,twenty thousand leagues under the sea
t. s. eliot,prufrock and other observations
anatole france,penguin island
nathaniel hawthorne,twice told tales
,beowulf
ernest poole,his family
david herbert lawrence,sons and lovers
oscar wilde,the picture of dorian gray
aristophanes,lysistrata
e. m. forster,a room with a view
max beerbohm,zuleika dobson
lucy maud montgomery,anne of green gables
willa cather,o pioneers!
frances hodgson burnett,the secret garden
sinclair lewis,main street
arnold bennett,the old wives' tale
zane grey,riders of the purple sage
willa cather,one of ours
stephen crane,maggie: a girl of the streets
jack london,martin eden
h. g. wells,the history of mr. polly
honore de balzac,eugenie grandet
alexandre dumas, pere,the three musketeers
henry fielding,amelia
alexandre dumas, pere,the count of monte cristo
charles dickens,a tale of two cities
homer,the odyssey
anthony trollope,the warden
franz kafka,the trial
wilkie collins,the moonstone
wilkie collins,the woman in white
thomas hardy,the mayor of casterbridge
sarah orne jewett,the country of the pointed firs
thomas hardy,tess of the d'urbervilles
virginia woolf,the voyage out
edith wharton,the age of innocence
gustave flaubert,madame bovary
edith wharton,the custom of the country
henry james,the golden bowl
jane austen,persuasion
george eliot,the mill on the floss
elizabeth cleghorn gaskell,cranford
henry james,the beast in the jungle
jane austen,pride and prejudice
henry james,the ambassadors
jane austen,emma
anthony trollope,the last chronicle of barset
george eliot,middlemarch
gertrude stein,three lives
anthony trollope,barchester towers
anthony trollope,the eustace diamonds
anthony trollope,the way we live now
samuel butler,the way of all flesh
david garnett,lady into fox
henry james,the spoils of poynton
henry james,the portrait of a lady
william makepeace thackeray,vanity fair
sherwood anderson,winesburg, ohio
upton sinclair,the jungle
james joyce,a portrait of the artist as a young man
leo tolstoy,war and peace
l. frank baum,the wonderful wizard of oz
jack london,the call of the wild
jack london,white fang
stephen crane,the red badge of courage

Designing Axess

Designing Axess

A database of students.

What makes up a student?

- They have a name
- They have a SUID
- They have taken a certain number of units

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- They have taken a certain number of units

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What makes up a student?

- They have a name (string)
- They have a SUID (string)
- They have taken a certain number of units (int)

Designing Axess

A database of students.

What makes up a student?

How can we capture this in code?

- They have a name (string)
- They have a SUID (string)
- They have taken a certain number of units (int)

A First Idea

A First Idea

```
struct Student {
    std::string name;
    std::string suid;
    int unitsTaken;
};
```

A First Idea

What are the issues with using just structs?

- Public access to all internal state data.
- Users of struct need to explicitly initialize each data member.
- In short: not one neat package of an object

A First Idea

What are the issues with using just structs?

- Public access to all internal state data.
- Users of struct need to explicitly initialize each data member.
- In short: not one neat package of an object

There must be a better way!

A First Idea

“A struct simply feels like an open pile of bits with very little in the way of encapsulation or functionality. A class feels like a living and responsible member of society with intelligent services, a strong encapsulation barrier, and a well defined interface”

- *Bjarne Stroustrup*

Classes

Objects

We use objects all the time (string, vector etc.)

Objects encapsulate behaviour

Classes allow you to define your own type as if it were built into C++

Classes

We want to be able to use Student like a built-in type.

C++ lets the programer do this!

But first, some design...

Classes

Public interface:

- Get name, suid, and number of units
- Get class year (based on units)
- Check if international/local student

Classes

We are going to break the class up between the interface (Student.h) and implementation (Student.cpp):

StudentClass
(StudentClass.`pro`)

Structs vs Classes

Members of a struct by default public

Member of a class are by default private

```
struct Student {
    std::string name;
    std::string suid;
    int unitsTaken;
};
```

```
class Student {
public:
    std::string name;
    std::string suid;
    int unitsTaken;
};
```

Structs vs Classes

Members of a struct by default public

Member of a class are by default private

```
class Student {
    std::string name;
    std::string suid;
    int unitsTaken;
};
```

```
class Student {
private:
    std::string name;
    std::string suid;
    int unitsTaken;
};
```

Scope Resolution

There was a lot of `std::` and `Student::` in our code

Why?

Namespaces

The standard library uses common names

- string
- max
- count

It is easy for libraries to conflict in their names

NamespaceClash
(NamespaceClash.`pro`)

Namespaces

Most modern languages use namespaces to fix this

Namespaces (Python)

Most modern languages use namespaces to fix this

```
# Generate a random number in Python
import random

print random.random()
```

Namespaces (JavaScript)

Most modern languages use namespaces to fix this

```
# Read file in JavaScript
const fs = require('fs');

const data = fs.readFileSync('file.txt')
```

Namespaces (C++)

Most modern languages use namespaces to fix this

```
# Generate a random number in Python
```

```
#include <algorithm>

std::count(v.begin(), v.end(), 5);
```

Questions

Classes

Now we have a usable Student class.

Let’s now represent the database!

```
vector<Student> database;
```

Classes

Now we have a usable Student class.

Let’s now represent the database!

~~`vector<Student> database;`~~

Classes

Now we have a usable Student class.

Let’s now represent the database!

```
Database db;
```

Classes

The `Database` class will internally have a vector of `Student`

Public interface:

- Add student to database
- Check if student is in database
- Get students in a single year

Classes

Example:

StudentClass
(StudentClass.pro)

Classes - Issues

C++ doesn’t know how to use operators on types defined by us:

- We can tell it how to via operator overloading.

An algorithm needed a function that could capture a local variable

- More about this next time.