Lecture 38: Structures

Announcements and reminders

- Project 3 due Wednesday 24 April at 11 PM

- I'm gone Monday - Thursday next week for a conference
  - **Extra office hour:** Monday 9-9:50 (T-Th office hours
  - Available by Piazza/email
  - **TA Karthik** will cover lecture:
    - **Mon:** VScode/coding.csel.io/Python
    - **Wed:** Practicum 3 review

Last time on *Intro Computing…*

Command line arguments just happened!

- How we can supply arguments to our program directly
- No user-supplied values while the function is running
- Instead, give the values ***before*** the function executes
- **Great for automating code execution!**

Some encryption/decryption just happened too!

- Great for not getting murdered by your Roman friends!

Structures

A C++ **structure** is like a way to store data of different types that is all associated with a particular object.

1) All data members are public (by default)
2) Structures generally do not have member functions

We can define a structure using the **struct** reserved word similarly to how we define a class:

```
struct StreetAddress
{
    int house_number;
    string street_name;
};
```

Structures

Now we have the **StreetAddress** data type and
can declare a **StreetAddress** variable in the usual way:

```
StreetAddress engCenter;
```

We use the *dot* notation to access/mutate the
StreetAddress data **members**:

```
engCenter.house_number = 1111;
engCenter.street_name = “Engineering Drive”;
```

Structures -- *why?*

Arrays -- We use arrays to organize **data of a similar type** that belong to **different objects**

Structures -- We use structs to organize **data of different types** that all belong to **the same object**

Example: junk mail

Write a program that reads in two files: a **template** and a **database**. The template file contains text and tags. The tags have the form |1| |2| |3|… and need to be replaced with the first, second, third, … field in the current database record. Your program should print out copies of the template with the tag fields replaced with database entries.

Example: junk mail

A typical database looks like this:

```
Mr.|Harry|Morgan|1105 Torre Ave.|Cupertino|CA|95014
Dr.|John|Lee|702 Ninth Street Apt. 4|San Jose|CA|95109
Miss|Evelyn|Garcia|1101 S. University Place|Ann Arbor|MI|48105
Hon.|Telly|Umada|123 Sesame St.|Nederland|CO|80466
```

And here is a typical template:

```
To:
|1| |2| |3|
|4|
|5|, |6| |7|
Dear |1| |3|:
You and the |3| family may be the lucky winners of $10,000,000 in
the C++ Compiler Clearinghouse sweepstakes! . . .
```

Example: junk mail

And here is a typical template:

```
To:
|1| |2| |3|
|4|
|5|, |6| |7|
Dear |1| |3|:
You and the |3| family may
be the lucky winners of
$10,000,000 in the C++
Compiler Clearinghouse
sweepstakes! . . .
```

And here is what we would want the output email to look like:

```
To:
Hon. Telly Umada
123 Sesame St.
Nederland, CO 80466
Dear Hon. Umada:
You and the Umada family may
be the lucky winners of
$10,000,000 in the C++
Compiler Clearinghouse
sweepstakes! ...
```

What just happened?!

Structures just happened!

- A way to group together ***different types of data*** that are all associated with the ***same object***

… then, we took this cool new skill and used it for ***evil***.