

Project 1

1.0

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Chapter 1

CSCI331Project

Github for the CSCI 331 Sequence Set Class Group Programming Project

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

ListInterface< ItemType >	7
LinkedList< ItemType >	7
ListInterface< int >	7
LinkedList< int >	7
ListInterface< SecKeySS >	7
LinkedList< SecKeySS >	7
Node< ItemType >	12
Node< int >	12
Node< SecKeySS >	12
SecKeySS	15
SSClass	21

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

LinkedList< ItemType >	
This is LinkedList class creating a list of linked nodes	7
ListInterface< ItemType >	7
Node< ItemType >	
This is Node class for linked list	12
SecKeySS	15
SSClass	
LinkedList integration for blocks, records, and fields	21

Chapter 4

Class Documentation

4.1 `LinkedList< ItemType >` Class Template Reference

This is `LinkedList` class creating a list of linked nodes.

```
#include "LinkedList.h"
```

Inheritance diagram for `LinkedList< ItemType >`:

4.2 `ListInterface< ItemType >` Class Template Reference

Inheritance diagram for `ListInterface< ItemType >`:

Public Member Functions

- virtual bool `isEmpty` () const =0
- virtual int `getLength` () const =0
- virtual int `getItemCount` () const =0
- virtual bool `insert` (int newPosition, const ItemType &newEntry)=0
- virtual bool `deletion` (int position)=0
- virtual void `clear` ()=0
- virtual ItemType `getEntry` (int position) const =0
- virtual void `replace` (int position, const ItemType &newEntry)=0
- virtual ItemType `displayList` ()=0

4.2.1 Detailed Description

```
template<class ItemType>  
class ListInterface< ItemType >
```

Definition at line 7 of file ListInterface.h.

4.2.2 Member Function Documentation

4.2.2.1 clear()

```
template<class ItemType>
virtual void ListInterface< ItemType >::clear ( ) [pure virtual]
```

Removes all entries from this list.

Postcondition

List contains no entries and the count of items is 0.

Implemented in [LinkedList< ItemType >](#), [LinkedList< int >](#), and [LinkedList< SecKeySS >](#).

4.2.2.2 deletion()

```
template<class ItemType>
virtual bool ListInterface< ItemType >::deletion (
    int position ) [pure virtual]
```

Removes the entry at a given position from this list.

Precondition

None.

Postcondition

If $1 \leq \text{position} \leq \text{getLength}()$ and the removal is successful, the entry at the given position in the list is removed, other items are renumbered accordingly, and the returned value is true.

Parameters

<i>position</i>	The list position of the entry to remove.
-----------------	---

Returns

True if removal is successful, or false if not.

Implemented in [LinkedList< ItemType >](#), [LinkedList< int >](#), and [LinkedList< SecKeySS >](#).

4.2.2.3 getEntry()

```
template<class ItemType>
virtual ItemType ListInterface< ItemType >::getEntry (
    int position ) const [pure virtual]
```

Gets the entry at the given position in this list.

Precondition

1 <= position <= [getLength\(\)](#).

Postcondition

The desired entry has been returned.

Parameters

<i>position</i>	The list position of the desired entry.
-----------------	---

Returns

The entry at the given position.

Implemented in [LinkedList< ItemType >](#), [LinkedList< int >](#), and [LinkedList< SecKeySS >](#).

4.2.2.4 getLength()

```
template<class ItemType>
virtual int ListInterface< ItemType >::getLength ( ) const [pure virtual]
```

Gets the current number of entries in this list.

Returns

The integer number of entries currently in the list.

Implemented in [LinkedList< ItemType >](#), [LinkedList< int >](#), and [LinkedList< SecKeySS >](#).

4.2.2.5 insert()

```
template<class ItemType>
virtual bool ListInterface< ItemType >::insert (
    int newPosition,
    const ItemType & newEntry ) [pure virtual]
```

Inserts an entry into this list at a given position.

Precondition

None.

Postcondition

If $1 \leq \text{position} \leq \text{getLength}() + 1$ and the insertion is successful, `newEntry` is at the given position in the list, other entries are renumbered accordingly, and the returned value is true.

