GIT Department of Computer Engineering
CSE 222/505 - Spring 2022
Homework 3 Report

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1. SYSTEM REQUIREMENTS

1.1 **Functional Requirements**:

This program creates and designs streets to use it's functions, a Street must be created and initialized. A Street can be initialized by giving it's length property. Length must be positive integer to create Street. After initializing parting is done, software is ready to use. User can both access editing and viewing modes of program via command menu:

Editing Mode:

- User can add an instance of Buildings by giving it's necessary properties.
- User also delete a Building from Street by entering it's location position and side.

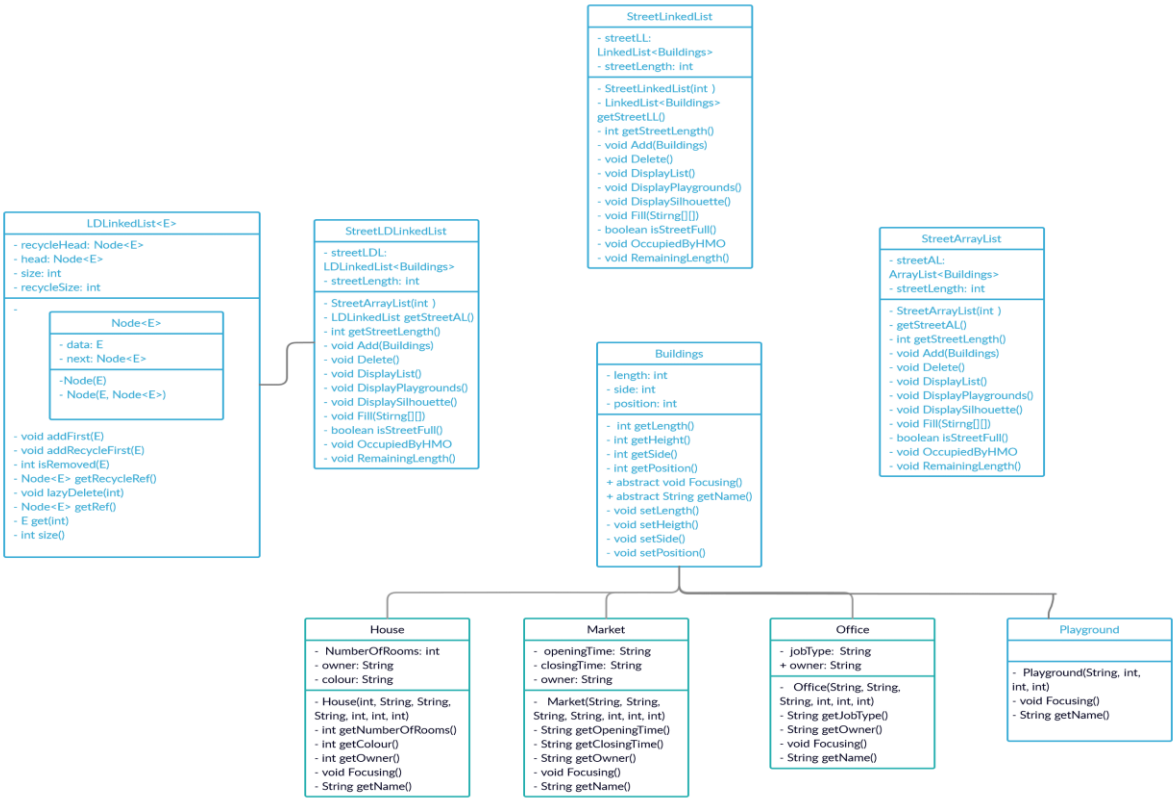
Viewing Mode:

- User can access RemainingLength() method of Street Class to display the total remaining length of lands on the street
- User can access DisplayList() method of Street Class to display the list of buildings on the street.
- With the help of DisplayPlayground() method of Street Class, the user could display the number and ratio of length of playgrounds in the street.
- OccupiedByHMO() method calculates the total length of street occupied by the markets, houses or offices.
- DisplaySilhoutte() method display the skyline silhouette of the street.

