

原 LIRe 源代码分析 4：建立索引（DocumentBuilder）[以颜色布局为例]

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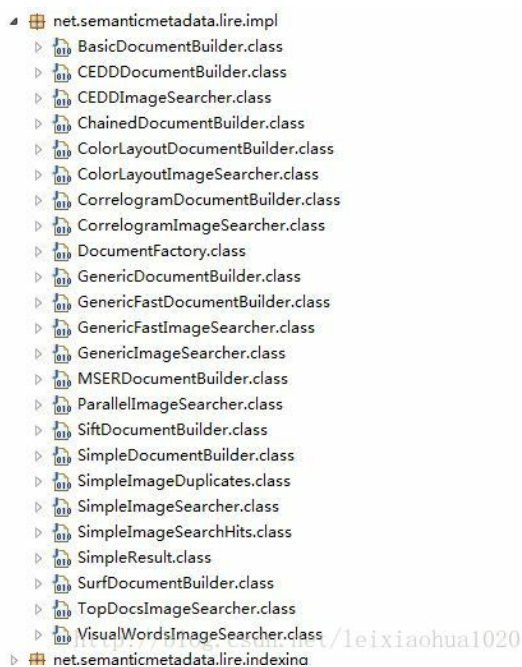
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前几篇文章介绍了LIRe 的基本接口。现在来看一看它的实现部分，本文先来看一看建立索引（DocumentBuilder）部分。不同的特征向量提取方法的建立索引的类各不相同，它们都位于"net.semanticmetadata.lire.impl"中，如下图所示：



由图可见，每一种方法对应一个DocumentBuilder和一个ImageSearcher，类的数量非常的多，无法一一分析。在这里仅分析一个比较有代表性的：颜色布局。

颜色直方图建立索引的类的名称是ColorLayoutDocumentBuilder，该类继承了AbstractDocumentBuilder，它的源代码如下所示：

```

1.  /*
2.   * This file is part of the LIRe project: http://www.semanticmetadata.net/lire
3.   * LIRe is free software; you can redistribute it and/or modify
4.   * it under the terms of the GNU General Public License as published by
5.   * the Free Software Foundation; either version 2 of the License, or
6.   * (at your option) any later version.
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8.   * LIRe is distributed in the hope that it will be useful,
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10.  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
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13.  * You should have received a copy of the GNU General Public License
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15.  * Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA
16.  *
17.  * We kindly ask you to refer the following paper in any publication mentioning Lire:
18.  *
19.  * Lux Mathias, Savvas A. Chatzichristofis. Lire: Lucene Image Retrieval 欵
20.  * An Extensible Java CBIR Library. In proceedings of the 16th ACM International
21.  * Conference on Multimedia, pp. 1085-1088, Vancouver, Canada, 2008
22.  *
23.  * http://doi.acm.org/10.1145/1459359.1459577
24.  *
25.  * Copyright statement:
26.  * -----
27.  * (c) 2002-2011 by Mathias Lux (mathias@juggle.at)
28.  * http://www.semanticmetadata.net/lire
29.  */
30. package net.semanticmetadata.lire.impl;
31.
32. import net.semanticmetadata.lire.AbstractDocumentBuilder;
33. import net.semanticmetadata.lire.DocumentBuilder;
34. import net.semanticmetadata.lire.imageanalysis.ColorLayout;
35. import net.semanticmetadata.lire.utils.ImageUtils;
36. import org.apache.lucene.document.Document;
37. import org.apache.lucene.document.Field;
38.
39. import java.awt.image.BufferedImage;
40. import java.util.logging.Logger;
41.
42. /**
43.  * Provides a faster way of searching based on byte arrays instead of Strings. The method
44.  * {@link net.semanticmetadata.lire.imageanalysis.ColorLayout#getBytesRepresentation()} is used
45.  * to generate the signature of the descriptor much faster.
46.  * User: Mathias Lux, mathias@juggle.at
47.  * Date: 30.06.2011
48.  */
49. public class ColorLayoutDocumentBuilder extends AbstractDocumentBuilder {
50.     private Logger logger = Logger.getLogger(getClass().getName());
51.     public static final int MAX_IMAGE_DIMENSION = 1024;
52.
53.     public Document createDocument(BufferedImage image, String identifier) {
54.         assert (image != null);
55.         BufferedImage bimg = image;
56.         // Scaling image is especially with the correlogram features very important!
57.         // All images are scaled to guarantee a certain upper limit for indexing.
58.         if (Math.max(image.getHeight(), image.getWidth()) > MAX_IMAGE_DIMENSION) {
59.             bimg = ImageUtils.scaleImage(image, MAX_IMAGE_DIMENSION);
60.         }
61.         Document doc = null;
62.         logger.finer("Starting extraction from image [ColorLayout - fast].");
63.         ColorLayout vd = new ColorLayout();
64.         vd.extract(bimg);
65.         logger.fine("Extraction finished [ColorLayout - fast].");
66.
67.         doc = new Document();
68.         doc.add(new Field(DocumentBuilder.FIELD_NAME_COLORLAYOUT_FAST, vd.getBytesRepresentation()));
69.         if (identifier != null)
70.             doc.add(new Field(DocumentBuilder.FIELD_NAME_IDENTIFIER, identifier, Field.Store.YES, Field.Index.NOT_ANALYZED));
71.
72.         return doc;
73.     }
74. }