Parameters

<i>newPosition</i>	The list position at which to insert newEntry.
<i>newEntry</i>	The entry to insert into the list.

Returns

True if insertion is successful, or false if not.

Implemented in [LinkedList< ItemType >](#), [LinkedList< int >](#), and [LinkedList< SecKeySS >](#).

4.2.2.6 isEmpty()

```
template<class ItemType>
virtual bool ListInterface< ItemType >::isEmpty ( ) const [pure virtual]
```

Sees whether this list is empty.

Returns

True if the list is empty; otherwise returns false.

Implemented in [LinkedList< ItemType >](#), [LinkedList< int >](#), and [LinkedList< SecKeySS >](#).

4.2.2.7 replace()

```
template<class ItemType>
virtual void ListInterface< ItemType >::replace (
    int position,
    const ItemType & newEntry ) [pure virtual]
```

Replaces the entry at the given position in this list.

Precondition

1 <= position <= [getLength\(\)](#).

Postcondition

The entry at the given position is newEntry.

Parameters

<i>position</i>	The list position of the entry to replace.
<i>newEntry</i>	The replacement entry.

Implemented in [LinkedList< ItemType >](#), [LinkedList< int >](#), and [LinkedList< SecKeySS >](#).

The documentation for this class was generated from the following file:

- ListInterface.h

4.3 Node< ItemType > Class Template Reference

This is [Node](#) class for linked list.

```
#include "Node.h"
```

Public Member Functions

- [Node](#) ()
Node default constructor.
- [Node](#) (const ItemType &anItem)
Node constructor.
- [Node](#) (const ItemType &anItem, [Node](#)< ItemType > *nextNodePtr)
Node constructor.
- void [setItem](#) (const ItemType &anItem)
Member function taking one argument to set the memebr item.
- void [setNext](#) ([Node](#)< ItemType > *nextNodePtr)
Member function taking one argument, a pointer to a Node.
- ItemType [getItem](#) () const
Member function returning an item.
- [Node](#)< ItemType > * [getNext](#) () const
Memebr funtion to get the pointer to the next Node.

4.3.1 Detailed Description

```
template<class ItemType>
class Node< ItemType >
```

This is [Node](#) class for linked list.

This class is to create a node that is used in linked list class. The [Node](#) will store a template ItemType, item and a [Node](#) pointer of item type, next.

Definition at line 12 of file Node.h.

4.3.2 Constructor & Destructor Documentation

4.3.2.1 Node() [1/3]

```
template<class ItemType >
Node< ItemType >::Node ( )
```

Node default constructor.

Default constructor assigning next as NULLPTR

Definition at line 8 of file Node.cpp.

```
8             : next (nullptr)
9 {
10 } // end default constructor
```

4.3.2.2 Node() [2/3]

```
template<class ItemType>
Node< ItemType >::Node (
    const ItemType & anItem )
```

Node constructor.

Taking one argument to assign to item and assigns next to null pointer.

Parameters

<i>anItem</i>	a constant reference to an item of itemtype
---------------	---

Definition at line 18 of file Node.cpp.

```
18             : item(anItem), next (nullptr)
19 {
20 } // end constructor
```

4.3.2.3 Node() [3/3]

```
template<class ItemType>
Node< ItemType >::Node (
    const ItemType & anItem,
    Node< ItemType > * nextNodePtr )
```

Node constructor.

Taking two arguments. The first to assign to item and the other assigns next to argument.

Parameters

<i>anItem</i>	a constant reference to an item of itemType
<i>nextNodePtr</i>	a pointer to the next node

Definition at line 30 of file Node.cpp.

```

30                                     :
31     item(anItem), next(nextNodePtr)
32 {
33 } // end constructor

```

4.3.3 Member Function Documentation**4.3.3.1 getItem()**

```

template<class ItemType >
ItemType Node< ItemType >::getItem ( ) const

```

Member function returning an item.

/return the item of itemType

Definition at line 60 of file Node.cpp.

```

61 {
62     return item;
63 } // end getItem

```

4.3.3.2 getNext()

```

template<class ItemType >
Node< ItemType > * Node< ItemType >::getNext ( ) const

```

Member function to get the pointer to the next Node.