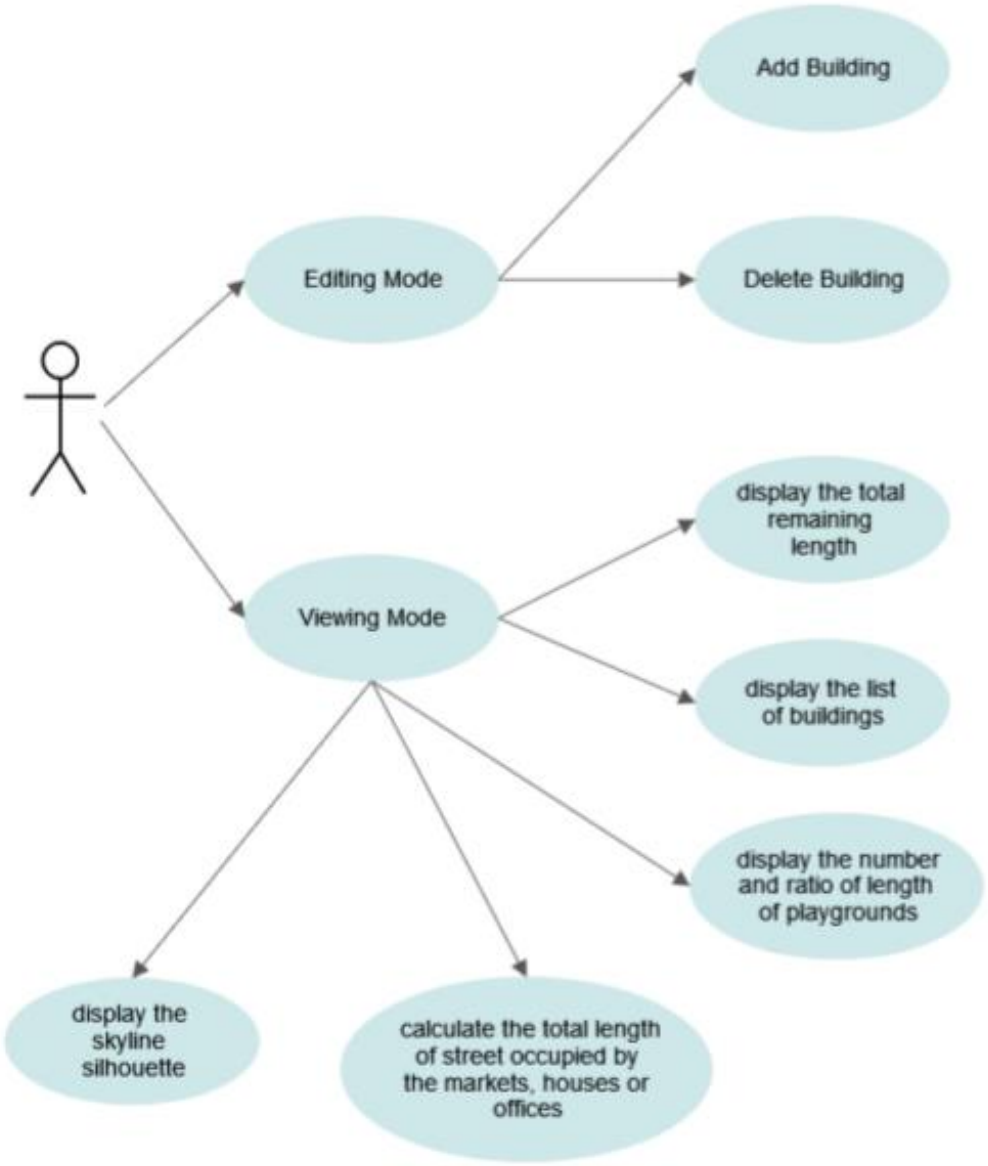
1.2 **Non-functional Requirements:**

- Add method blocks to add a building if given position or street is full.
- Delete method blocks to delete if given position is already empty.
- streetLength variable must be a positive integer to be able to create container class reference.
- User inputs shouldn't throw exceptions which unhandled.

