Lung Anatomy + Particle Deposition (lapd) Mouse Archive
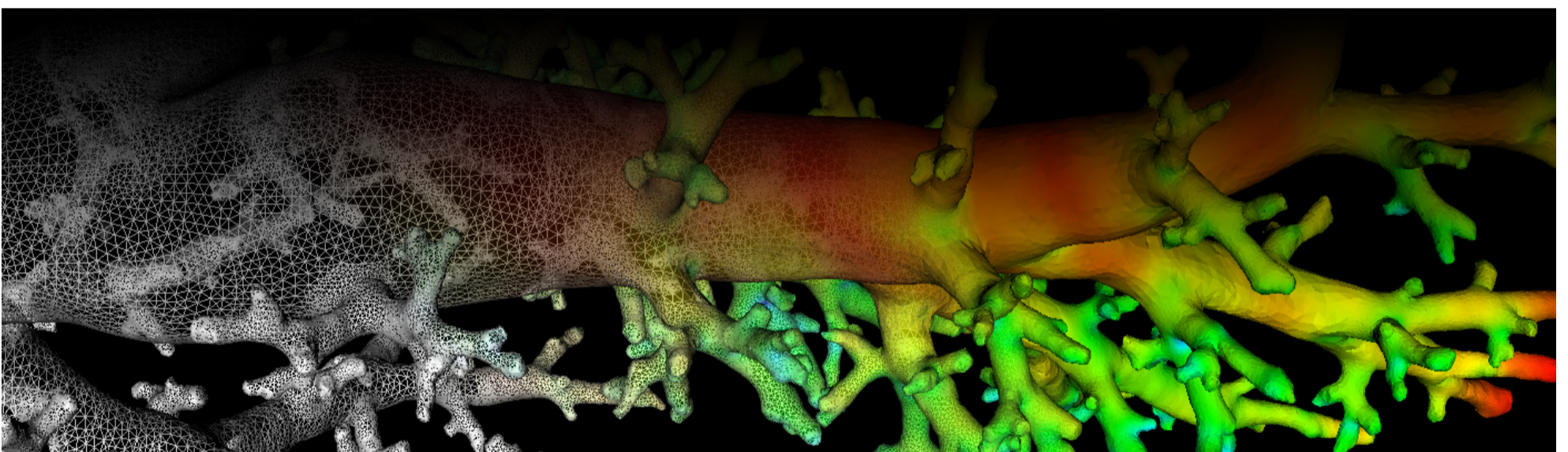
for Modeling and Computational Toxicology

Table *_AirwayTreeTable.csv

Tabular representation of airway tree.

The airway tree can be represented as a set of connected airway segments approximated by cylindrical elements. This representation can be stored as a .csv table, which can be read with many software packages. Each row in ***_AirwayTreeTable.csv** contains the following information for an airway segment:

- **label:** Identifier of the airway segment; the root (trachea) has label 1.
- **parent:** Label of the parent segment; the root (trachea) has no parent.
- **length:** Length of the cylinder.
- **radius:** Radius of the cylinder.
- **name:** Name of airway branch this segment belongs to, if it belongs to any labeled airway branch, otherwise NaN.
- **centroid*:** 3d coordinate of the cylinder center.
- **direction*:** 3d normalized tangent direction of the cylinder pointing in the distal direction of the segment.

