

CS 225

Data Structures

Feb. 5 – Templates and Linked Memory
Wade Fagen-Ulmschneider



Abstract Data Type



List ADT

What types of “stuff” do we want in our list?

--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--

--	--	--	--	--	--	--	--



Templates

template1.cpp

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

List.h

```
1 #ifndef LIST_H_
2 #define LIST_H_
3
4
5
6 class List {
7     public:
8
9
10
11
12
13
14
15
16     private:
17
18
19
20 };
21
22 #endif
```

List.cpp

```
1
2
3
4
5
6
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9
10
11
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14
15
16
17
18
19
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21
22
```

List Implementations

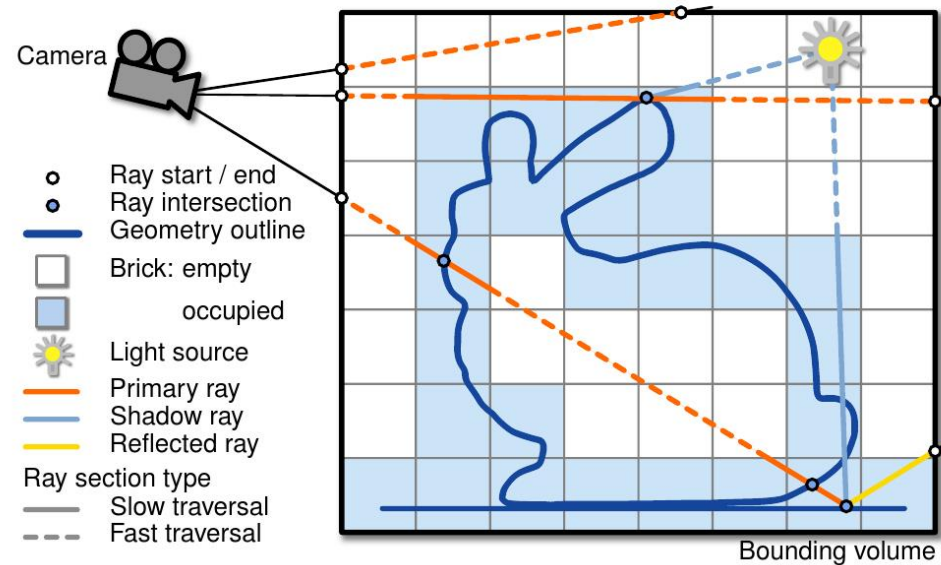
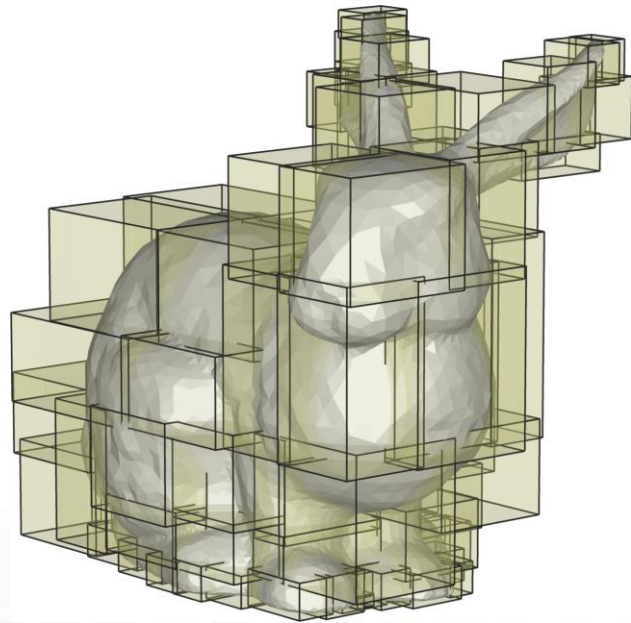
1.

2.