2. UML CLASS DIAGRAM



3. USE CASE DIAGRAM



4. PROBLEM SOLUTION APPROACH

In this homework data could store in three separate containers, ArrayList, LinkedList and mine implementation LDLinkedList. When user wants to add/delete different types of buildings via ArrayList or LinkedList, program can use predefined add and remove methods for these classes. But for LDLinkedList I should implement AbstractList interface's get and size methods. To create LinkedList, I am defined inner Node<E> classes which contains data and reference for next node. With the help of Node class LinkedList completed.

On the other hand, LDLinkedList must use Lazy Deletion strategy. To solve it I created another Node<E> reference in LDLinkedList class which is named as recycleHead. In every deletion Node transferred to recycleHead reference from head reference. Also, in every addition operation to head reference, program checked recycleHead reference. If recycle list contains searched Node program transferred Node from recycleHead to head reference. Else, program add searched node directly to the head reference.

Second problem is Focusing and getName methods which must be implemented by every type of Building. Instead of early binding, every method has different implementation on it. To obtained it I used polymorphism and inheritance. With the help of "abstract" and "extends" keyword, every implementation has done separately in subclasses.

The last problem is printing skyline silhouette to the console. Containers keep position in unsorted way and some of positions also doesn't contain anything. To print in silhouette view, firstly I write an algorithm which finds a maximum height value in Street. Then, I create 2D array in size of "max height * street length". This array filled by upper corner points of buildings. After that, upper corners of buildings are combined by "*" strings. I completed the street view with lines descending from the upper corners to the floor. At the end I create conditional statements to get silhouette view.

5. TEST CASES

a) ArrayList

b) LinkedList

c) LDLinkedList

1- **Compile -> Set Street Size -> Invalid Input**
2- **Compile -> Menu -> Valid Input**
3- **Compile -> Menu -> Invalid Input**
4- **Compile -> Menu -> Editing Mode -> Add -> New Location -> Valid Input**
5- **Compile -> Menu -> Editing Mode -> Add -> New Location -> Invalid Input**
6- **Compile -> Menu -> Editing Mode -> Add -> Try Used Location**
7- **Compile -> Menu -> Editing Mode -> Delete -> Valid Input**
8- **Compile -> Menu -> Editing Mode -> Delete -> Invalid Input**
9- **Compile -> Menu -> Editing Mode -> Delete -> Try Empty Position**

10- Compile -> Menu -> Viewing Mode -> Display the total remaining length of lands

11- Compile -> Menu -> Viewing Mode -> Display the list of buildings

12- Compile -> Menu -> Viewing Mode -> Display the number and ratio of length of playgrounds

13- Compile -> Menu -> Viewing Mode -> Calculate the total length of street occupied by the markets, houses or offices

14- Compile -> Menu -> Viewing Mode -> Display the skyline silhouette

15- Compile -> Menu -> Viewing Mode -> Focusing Methods

6. RUNNING AND RESULTS

a) ArrayList

1)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_ArrayList$ make
javac -d . *.java
java Main
Set Street Length:
-7
Exception in thread "main" java.lang.ArrayIndexOutOfBoundsException: ERROR: street length must be positive integer!!
        at StreetArrayList.<init>(StreetArrayList.java:21)
        at Main.main(Main.java:46)
make: *** [makefile:3: all] Error 1
```

2)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_ArrayList$ make
javac -d . *.java
java Main
Set Street Length:
25
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
3
```

3)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_ArrayList$ make
javac -d . *.java
java Main
Set Street Length:
55
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
4
invalid input!! please try again
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
5
invalid input!! please try again
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
```

4)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_ArrayList$ make
javac -d . *.java
java Main
Set Street Length:
55
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
1
enter side:
right
enter position:
27
enter length:
10
enter height:
8
---Choose Building Type---
1 - House
2 - Office
3 - Market
4 - Playground
enter:
1
enter number of rooms:
7
enter colour:
white
enter owner:
emircan
House Succesfully added to street
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
3
```

