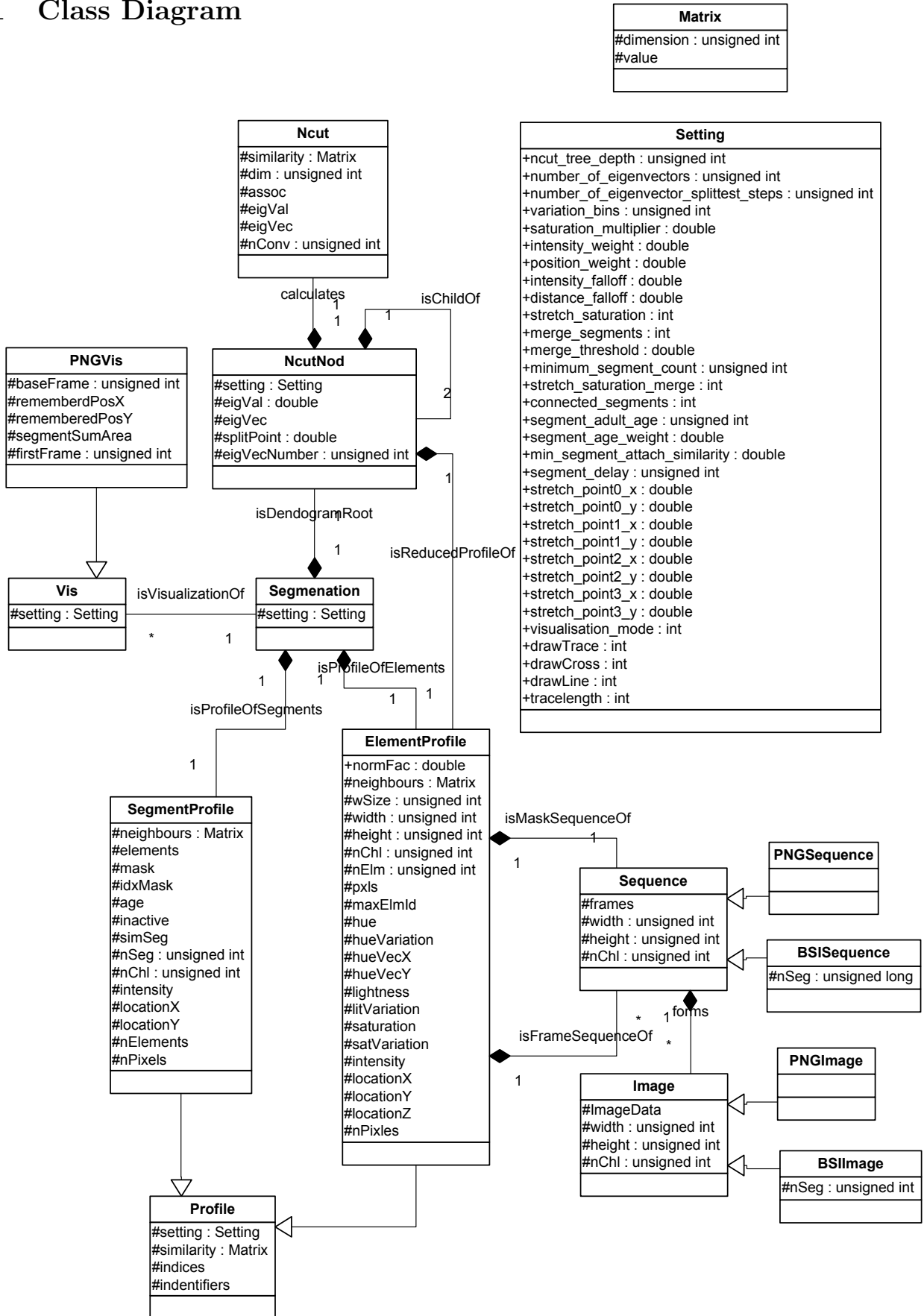


# Normalized Cut With MST Class Diagram

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# 1 Class Diagram



## 2 Description

### 2.1 Class BSIIImage

**BSIIImage** adds BSI-specific load and functionality to its base class **Image**. It also provides information about the number of segments and the maximum label number stored.

Author: Stefan Fiel

### 2.2 Class BSISequence

A **BSISequence** keeps track of the total number of segments in the sequence. Only images of type **BSIIImage** are allowed in a **BSISequence**.

Author: Stefan Fiel

### 2.3 Class ElementProfile

**ElementProfile** handles the similarity information of the elements in a frame window. Segmentation is only done on a few frames (= frame window) of the sequence. The frame window is moved over the whole sequence to get a complete segmentation. An **ElementProfile** is used to store information about the elements in one frame window (= the frames that are used for one segmentation step). It is also used to calculate the similarity between those elements, which is then stored in the similarity matrix. **ElementProfile** administers the frame and mask sequences.

