**[LRU缓存实现(Java)](http://www.cnblogs.com/lzrabbit/p/3734850.html)**

* [LRU Cache的LinkedHashMap实现](http://www.cnblogs.com/lzrabbit/p/3734850.html#f1)
* [LRU Cache的链表+HashMap实现](http://www.cnblogs.com/lzrabbit/p/3734850.html#f2)
* [LinkedHashMap的FIFO实现](http://www.cnblogs.com/lzrabbit/p/3734850.html#f3)
* [调用示例](http://www.cnblogs.com/lzrabbit/p/3734850.html#f4)

LRU是Least Recently Used 的缩写，翻译过来就是“最近最少使用”，LRU缓存就是使用这种原理实现，简单的说就是缓存一定量的数据，当超过设定的阈值时就把一些过期的数据删除掉，比如我们缓存10000条数据，当数据小于10000时可以随意添加，当超过10000时就需要把新的数据添加进来，同时要把过期数据删除，以确保我们最大缓存10000条，那怎么确定删除哪条过期数据呢，采用LRU算法实现的话就是将最老的数据删掉，废话不多说，下面来说下Java版的LRU缓存实现

Java里面实现LRU缓存通常有两种选择，一种是使用LinkedHashMap，一种是自己设计数据结构，使用链表+HashMap

**LRU Cache的LinkedHashMap实现**

LinkedHashMap自身已经实现了顺序存储，默认情况下是按照元素的添加顺序存储，也可以启用按照访问顺序存储，即最近读取的数据放在最前面，最早读取的数据放在最后面，然后它还有一个判断是否删除最老数据的方法，默认是返回false，即不删除数据，我们使用LinkedHashMap实现LRU缓存的方法就是对LinkedHashMap实现简单的扩展，扩展方式有两种，一种是inheritance，一种是delegation，具体使用什么方式看个人喜好

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//LinkedHashMap的一个构造函数，当参数accessOrder为true时，即会按照访问顺序排序，最近访问的放在最前，最早访问的放在后面

public LinkedHashMap(int initialCapacity, float loadFactor, boolean accessOrder) {

super(initialCapacity, loadFactor);

this.accessOrder = accessOrder;

}

//LinkedHashMap自带的判断是否删除最老的元素方法，默认返回false，即不删除老数据

//我们要做的就是重写这个方法，当满足一定条件时删除老数据

protected boolean removeEldestEntry(Map.Entry<K,V> eldest) {

return false;

}

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**LRU缓存LinkedHashMap(inheritance)实现**

采用inheritance方式实现比较简单，而且实现了Map接口，在多线程环境使用时可以使用 Collections.synchronizedMap()方法实现线程安全操作

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package cn.lzrabbit.structure.lru;

import java.util.LinkedHashMap;

import java.util.Map;

/\*\*

\* Created by liuzhao on 14-5-15.

\*/

public class LRUCache2<K, V> extends LinkedHashMap<K, V> {

private final int MAX\_CACHE\_SIZE;

public LRUCache2(int cacheSize) {

super((int) Math.ceil(cacheSize / 0.75) + 1, 0.75f, true);

MAX\_CACHE\_SIZE = cacheSize;

}

@Override

protected boolean removeEldestEntry(Map.Entry eldest) {

return size() > MAX\_CACHE\_SIZE;

}

@Override

public String toString() {

StringBuilder sb = new StringBuilder();

for (Map.Entry<K, V> entry : entrySet()) {

sb.append(String.format("%s:%s ", entry.getKey(), entry.getValue()));

}

return sb.toString();

}

}

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 这样算是比较标准的实现吧，实际使用中这样写还是有些繁琐，更实用的方法时像下面这样写，省去了单独见一个类的麻烦

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final int cacheSize = 100;

Map<String, String> map = new LinkedHashMap<String, String>((int) Math.ceil(cacheSize / 0.75f) + 1, 0.75f, true) {

@Override

protected boolean removeEldestEntry(Map.Entry<String, String> eldest) {

return size() > cacheSize;

}

};

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**LRU缓存LinkedHashMap(delegation)实现**

delegation方式实现更加优雅一些，但是由于没有实现Map接口，所以线程同步就需要自己搞定了

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package cn.lzrabbit.structure.lru;

import java.util.LinkedHashMap;

import java.util.Map;

import java.util.Set;

/\*\*

\* Created by liuzhao on 14-5-13.