5)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_ArrayList$ make
javac -d . *.java
java Main
Set Street Length:
20
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
1
enter side:
left
enter position:
10
enter length:
55
enter height:
4
---Choose Building Type---
1 - House
2 - Office
3 - Market
4 - Playground
enter:
4
Exception in thread "main" java.lang.ArrayIndexOutOfBoundsException: ERROR: building couldn't fit in the street
        at StreetArrayList.Add(StreetArrayList.java:59)
        at Main.main(Main.java:110)
make: *** [makefile:3: all] Error 1
```

6)

```
4
Playground Succesfully added to street
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
1
enter side:
left
enter position:
2
enter length:
4
enter height:
7
---Choose Building Type---
1 - House
2 - Office
3 - Market
4 - Playground
enter:
4
ERROR: position is full!!
--------------------
```

7)

```
House Succesfully added to street
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
2
enter side:
right
enter position:
4
House Succesfully deleted
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
```

8)

```
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
2
enter side:
lft
invalid side input.. try again
enter side:
rigt
invalid side input.. try again
enter side:
```

9)

```
enter side:
left
enter position:
3
ERROR: the position is already empty!!!
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
```

Used Inputs for next parts:

```
/*String side, int position, int height, int length */
House a = new House(3, "white", "emir", "right", 0, 7, 4);
House b = new House(3, "black", "can", "left", 0, 3, 3);
Office c = new Office("law", "demirel", "left", 4, 4, 6);
Office d = new Office("finance", "demirel", "left", 11, 5, 4);
Playground e = new Playground("right", 22, 0, 2);
Playground h = new Playground("right", 8, 0, 2);
Market g = new Market("09:30", "21:30", "migros", "right", 14, 2, 7);
Market f = new Market("09:00", "22:00", "carrefour", "left", 20, 2, 7);
StreetArrayList mainStreet = new StreetArrayList(30);

System.out.println("----------test----------");
mainStreet.Add(a);
mainStreet.Add(b);
mainStreet.Add(c);
mainStreet.Add(d);
mainStreet.Add(e);
mainStreet.Add(f);
mainStreet.Add(g);
mainStreet.Add(h);
mainStreet.Add(h);
mainStreet.Delete(0, 1);
mainStreet.RemainingLength();
mainStreet.DisplayList();
mainStreet.DisplayPlaygrounds();
mainStreet.OccupiedByHMO();
mainStreet.DisplaySilhoutte();
```

10)

```
-------the total remaining length of lands on the street-------
28 is the total remaining length of lands on the street.
```

11)

```
-------List of Buildings On The Street-------
1-House
2-Market
2-Office
2-Playground
```

12)

```
-------the number and ratio of length of playgrounds on the street-------
Number of Playgrounds: 2
The ratio length of playgrounds on the street: %6
```

13)

```
-------total length of street occupied by the markets, houses or offices-------
total lengths of HMO's: 28
```

14)

```
-------street silhouette-------
-+++-
*   *
*   *      -+++-
*   -++++-*   *
*             *
*             +++++--++++-
*                       *
emircand@emircand:~/Desktop/1901042674_hw3/hw03_ArrayList$
```

15)

```
Owner of the house: emir
Job Type of the office: law
Job Type of the office: finance
length of the playground: 2
The market closing at: 22:00
The market closing at: 21:30
length of the playground: 2
```

b) LinkedList

1)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LinkedList$ make
javac -d . *.java
java Main
Set Street Length:
-7
Exception in thread "main" java.lang.ArrayIndexOutOfBoundsException: ERROR: street length must be positive integer!!
        at StreetLinkedList.<init>(StreetLinkedList.java:31)
        at Main.main(Main.java:43)
make: *** [makefile:3: all] Error 1
```

2)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LinkedList$ make
javac -d . *.java
java Main
Set Street Length:
30
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
3
```

3)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LinkedList$ make
javac -d . *.java
java Main
Set Street Length:
30
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
4
invalid input!! please try again
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
5
invalid input!! please try again
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
3
```