Author: Paul Guerrero

### 2.4 Class Image

Represents a two-dimensional image.

**Image** is the base class for **PNGImage** and **BSIIImage**. **Image** is a small wrapper around an STL vector containing the raw image values, providing additional information, such as width and height, and more convenient image element access functions.

Author: Stefan Fiel

### 2.5 Class Matrix

**Matrix** is a simple quadratic matrix class containing all operations needed by the **ncut** library.

Author: Stefan Fiel

### 2.6 Class Ncut

**Ncut** represents one **ncut** of a similarity matrix.

This class is used by **NcutNode** to calculate the **ncuts** and construct the tree accordingly. Do not use **Ncut** directly, use the functions provided by the class **Segmentation**.

Author: Paul Guerrero

## 2.7 Class NcutNode

**NcutNode** is one Node in the ncut dendrogram.

A node represents one bipartition of a segment into two halves. The root **NcutNode** bipartitions (splits) the whole image. Each Node may have two child nodes which represent the partitions of the two resulting segments. There are no child nodes if the resulting segments are not partitioned any further. An eigenvector, calculated by the class **Ncut**, is used as an indicator vector to bipartition a segment. The node does not necessarily contain a new ncut, an eigenvector of an ncut calculated in a level closer to the root may also be used. Segmentation is not performed on pixels, but on elements, for example the segments of a pre-segmentation. Elements have global identifiers and local indices. There is a map from element identifiers to element indices in each **NcutNode**. This map is also a list of elements that are part of the current segment. Do not use **NcutNode** directly, construct the ncut dendrogram using the functions provided by the class **Segmentation**.

Author: Paul Guerrero

## 2.8 Class PNGImage

**PNGImage** adds PNG-specific load and save functionality to its base class **Image**.

Author: Stefan Fiel

## 2.9 Class PNGSequence

**PNGSequence** adds PNG-specific save functionality to its base class **Sequence**. Only images of type **PNGImage** are allowed in a **PNGSequence**

Author: Stefan Fiel

## 2.10 Class PNGVis

Visualization of a segmentation using PNG images.

This class creates a visualization of a given segmentation using png images. Different final segments are assigned different colours. Optionally traces can be drawn for the tracked segments.

Author: Stefan Fiel

## 2.11 Class Profile

Profile handles similarity information of one frame window.

The base class for **ElementProfile** and **SegmentProfile**. A Profile contains Information about its associated type. Segmentation is done on Elements (e.g. from a prior segmentation step) using information stored in an **ElementProfile** and the information of the resulting segments is stored in a **SegmentProfile**. Elements and segments are identified by numbers unique in all of the sequence. To get the index used for an element or a segment in a Profile (e.g. the index of this element in the similarity matrix) use the function `idx(elementID)` of this class.

Author: Paul Guerrero

## 2.12 Class Segmentation

Segmentation represents the complete segmentation of the elements in an image sequence.

The data structure used for segmentation is a dendrogram consisting of **NcutNodes**. Segmentation contains a pointer to the root **NcutNode**. Each **NcutNode** represents a bipartition of a part of the image into two halves. Each **NcutNode** may have two child **NcutNodes** representing the further bipartition of

each of the two halves. The dendogram has a maximum depth and a desired number of eigenvectors per ncut. Use the function `push` of this class to push further images and corresponding masks for segmentation.

Author: Paul Guerrero

### 2.13 Class `SegmentProfile`

`SegmentProfile` handles the similarity information of the segments in a frame window.

A `SegmentProfile` is used to store information about the segments resulting of the segmentation of one frame window. `SegmentProfile` is also used to determine the connections of segments from this frame window to segments from the last frame window. Throughout the sequence, segments are connected through their identifiers. Segments that appear in consecutive frames and have the same identifiers are to be considered the same segment.

Author: Paul Guerrero

### 2.14 Class `Sequence`

`Sequence` is the base class for `PNGSequence` and `BSISSequence`. It stores pointers to a sequence images. `Sequence` is a small wrapper around a STL `deque` containing pointers to all `Sequence` s in the sequence, providing additional information, such as width, height and length, and special sequence manipulation functions.

Author: Stefan Fiel

### 2.15 Class `Setting`

This class stores all parameters. It is referenced by every class. If parameters are not given in the ini file default values are used.

Author: Stefan Fiel

### 2.16 Class `Vis`

Visualization of a `Segmenation`. This class is the abstract class for all visualizations.

Author: Stefan Fiel