```

从源代码来看，其实主要就一个函数：createDocument(BufferedImage image, String identifier)，该函数的流程如下所示：

- 1.如果输入的图像分辨率过大（在这里是大于1024），则将图像缩小。
- 2.新建一个ColorLayout类型的对象vd。
- 3.调用vd.extract()提取特征向量。
- 4.调用vd.getBytesRepresentation()获得特征向量。
- 5.将获得的特征向量加入Document，返回Document。

其实其他方法的DocumentBuilder的实现和颜色直方图的DocumentBuilder差不多。例如CEDDDocumentBuilder的源代码如下所示：

```
[java]
1.  /*
2.   * This file is part of the LIRE project: http://www.semanticmetadata.net/lire
3.   * LIRE is free software; you can redistribute it and/or modify
4.   * it under the terms of the GNU General Public License as published by
5.   * the Free Software Foundation; either version 2 of the License, or
6.   * (at your option) any later version.
7.   *
8.   * LIRE is distributed in the hope that it will be useful,
9.   * but WITHOUT ANY WARRANTY; without even the implied warranty of
10.  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
11.  * GNU General Public License for more details.
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16.  *
17.  * We kindly ask you to refer the following paper in any publication mentioning Lire:
18.  *
19.  * Lux Mathias, Savvas A. Chatzichristofis. Lire: Lucene Image Retrieval 欽
20.  * An Extensible Java CBIR Library. In proceedings of the 16th ACM International
21.  * Conference on Multimedia, pp. 1085-1088, Vancouver, Canada, 2008
22.  *
23.  * http://doi.acm.org/10.1145/1459359.1459577
24.  *
25.  * Copyright statement:
26.  * ~~~~~
27.  * (c) 2002-2011 by Mathias Lux (mathias@juggle.at)
28.  * http://www.semanticmetadata.net/lire
29.  */
30. package net.semanticmetadata.lire.impl;
31.
32. import net.semanticmetadata.lire.AbstractDocumentBuilder;
33. import net.semanticmetadata.lire.DocumentBuilder;
34. import net.semanticmetadata.lire.imageanalysis.CEDD;
35. import net.semanticmetadata.lire.utils.ImageUtils;
36. import org.apache.lucene.document.Document;
37. import org.apache.lucene.document.Field;
38.
39. import java.awt.image.BufferedImage;
40. import java.util.logging.Logger;
41.
42. /**
43.  * Provides a faster way of searching based on byte arrays instead of Strings. The method
44.  * {@link net.semanticmetadata.lire.imageanalysis.CEDD#getBytesRepresentation()} is used
45.  * to generate the signature of the descriptor much faster.
46.  * User: Mathias Lux, mathias@juggle.at
47.  * Date: 12.03.2010
48.  * Time: 13:21:35
49.  *
50.  * @see GenericFastDocumentBuilder
51.  * @deprecated use GenericFastDocumentBuilder instead.
52.  */
53. public class CEDDDocumentBuilder extends AbstractDocumentBuilder {
54.     private Logger logger = Logger.getLogger(getClass().getName());
55.     public static final int MAX_IMAGE_DIMENSION = 1024;
56.
57.     public Document createDocument(BufferedImage image, String identifier) {
58.         assert (image != null);
59.         BufferedImage bimg = image;
60.         // Scaling image is especially with the correlogram features very important!
61.         // All images are scaled to guarantee a certain upper limit for indexing.
62.         if (Math.max(image.getHeight(), image.getWidth()) > MAX_IMAGE_DIMENSION) {
63.             bimg = ImageUtils.scaleImage(image, MAX_IMAGE_DIMENSION);
64.         }
65.         Document doc = null;
66.         logger.finer("Starting extraction from image [CEDD - fast].");
67.         CEDD vd = new CEDD();
68.         vd.extract(bimg);
69.         logger.fine("Extraction finished [CEDD - fast].");
70.
71.         doc = new Document();
72.         doc.add(new Field(DocumentBuilder.FIELD_NAME_CEDD, vd.getBytesRepresentation()));
73.         if (identifier != null)
74.             doc.add(new Field(DocumentBuilder.FIELD_NAME_IDENTIFIER, identifier, Field.Store.YES, Field.Index.NOT_ANALYZED));
75.
76.         return doc;
77.     }
78. }
```

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