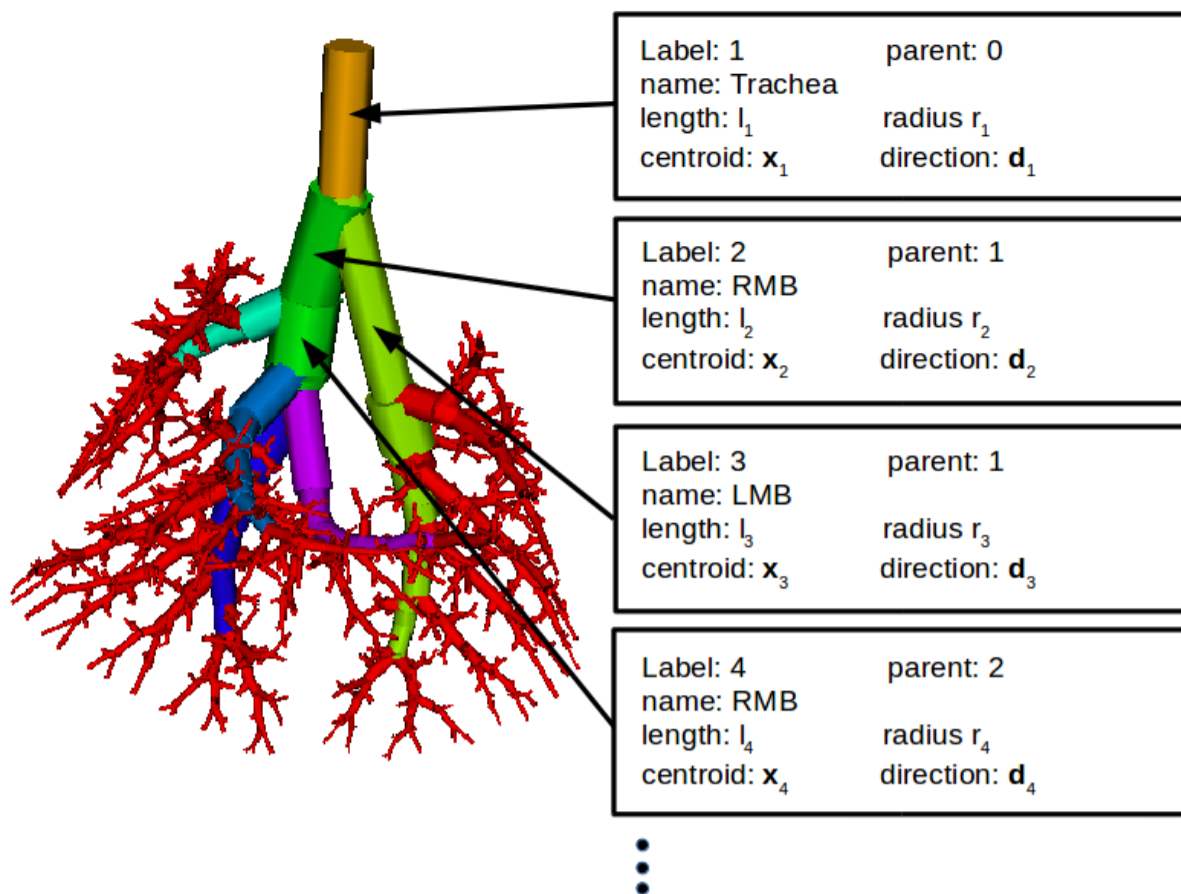| label	parent	length	radius
1	0	3.?.9	0.633658
2	1	78	0.621015
3	1		0.853296
4			0.?66713
5		?672	?69
6		?68?	?01
7		?.?1?	??
8		0.650??	?294.??
9	4	?0.49?65?	0.38??52

Fig. 1: Structural information stored in ***_AirwayTreeTable.csv**

The labels/IDs corrospond to the IDs utilized to identify airway segments in files *_AirwayTree.meta, *_AirwaySegments.nrrd, and *_AirwaySegments.vtk. See Airway Tree Label Correspondence for more information. *_AirwayTree.meta contains very similar information as ***_AirwayTreeTable.csv** and describes each airway segment in more detail.

