CS 225

#9: Templates and Linked Memory

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Why Polymorphism? Suppose you're managing an animal shelter that adopts cats and dogs:

Option 1 – No Inheritance

animalShelter.cpp

```
1  Cat & AnimalShelter::adopt() { ... }
2  Dog & AnimalShelter::adopt() { ... }
3  ...
```

Option 2 – Inheritance

animalShelter.cpp

```
1  Animal & AnimalShelter::adopt() { ... }
```

Abstract Class:

1. [Requirement]:
2. [Syntax]:
3. [As a result]:

Note about destructors:

Abstract Data Types (ADT):

List ADT - Purpose	Function Definition

List Implementation

What types of List do we want?

Templated Functions:

functionTemplate1.cpp

```
1
2
3  T maximum(T a, T b) {
4    T result;
5    result = (a > b) ? a : b;
6    return result;
7  }
```

Templated Classes:

List.h

```
1  #pragma once
2
3
4  class List {
5    public:
6
7
8
9
10
11
12   private:
13
14
15 };
```

List.hpp

```
1
2
3
4
5
```

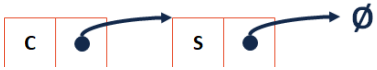
Two Basic Implementations of List:

1.
2.

Linked Memory:

List.h

```
28  class ListNode {
29    T & data;
30    ListNode * next;
31    ListNode(T & data) : data(data), next(NULL) { }
32  };
```



Coding with Linked Lists: Examples

List.h

```
 1  #pragma once
 2
 3  template <typename T>
 4  class List {
 5    public:
 6       /* ... */
 …
28    private:
29      class ListNode {
30        T & data;
31        ListNode * next;
32        ListNode(T & data) : data(data), next(NULL) { }
33      };
34
35
36
37
38
39  };
```

List.hpp

```
 9  #include "List.h"
10
11  template <typename T>
12  void List<T>::insertAtFront(T & t) {
13
14
15
16
17
18
19
20  }
25  template <typename T>
26  void List<T>::printReverse() const {
27
28
29  }
30
31
32
33
34
35
39  template <typename T>
40  T List<T>::operator[](unsigned index) {
41
42
43
44  }
 …
48  template <typename T>
49  typename List<T>::ListNode *
    List<T>::_index(unsigned index) {
50
51
52
53
54
55
56  }
```

CS 225 – Things To Be Doing:

1. Programming Exam A starts Feb. 14 (10 days from now)
2. MP2 due Feb. 11 (7 days), EC deadline is tonight!
3. Lab Extra Credit → Attendance in your registered lab section!
4. Daily POTDs