\*/

public class LRUCache3<K, V> {

private final int MAX\_CACHE\_SIZE;

private final float DEFAULT\_LOAD\_FACTOR = 0.75f;

LinkedHashMap<K, V> map;

public LRUCache3(int cacheSize) {

MAX\_CACHE\_SIZE = cacheSize;

//根据cacheSize和加载因子计算hashmap的capactiy，+1确保当达到cacheSize上限时不会触发hashmap的扩容，

int capacity = (int) Math.ceil(MAX\_CACHE\_SIZE / DEFAULT\_LOAD\_FACTOR) + 1;

map = new LinkedHashMap(capacity, DEFAULT\_LOAD\_FACTOR, true) {

@Override

protected boolean removeEldestEntry(Map.Entry eldest) {

return size() > MAX\_CACHE\_SIZE;

}

};

}

public synchronized void put(K key, V value) {

map.put(key, value);

}

public synchronized V get(K key) {

return map.get(key);

}

public synchronized void remove(K key) {

map.remove(key);

}

public synchronized Set<Map.Entry<K, V>> getAll() {

return map.entrySet();

}

public synchronized int size() {

return map.size();

}

public synchronized void clear() {

map.clear();

}

@Override

public String toString() {

StringBuilder sb = new StringBuilder();

for (Map.Entry entry : map.entrySet()) {

sb.append(String.format("%s:%s ", entry.getKey(), entry.getValue()));

}

return sb.toString();

}

}

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**LRU Cache的链表+HashMap实现**

 注：此实现为非线程安全，若在多线程环境下使用需要在相关方法上添加synchronized以实现线程安全操作

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package cn.lzrabbit.structure.lru;

import java.util.HashMap;

/\*\*

\* Created by liuzhao on 14-5-12.

\*/

public class LRUCache1<K, V> {

private final int MAX\_CACHE\_SIZE;

private Entry first;

private Entry last;

private HashMap<K, Entry<K, V>> hashMap;

public LRUCache1(int cacheSize) {

MAX\_CACHE\_SIZE = cacheSize;

hashMap = new HashMap<K, Entry<K, V>>();

}

public void put(K key, V value) {

Entry entry = getEntry(key);

if (entry == null) {

if (hashMap.size() >= MAX\_CACHE\_SIZE) {

hashMap.remove(last.key);

removeLast();

}

entry = new Entry();

entry.key = key;

}

entry.value = value;

moveToFirst(entry);

hashMap.put(key, entry);

}

public V get(K key) {

Entry<K, V> entry = getEntry(key);

if (entry == null) return null;

moveToFirst(entry);

return entry.value;

}

public void remove(K key) {

Entry entry = getEntry(key);

if (entry != null) {

if (entry.pre != null) entry.pre.next = entry.next;

if (entry.next != null) entry.next.pre = entry.pre;

if (entry == first) first = entry.next;

if (entry == last) last = entry.pre;

}

hashMap.remove(key);

}

private void moveToFirst(Entry entry) {

if (entry == first) return;

if (entry.pre != null) entry.pre.next = entry.next;

if (entry.next != null) entry.next.pre = entry.pre;

if (entry == last) last = last.pre;

if (first == null || last == null) {

first = last = entry;

return;

}

entry.next = first;

first.pre = entry;

first = entry;

entry.pre = null;

}

private void removeLast() {

if (last != null) {

last = last.pre;

if (last == null) first = null;

else last.next = null;

}

}

private Entry<K, V> getEntry(K key) {

return hashMap.get(key);

}

@Override

public String toString() {

StringBuilder sb = new StringBuilder();

Entry entry = first;

while (entry != null) {

sb.append(String.format("%s:%s ", entry.key, entry.value));

entry = entry.next;

}

return sb.toString();

}

class Entry<K, V> {

public Entry pre;

public Entry next;

public K key;

public V value;

}

}

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**LinkedHashMap的FIFO实现**

FIFO是First Input First Output的缩写，也就是常说的先入先出，默认情况下LinkedHashMap就是按照添加顺序保存，我们只需重写下removeEldestEntry方法即可轻松实现一个FIFO缓存，简化版的实现代码如下

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final int cacheSize = 5;

LinkedHashMap<Integer, String> lru = new LinkedHashMap<Integer, String>() {

@Override

protected boolean removeEldestEntry(Map.Entry<Integer, String> eldest) {

return size() > cacheSize;

}

};

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**调用示例**

测试代码

http://images.cnblogs.com/OutliningIndicators/ExpandedBlockStart.gif

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package cn.lzrabbit.structure.lru;

import cn.lzrabbit.ITest;

import java.util.LinkedHashMap;

import java.util.Map;

/\*\*

\* Created by liuzhao on 14-5-15.