/return a pointer to the next node.

Definition at line 70 of file Node.cpp.

```

71 {
72     return next;
73 } // end getNext

```

4.3.3.3 setItem()

```

template<class ItemType>
void Node< ItemType >::setItem (
    const ItemType & anItem )

```

Member function taking one argument to set the member item.

Parameters

<i>anItem</i>	to be reference to by item
---------------	----------------------------

Definition at line 40 of file Node.cpp.

```
41 {
42     item = anItem;
43 } // end setItem
```

4.3.3.4 setNext()

```
template<class ItemType>
void Node< ItemType >::setNext (
    Node< ItemType > * nextNodePtr )
```

Member function taking one argument, a pointer to a [Node](#).

/param nextNodePtr a point to a [Node](#), the next [Node](#) in a linked list

Definition at line 50 of file Node.cpp.

```
51 {
52     next = nextNodePtr;
53 } // end setNext
```

The documentation for this class was generated from the following files:

- Node.h
- Node.cpp

4.4 SecKeySS Class Reference

```
#include "SecKeySS.h"
```

Public Member Functions

- [SecKeySS](#) ()
- [SecKeySS](#) (const [SecKeySS](#) &s)
- [~SecKeySS](#) ()
- string [getData](#) () const
- [LinkedList](#)< int > [getDuplicates](#) () const
- void [setData](#) (const string s)
- void [setDuplicates](#) ([LinkedList](#)< int > dup)
- bool [operator<](#) (const string &s) const
- bool [operator<](#) (const [SecKeySS](#) &s) const
- bool [operator>](#) (const string &s) const
- bool [operator>](#) (const [SecKeySS](#) &s) const
- bool [operator==](#) (const string &s) const
- bool [operator==](#) (const [SecKeySS](#) &s) const
- void [operator=](#) (const [SecKeySS](#) &s)

4.4.1 Detailed Description

\brief This is the class for Section Keys of the SS class

Definition at line 14 of file SecKeySS.h.

4.4.2 Constructor & Destructor Documentation

4.4.2.1 SecKeySS() [1/2]

```
SecKeySS::SecKeySS ( ) [inline]
```

Default constructor

Definition at line 20 of file SecKeySS.h.

```
20 { duplicates = LinkedList<int>(); };
```

4.4.2.2 SecKeySS() [2/2]

```
SecKeySS::SecKeySS (
    const SecKeySS & s )
```

Constructor

Definition at line 94 of file SecKeySS.h.

```
94 { data = s.getData(); setDuplicates(s.getDuplicates()); }
```

4.4.2.3 ~SecKeySS()

```
SecKeySS::~~SecKeySS ( )
```

Deconstructor

Definition at line 95 of file SecKeySS.h.

```
95 { duplicates.clear(); }
```

4.4.3 Member Function Documentation

4.4.3.1 getData()

```
string SecKeySS::getData ( ) const [inline]
```

Gets data

Returns

data the data to be returned

Definition at line 31 of file SecKeySS.h.

```
31 { return data; };
```

4.4.3.2 getDuplicates()

```
LinkedList< int > SecKeySS::getDuplicates ( ) const
```

Gets duplicates

Returns

LinkedList of itemType

Definition at line 110 of file SecKeySS.h.

```
110 {  
111     LinkedList<int> list;  
112     int temp;  
113     for (int i = 1; i < duplicates.getItemCount() + 1; i++) {  
114         temp = duplicates.getEntry(i);  
115         list.insert(i, temp);  
116     }  
117     return list;  
118 }
```

4.4.3.3 operator<() [1/2]

```
bool SecKeySS::operator< (  
    const string & s ) const [inline]
```

Operator less than

Parameters

s	a reference to a string to check if than
----------	--

Returns

true is data < s

Definition at line 52 of file SecKeySS.h.

```
52 { return data < s; };
```

4.4.3.4 operator<() [2/2]

```
bool SecKeySS::operator< (  
    const SecKeySS & s ) const [inline]
```