4)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LinkedList$ make
javac -d . *.java
java Main
Set Street Length:
25
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
1
enter side:
right
enter position:
17
enter length:
3
enter height:
5
---Choose Building Type---
1 - House
2 - Office
3 - Market
4 - Playground
enter:
2
enter job type:
finance
enter owner:
hakan
Office Succesfully added to street
--------------------
```

5)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LinkedList$ make
javac -d . *.java
java Main
Set Street Length:
10
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
1
enter side:
left
enter position:
3
enter length:
25
enter height:
4
---Choose Building Type---
1 - House
2 - Office
3 - Market
4 - Playground
enter:
4
Exception in thread "main" java.lang.ArrayIndexOutOfBoundsException: ERROR: building couldn't fit in the street
        at StreetLinkedList.Add(StreetLinkedList.java:71)
        at Main.main(Main.java:107)
```

6)

```
Market Succesfully added to street
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
1
enter side:
left
enter position:
4
enter length:
10
enter height:
3
---Choose Building Type---
1 - House
2 - Office
3 - Market
4 - Playground
enter:
4
ERROR: position is full!!
--------------------
```

7)

```
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
2
enter side:
right
enter position:
12
12
Playground Succesfully deleted
--------------------
```

8)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LinkedList$ make
javac -d . *.java
java Main
Set Street Length:
20
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
2
enter side:
lft
invalid side input.. try again
enter side:
left
enter position:
30
30
Exception in thread "main" java.lang.ArrayIndexOutOfBoundsException: entered position is not in bounds of street
        at StreetLinkedList.Delete(StreetLinkedList.java:86)
        at Main.main(Main.java:127)
```

9)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LinkedList$ make
javac -d . *.java
java Main
Set Street Length:
30
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
2
enter side:
right
enter position:
2
2
ERROR: the position is already empty!!!
--------------------
```

Used inputs for next parts:

```
House a = new House(3, "white", "emir", "right", 0, 7, 4);
House b = new House(3, "black", "can", "left", 0, 3, 3);
Office c = new Office("law", "demirel", "left", 4, 4, 6);
Office d = new Office("finance", "demirel", "left", 11, 5, 4);
Playground e = new Playground("right", 22, 0, 2);
Playground h = new Playground("right", 8, 0, 2);
Market g = new Market("09:30", "21:30", "migros", "right", 14, 2, 7);
Market f = new Market("09:00", "22:00", "carrefour", "left", 20, 2, 7);
StreetLinkedList mainStreet = new StreetLinkedList(30);
System.out.println("----------test----------");
mainStreet.Add(a);
mainStreet.Add(b);
mainStreet.Add(c);
mainStreet.Add(d);
mainStreet.Add(e);
mainStreet.Add(f);
mainStreet.Add(g);
mainStreet.Add(h);
mainStreet.Delete(0, 1);
```

10 – 15)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LinkedList$ make
javac -d . *.java
java Main
----------test----------
House Succesfully added to street
House Succesfully added to street
Office Succesfully added to street
Office Succesfully added to street
Playground Succesfully added to street
Market Succesfully added to street
Market Succesfully added to street
Playground Succesfully added to street
House Succesfully deleted
-------the total remaining length of lands on the street-------
28 is the total remaining length of lands on the street.
-------List of Buildings On The Street-------
1-House
2-Market
2-Office
2-Playground
-------the number and ratio of length of playgrounds on the street-------
Number of Playgrounds: 2
The ratio length of playgrounds on the street: %6
-------total length of street occupied by the markets, houses or offices-------
total lengths of HMO's: 28
-------street silhouette-------
-+++-
*   *
*   *      -+++-
*   -++++-*   *
*             *
*             +++++--+++++-
*                        *
Owner of the house: emir
Job Type of the office: law
Job Type of the office: finance
length of the playground: 2
The market closing at: 22:00
The market closing at: 21:30
length of the playground: 2
```

C) LDLinkedList

1)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LDLinkedList$ make
javac -d . *.java
java Main
Set Street Length:
-3
Exception in thread "main" java.lang.ArrayIndexOutOfBoundsException: ERROR: street length must be positive integer!!
```

2)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LDLinkedList$ make
javac -d . *.java
java Main
Set Street Length:
30
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
3
```

3)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LDLinkedList$ make
javac -d . *.java
java Main
Set Street Length:
30
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
4
invalid input!! please try again
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
5
invalid input!! please try again
--------------------
```