Airway Segments that are part of main airway branches are assigned names (Fig. 2): **Trachea**, left main bronchus (**LMB**), right main bronchus (**RMB**), caudal right main bronchus (**CaRMB**), middle right main bronchus (**MiRMB**), cranial right main bronchus (**CrRMB**), and accessory right main bronchus (**AcRMB**).
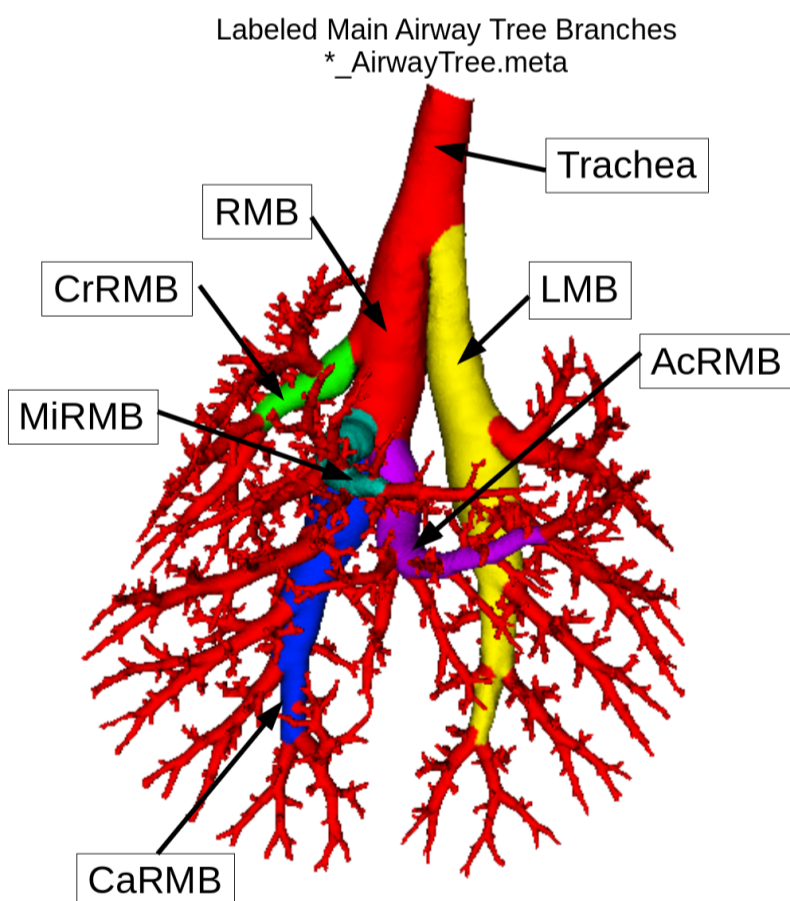

Fig. 2: Major airway branches with assigned names

Note on branching and gravitational angles: Branching and gravitational can be obtained easily based on the segment's direction vectors. The branching angle is the angle between a segment's direction vector and it's parent's direction vector. The gravitation angle is the angle between a segment's direction vector and the gravity direction vector. All models and images in the lapdMouse archive use an LPS (left-posterior-superior) coordinate system with the gravity direction vector being (0,-1,0). The code example below includes a reference implementation.

Code Example

This examples shows how to load and work with ***_AirwayTreeTable.csv**. It explains the organization of the stored information, shows how to create simple visualizations, identify airway segments with their children, paths to the root of the airway tree etc.

AirwayTreeTable.ipynb hosted with ❤ by GitHub   view raw

Tabulated Airway Tree

The following example demonstrates how to work with the structural airway trees' representations in `*_AirwayTreeTable.csv`

We utilize `pandas` for representation of data tables and `matplotlib` for visualization of data.

```
In [1]:  import os, pandas, matplotlib, numpy
         import matplotlib.pyplot as plt
```

First, we download an example file from the `lapdMouse` data archive using the `lapdMouseUtils` module which is part of the lapdMousePythonExamples. We can then load the `.csv` file with `pandas`.

```
In [2]:  from lapdMouseUtils import DBUtil
         DBUtil().downloadFile('m01/m01_AirwayTreeTable.csv')
         df = pandas.read_csv('m01/m01_AirwayTreeTable.csv', index_col='label')
         df.head(10)
```

Out[2]:

label	parent	length	radius	name	centroidX	centroidY	centroidZ	directionX	directionY	directi...
1	0	3.857900	0.633658	Trachea	15.6271	12.4944	21.1153	-0.063817	0.108764	-0.992...

Related Data Structures

[*_AirwayTree.meta](#) │ [*_AirwaySegments.nrrd](#) │ [*_AirwaySegments.vtk](#) │ [*_AirwaySegmentsDeposition.csv](#)

Related Code Examples

[AirwayTreeTable.ipynb](#) │ [simplifyTree.cpp](#)

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