Operator less than to check Sec key

Parameters

s	a string to check if than
----------	---------------------------

Returns

true is data < s.data

Definition at line 59 of file SecKeySS.h.

```
59 { return data < s.data; };
```

4.4.3.5 operator=()

```
void SecKeySS::operator= (  
    const SecKeySS & s )
```

Operator equal for copy constructor

Parameters

s	a reference to a SecKeySS
----------	---

Definition at line 106 of file SecKeySS.h.

```

106                                     {
107     data = s.data;
108     duplicates = s.duplicates;
109 }
```

4.4.3.6 operator==() [1/2]

```

bool SecKeySS::operator==(
    const string & s ) const [inline]
```

Operator is equal

Parameters

s	a reference to a string
---	-------------------------

Returns

true if data is equal to s

Definition at line 79 of file SecKeySS.h.

```

79 { return data == s; };
```

4.4.3.7 operator==() [2/2]

```

bool SecKeySS::operator==(
    const SecKeySS & s ) const [inline]
```

Operator is equal

Parameters

s	a reference to a secKeySS
---	---------------------------

Returns

true if data is equal to s.data

Definition at line 86 of file SecKeySS.h.

```

86 { return data == s.data; };
```

4.4.3.8 operator>() [1/2]

```
bool SecKeySS::operator> (
    const string & s ) const [inline]
```

Operator geater than

Parameters

s	a reference to a string to check if > than
---	--

Returns

true is data > s

Definition at line 66 of file SecKeySS.h.

```
66 { return data > s; };
```

4.4.3.9 operator>() [2/2]

```
bool SecKeySS::operator> (
    const SecKeySS & s ) const [inline]
```

Operator greater than to check a Sec key

Parameters

s	a string to check if greater than
---	-----------------------------------

Returns

true is data > s.data

Definition at line 73 of file SecKeySS.h.

```
73 { return data > s.data; };
```

4.4.3.10 setData()

```
void SecKeySS::setData (
    const string s ) [inline]
```

Sets the data equal to argument 1

Parameters

s	a string to set data to
---	-------------------------

Definition at line 41 of file SecKeySS.h.

```
41 { data = s; };
```

4.4.3.11 setDuplicates()

```
void SecKeySS::setDuplicates (
    LinkedList< int > dup )
```

Sets duplicates

Parameters

LinkedList	dup
----------------------------	-----

Definition at line 119 of file SecKeySS.h.

```
119                                     {
120     int temp;
121     duplicates.clear();
122     for (int i = 1; i < list.getItemCount() + 1; i++) {
123         temp = list.getEntry(i);
124         duplicates.insert(i, temp);
125     }
126 }
```

The documentation for this class was generated from the following file:

- SecKeySS.h

4.5 SSClass Class Reference

[LinkedList](#) integration for blocks, records, and fields.

```
#include "SSClass.h"
```

Public Member Functions

- [SSClass](#) ()
Default constructor.
- [SSClass](#) (const [SSClass](#) &ss)
Constructor.
- [~SSClass](#) ()
Destructor.
- bool [isEmpty](#) ()
Check if numRecords is 0.
- bool [openFile](#) (string input)
Opens external file.
- void [insert](#) (string s)
inserts line by line into data
- vector< int > [search](#) (string s, unsigned fieldNum)
Searches for record.
- int [directionalSearch](#) (string state, char direction)
Searches directionly (N, S, W, E)
- string [returnLine](#) (int rrn)
Fills secondary key vector.

4.5.1 Detailed Description

[LinkedList](#) integration for blocks, records, and fields.

Authors

Jordan Bremer, Melvin Schmid, ..., ..., ...

Sequence Set class: – allows for insert and deletion of linked list – populates secondary keys – allows for searching of said linked list – ability to return city, state, county, latitude, longitude, zip, and lower and upper indicies – ability to input a txt file and populate it's contents

Implementation and assumptions: – size defaults are listed towards the top of the program – array/vector elements are initialized to zero

Definition at line 65 of file SSClass.h.