4)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LDLinkedList$ make
javac -d . *.java
java Main
Set Street Length:
30
--------------------
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
--------------------
1 - Add Building to the street
2 - Delete Building from the street
enter:
1
enter side:
right
enter position:
20
enter length:
3
enter height:
7
---Choose Building Type---
1 - House
2 - Office
3 - Market
4 - Playground
enter:
2
enter job type:
law
enter owner:
demirel
Office Succesfully added to street
--------------------
```

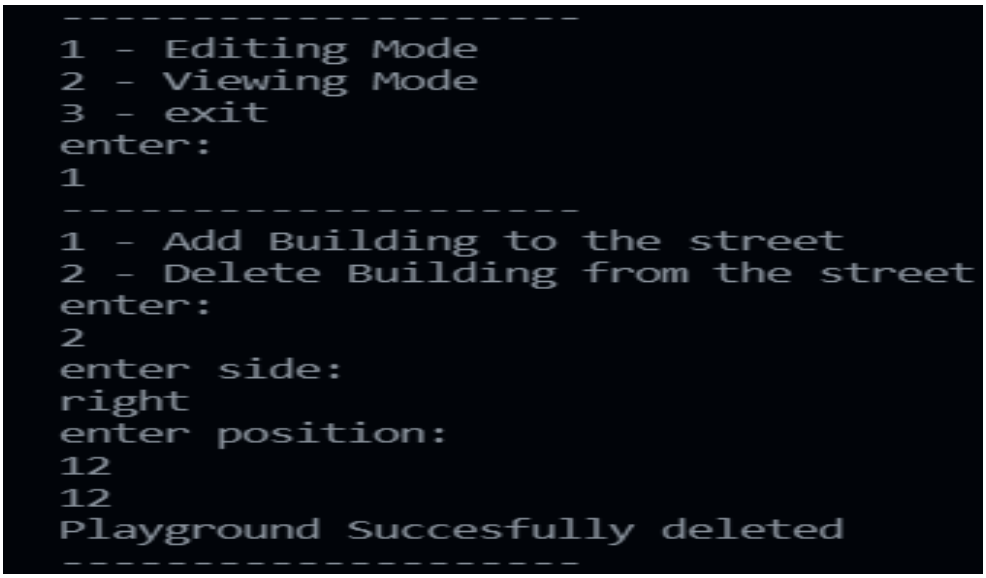
5)


1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
1 - Add Building to the street
2 - Delete Building from the street
enter:
1
enter side:
left
enter position:
22
enter length:
50
enter height:
4
---Choose Building Type---
1 - House
2 - Office
3 - Market
4 - Playground
enter:
4
Exception in thread "main" java.lang.ArrayIndexOutOfBoundsException: ERROR: building couldn't fit in the street
at StreetLDL.Add(StreetLDL.java:72)
at Main.main(Main.java:106)

6)


Playground Succesfully added to street
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
1 - Add Building to the street
2 - Delete Building from the street
enter:
1
enter side:
right
enter position:
12
enter length:
5
enter height:
7
---Choose Building Type---
1 - House
2 - Office
3 - Market
4 - Playground
enter:
4
ERROR: position is full!!

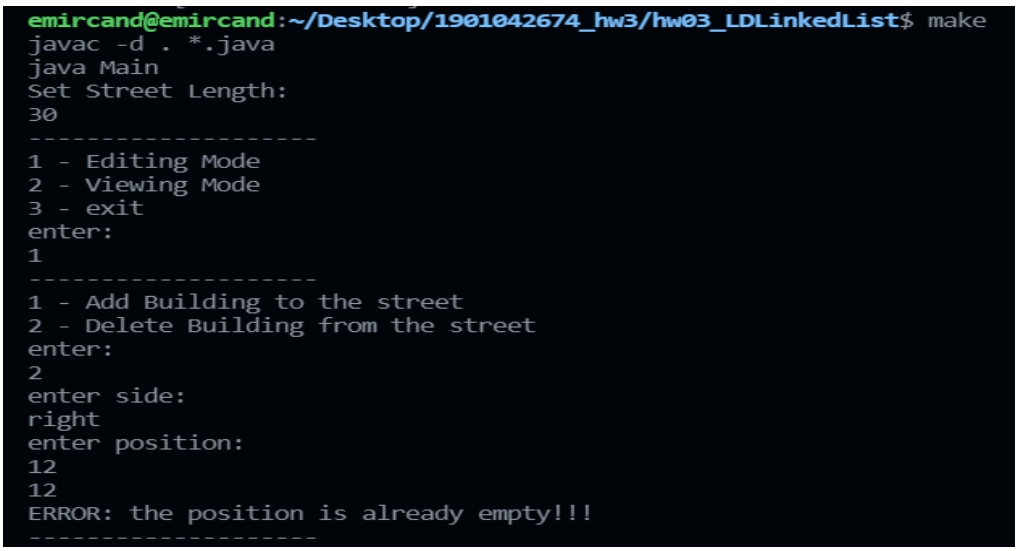
7)


----
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
----
1 - Add Building to the street
2 - Delete Building from the street
enter:
2
enter side:
right
enter position:
12
12
Playground Succesfully deleted
----

8)


----
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
----
1 - Add Building to the street
2 - Delete Building from the street
enter:
2
enter side:
left
enter position:
335
335
Exception in thread "main" java.lang.ArrayIndexOutOfBoundsException: entered position is not in bounds of street
at StreetLDL.Delete(StreetLDL.java:87)
at Main.main(Main.java:126)
make: *** [makefile:3: all] Error 1
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LDLinkedList$

9)


emircand@emircand:~/Desktop/1901042674_hw3/hw03_LDLinkedList$ make
javac -d . *.java
java Main
Set Street Length:
30
----
1 - Editing Mode
2 - Viewing Mode
3 - exit
enter:
1
----
1 - Add Building to the street
2 - Delete Building from the street
enter:
2
enter side:
right
enter position:
12
12
ERROR: the position is already empty!!!

Used inputs for next parts:

```
House a = new House(3, "white", "emir", "right", 0, 7, 4);
House b = new House(3, "black", "can", "left", 0, 3, 3);
Office c = new Office("law", "demirel", "left", 4, 4, 6);
Office d = new Office("finance", "demirel", "left", 11, 5, 4);
Playground e = new Playground("right", 22, 0, 2);
Playground h = new Playground("right", 8, 0, 2);
Market g = new Market("09:30", "21:30", "migros", "right", 14, 2, 7);
Market f = new Market("09:00", "22:00", "carrefour", "left", 20, 2, 7);
StreetLinkedList mainStreet = new StreetLinkedList(30);


System.out.println("----------test----------");
mainStreet.Add(a);
mainStreet.Add(b);
mainStreet.Add(c);
mainStreet.Add(d);
mainStreet.Add(e);
mainStreet.Add(f);
mainStreet.Add(g);
mainStreet.Add(h);
mainStreet.Delete(0, 1);
```

10 – 15)

```
emircand@emircand:~/Desktop/1901042674_hw3/hw03_LDLinkedList$ make
javac -d . *.java
java Main
----------test----------
House Succesfully added to street
House Succesfully added to street
Office Succesfully added to street
Office Succesfully added to street
Playground Succesfully added to street
Market Succesfully added to street
Market Succesfully added to street
Playground Succesfully added to street
House Succesfully deleted
-------the total remaining length of lands on the street-------
28 is the total remaining length of lands on the street.
-------List of Buildings On The Street-------
1-House
2-Market
2-Office
2-Playground
-------the number and ratio of length of playgrounds on the street-------
Number of Playgrounds: 2
The ratio length of playgrounds on the street: %6
-------total length of street occupied by the markets, houses or offices-------
total lengths of HMO's: 28
-------street silhouette-------
-+++-
*   *
*   *      -+++-
*   -++++-*   *
*             *
*             +++++--+++++-
*                         *
length of the playground: 2
The market closing at: 21:30
The market closing at: 22:00
length of the playground: 2
Job Type of the office: finance
Job Type of the office: law
Owner of the house: emir
```