Geometric Data Structures for Computer Graphics

Eric Shaffer

CS 296: Honors Section for CS 225



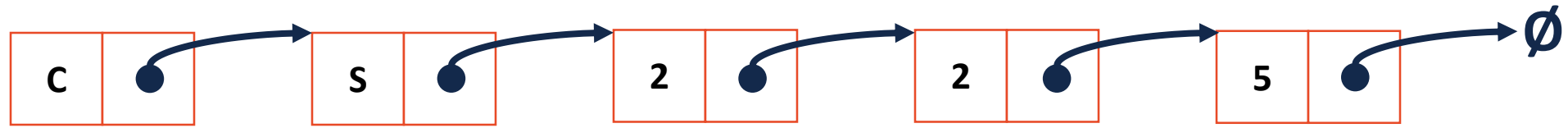
Thursday 5-6pm 1404 Siebel Center

Starts Feb. 8

Meetings will be available on video

<https://courses.engr.illinois.edu/cs225/sp2018/honors/>

Linked Memory



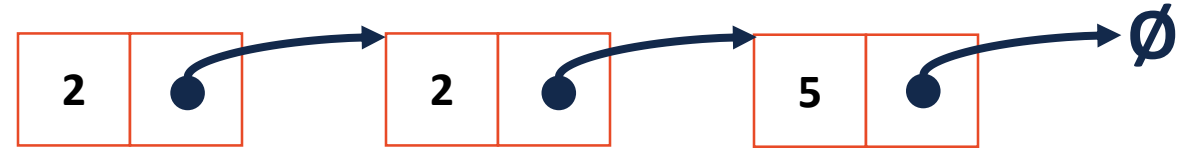
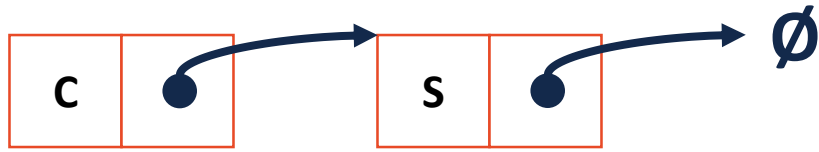
List.h

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

Linked Memory



Linked Memory



List.h

```
1 #ifndef LIST_H
2 #define LIST_H
3
4 template <class T>
5 class List {
6     public:
7     ...     /* ... */
8
9     private:
10    class ListNode {
11        T & data;
12        ListNode * next;
13        ListNode(T & data) :
14            data(data), next(NULL) { }
15
16    };
17
18 };
19
20 #endif
```

List.cpp

```
1 #include "List.h"
2
3 template <class T>
4 void List::insertAtFront(const T& t) {
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22 }
```

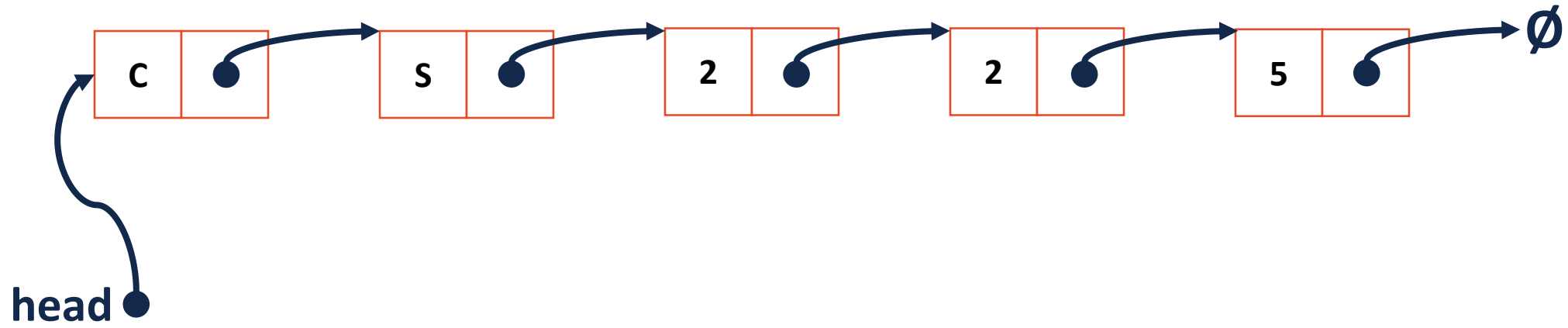
Running Time of Linked List `insertAtFront`

List.cpp

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96
97
98
99

```
14 void List::printReverse() const {  
15  
16  
17  
18  
19  
20  
21  
22 }
```


Linked Memory



Running Time of Linked List `printReverse`

```
24 template <typename T>
25 T List::operator[](unsigned index) {
26
27
28
29
30
31 }
```

```
33 ListNode *& List::_index(int index) const {  
34  
35  
36  
37  
38  
39  
40 }
```

CS 225 – Things To Be Doing

1. Programming Exam A starts Feb. 13 (*a week from tomorrow*)
2. MP2 due Feb. 12 (7 days), EC deadline is tonight!
3. Lab Extra Credit → Attendance in your registered lab section!
4. Daily POTDs