4.5.2 Member Function Documentation

4.5.2.1 directionalSearch()

```
int SSClass::directionalSearch (
    string state,
    char direction )
```

Searches directionly (N, S, W, E)

Parameters

<i>state</i>	the state to search
<i>direction</i>	(N, S, W, E)

Returns

the line contating the soght after direction

Definition at line 434 of file SSClass.h.

```

434                                     {
435     direction = toupper(direction);
436     int i = 1;
437     int returnIndex = -1;
438     double highOrLow;
439     vector<int> state = search(stateS, 3);
440     switch (direction) {
441     case 'N':
442     {
443         returnIndex = state[0];
444         highOrLow = stod(getLat(returnLine(state[0])));
445         for (i; i < state.size(); i++) {
446             if (highOrLow < stod(getLat(returnLine(state[i])))) {
447                 highOrLow = stod(getLat(returnLine(state[i])));
448                 returnIndex = i;
449             }
450         }
451     }
452     }
453     break;
454     case 'E':
455     {
456         returnIndex = state[0];
457         highOrLow = stod(getLon(returnLine(state[0])));
458         for (i; i < state.size(); i++) {
459             if (highOrLow < stod(getLon(returnLine(state[i])))) {
460                 highOrLow = stod(getLon(returnLine(state[i])));
461                 returnIndex = i;
462             }
463         }
464     }
465     }
466     break;
467     case 'S':
468     {
469         returnIndex = state[0];
470         highOrLow = stod(getLat(returnLine(state[0])));
471         for (i; i < state.size(); i++) {
472             if (highOrLow > stod(getLat(returnLine(state[i])))) {
473                 highOrLow = stod(getLat(returnLine(state[i])));
474                 returnIndex = i;
475             }
476         }
477         break;
478     }
479     case 'W':
480     {
481         returnIndex = state[0];
482         highOrLow = stod(getLon(returnLine(state[0])));
483         for (i; i < state.size(); i++) {
484             if (highOrLow > stod(getLon(returnLine(state[i])))) {
485                 highOrLow = stod(getLon(returnLine(state[i])));
486                 returnIndex = i;
487             }
488         }
489     }
490     }
491     break;
492     }
493     return returnIndex;
494 }
495 }
```

4.5.2.2 insert()

```
void SSClass::insert (
    string s )
```

inserts line by line into data

Parameters

s	a string to insert
---	--------------------

Insertion of records into both the index file as well as the linkedlist of linkedlists /param s string to be inserted

Definition at line 325 of file SSClass.h.

```
325         {
326     if (nextEmpty == -1) {
327         goToLine(indexFile, numLinesIndex);
328         indexFile << "\n" << s;
329         insertZip(getZip(s), numLinesIndex);
330         insertPlace(getPlace(s), numLinesIndex);
331         insertState(getState(s), numLinesIndex);
332         insertCounty(getCounty(s), numLinesIndex);
333         insertLat(getLat(s), numLinesIndex);
334         insertLon(getLon(s), numLinesIndex);
335         numLinesIndex++;
336         return;
337     }
338     goToLine(indexFile, nextEmpty);
339     //replace(s, nextEmpty);
340     insertZip(getZip(s), nextEmpty);
341     insertPlace(getPlace(s), nextEmpty);
342     insertState(getState(s), nextEmpty);
343     insertCounty(getCounty(s), nextEmpty);
344     insertLat(getLat(s), nextEmpty);
345     insertLon(getLon(s), nextEmpty);
346 }
```

4.5.2.3 isEmpty()

```
bool SSClass::isEmpty ( ) [inline]
```

Check if numRecords is 0.

Returns

returns false if empty, otherwise returns true

Definition at line 206 of file SSClass.h.

```
206 { return numRecords == 0; };
```

4.5.2.4 openFile()

```
bool SSClass::openFile (
    string input )
```

Opens external file.

Parameters

<i>input</i>	string
--------------	--------

Precondition

data file

Returns

true if file location exists, otherwise returns false

Definition at line 261 of file SSClass.h.

```
261                                     { //input is a file name
262     indexFile.open(input);
263     nextEmpty = -1;
264     return (indexFile.is_open());
265
266 }
```

4.5.2.5 returnLine()

```
string SSClass::returnLine (
    int rrn )
```

Fills secondary key vector.