\*/

public class LRUCacheTest {

public static void main(String[] args) throws Exception {

System.out.println("start...");

lruCache1();

lruCache2();

lruCache3();

lruCache4();

System.out.println("over...");

}

static void lruCache1() {

System.out.println();

System.out.println("===========================LRU 链表实现===========================");

LRUCache1<Integer, String> lru = new LRUCache1(5);

lru.put(1, "11");

lru.put(2, "11");

lru.put(3, "11");

lru.put(4, "11");

lru.put(5, "11");

System.out.println(lru.toString());

lru.put(6, "66");

lru.get(2);

lru.put(7, "77");

lru.get(4);

System.out.println(lru.toString());

System.out.println();

}

static <T> void lruCache2() {

System.out.println();

System.out.println("===========================LRU LinkedHashMap(inheritance)实现===========================");

LRUCache2<Integer, String> lru = new LRUCache2(5);

lru.put(1, "11");

lru.put(2, "11");

lru.put(3, "11");

lru.put(4, "11");

lru.put(5, "11");

System.out.println(lru.toString());

lru.put(6, "66");

lru.get(2);

lru.put(7, "77");

lru.get(4);

System.out.println(lru.toString());

System.out.println();

}

static void lruCache3() {

System.out.println();

System.out.println("===========================LRU LinkedHashMap(delegation)实现===========================");

LRUCache3<Integer, String> lru = new LRUCache3(5);

lru.put(1, "11");

lru.put(2, "11");

lru.put(3, "11");

lru.put(4, "11");

lru.put(5, "11");

System.out.println(lru.toString());

lru.put(6, "66");

lru.get(2);

lru.put(7, "77");

lru.get(4);

System.out.println(lru.toString());

System.out.println();

}

static void lruCache4() {

System.out.println();

System.out.println("===========================FIFO LinkedHashMap默认实现===========================");

final int cacheSize = 5;

LinkedHashMap<Integer, String> lru = new LinkedHashMap<Integer, String>() {

@Override

protected boolean removeEldestEntry(Map.Entry<Integer, String> eldest) {

return size() > cacheSize;

}

};

lru.put(1, "11");

lru.put(2, "11");

lru.put(3, "11");

lru.put(4, "11");

lru.put(5, "11");

System.out.println(lru.toString());

lru.put(6, "66");

lru.get(2);

lru.put(7, "77");

lru.get(4);

System.out.println(lru.toString());

System.out.println();

}

}

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运行结果

http://images.cnblogs.com/OutliningIndicators/ExpandedBlockStart.gif

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"C:\Program Files (x86)\Java\jdk1.6.0\_10\bin\java" -Didea.launcher.port=7535 "-Didea.launcher.bin.path=C:\Program Files (x86)\JetBrains\IntelliJ IDEA 13.0.2\bin" -Dfile.encoding=UTF-8 -classpath "C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\charsets.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\deploy.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\javaws.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\jce.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\jsse.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\management-agent.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\plugin.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\resources.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\rt.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\ext\dnsns.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\ext\localedata.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\ext\sunjce\_provider.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\ext\sunmscapi.jar;C:\Program Files (x86)\Java\jdk1.6.0\_10\jre\lib\ext\sunpkcs11.jar;D:\SVN\projects\Java\Java.Algorithm\target\test-classes;D:\SVN\projects\Java\Java.Algorithm\target\classes;C:\Program Files (x86)\JetBrains\IntelliJ IDEA 13.0.2\lib\idea\_rt.jar" com.intellij.rt.execution.application.AppMain Main

start...

===========================LRU 链表实现===========================

5:11 4:11 3:11 2:11 1:11

4:11 7:77 2:11 6:66 5:11

===========================LRU LinkedHashMap(inheritance)实现===========================

1:11 2:11 3:11 4:11 5:11

5:11 6:66 2:11 7:77 4:11

===========================LRU LinkedHashMap(delegation)实现===========================

1:11 2:11 3:11 4:11 5:11

5:11 6:66 2:11 7:77 4:11

===========================FIFO LinkedHashMap默认实现===========================

{1=11, 2=11, 3=11, 4=11, 5=11}

{3=11, 4=11, 5=11, 6=66, 7=77}

over...

Process finished with exit code 0

[复制代码](javascript:void(0);)