Parameters

<i>rrn</i>	and integer refing to the line to get
------------	---------------------------------------

Returns

string containing the contents of the line

Definition at line 352 of file SSClass.h.

```
352                                     {
353     string returnVal;
354     goToLine(indexFile, rrn);
355     getline(indexFile, returnVal);
356     return returnVal;
357 }
```

4.5.2.6 search()

```
vector< int > SSClass::search (
    string s,
    unsigned fieldNum )
```

Searches for record.

Parameters

s	string to search for fieldNum the field in which to search
---	--

Returns

vector of results

Definition at line 360 of file SSClass.h.

```

360                                     {
361     SecKeySS secCopy;
362     int i;
363     vector<int> results;
364     switch (fieldNum) {
365     case 1:
366     {
367         for (i = 1; (i < (secKeyZip.getItemCount() + 1)) && (secKeyZip.
getEntry(i).getData() < s); i++);
368         if (stoi(secKeyZip.getEntry(i).getData()) == stoi(s)) {
369             LinkedList<int> toCopy = LinkedList<int>(secKeyZip.
getEntry(i).getDuplicates());
370             for (int j = 1; j < (toCopy.getItemCount() + 1); j++) {
371                 results.push_back(toCopy.getEntry(j));
372             }
373         }
374     }
375     break;
376     case 2:
377     {
378         for(i = 1; (i < (secKeyPlace.getItemCount() + 1)) && (secKeyPlace.
getEntry(i).getData() < s); i++);
379         if ((secKeyPlace.getEntry(i).getData()) == (s)) {
380             LinkedList<int> toCopy = LinkedList<int>(secKeyPlace.
getEntry(i).getDuplicates());
381             for (int j = 1; j < (toCopy.getItemCount() + 1); j++) {
382                 results.push_back(toCopy.getEntry(j));
383             }
384         }
385     }
386     break;
387     case 3:
388     {
389         for (i = 1; (i < (secKeyState.getItemCount() + 1)) && (secKeyState.
getEntry(i).getData() < s); i++);
390         if ((secKeyState.getEntry(i).getData()) == (s)) {
391             LinkedList<int> toCopy = LinkedList<int>(secKeyState.
getEntry(i).getDuplicates());
392             for (int j = 1; j < (toCopy.getItemCount() + 1); j++) {
393                 results.push_back(toCopy.getEntry(j));
394             }
395         }
396     }
397     break;
398     case 4:
399     {
400         for (i = 1; (i < (secKeyCounty.getItemCount() + 1)) && (secKeyCounty.
getEntry(i).getData() < s); i++);
401         if ((secKeyCounty.getEntry(i).getData()) == (s)) {
402             LinkedList<int> toCopy = LinkedList<int>(secKeyCounty.
getEntry(i).getDuplicates());
403             for (int j = 1; j < (toCopy.getItemCount() + 1); j++) {
404                 results.push_back(toCopy.getEntry(j));
405             }
406         }
407     }
408     break;
409     case 5:
410     {
411         for (i = 1; (i < (secKeyLat.getItemCount() + 1)) && (secKeyLat.
getEntry(i).getData() < s); i++);
412         if (stoi(secKeyLat.getEntry(i).getData()) == static_cast<int>(stod(s))) {
413             LinkedList<int> toCopy = LinkedList<int>(secKeyLat.
getEntry(i).getDuplicates());
414             for (int j = 1; j < (toCopy.getItemCount() + 1); j++) {
415                 results.push_back(toCopy.getEntry(j));
416             }
417         }
418     }

```

```
419     break;
420     case 6:
421     {
422         for (i = 1; (i < (secKeyLon.getItemCount() + 1)) && (secKeyLon.
423         getEntry(i).getData() < s); i++);
424         if (stoi(secKeyLon.getEntry(i).getData()) == static_cast<int>(stod(s))) {
425             LinkedList<int> toCopy = LinkedList<int>(secKeyLon.
426             getEntry(i).getDuplicates());
427             for (int j = 1; j < (toCopy.getItemCount() + 1); j++) {
428                 results.push_back(toCopy.getEntry(j));
429             }
430         }
431         break;
432     }
433     return results;
434 }
```

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