Introducing Loopedia

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Project in collaboration with
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Matter To The Deepest
Ustroń
September 2015

Goals of Loopedia

- Public database of loop integrals
- Community involvement (desired) for input
- Result of integral and reference
- Easy search (properties, categories, ...)

First Version of Loopedia

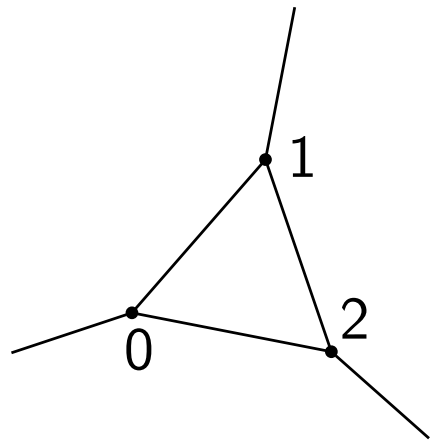
The first (current) version of the Loopedia website can be found at:
`http://www.mpp.mpg.de/~papara/loopediatest`

- Input:
  - Nickel Index
    or
  - Adjacency List
- Output: Generated Graph (with Neato and GraphState)

Construction of the Nickel Index

Nickel Index: e12| e2| e|

- Number the vertices starting with zero
- Nodes that have connection with zeroth vertex
- Nodes that have connection with first node (without already established connections)
- ...



Try all vertex numberings → minimal **Nickel Index**
More details in [Batkovich et al. (arXiv:1409.8227)]

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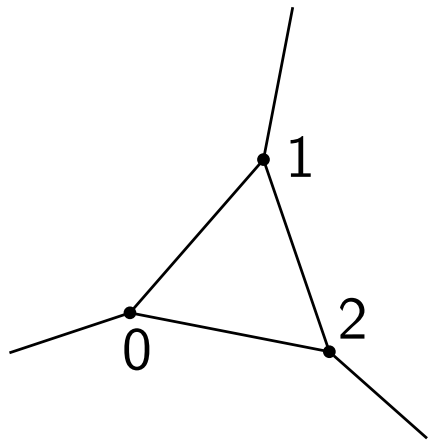

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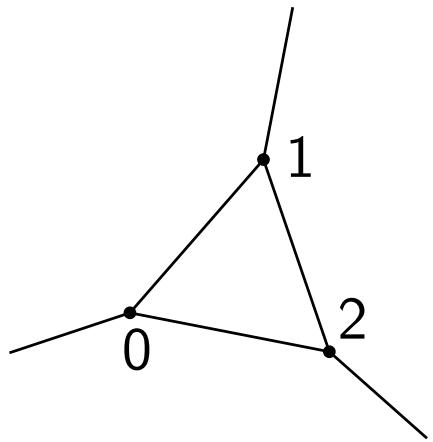

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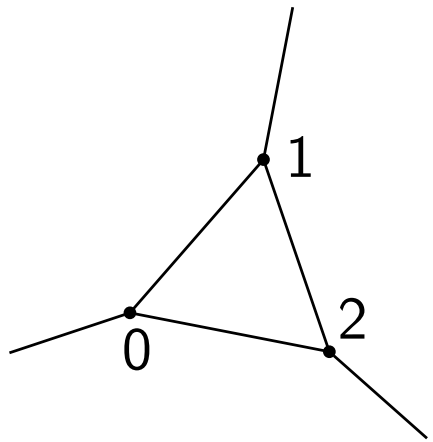

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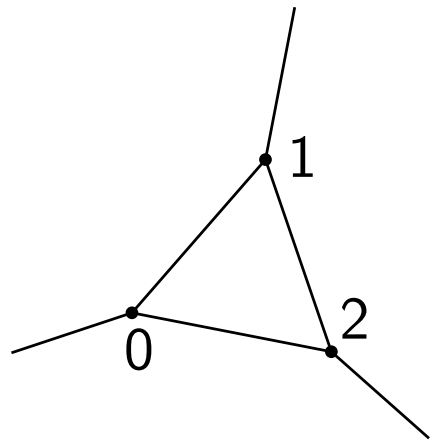

Try all vertex numberings $\rightarrow$ minimal **Nickel Index**
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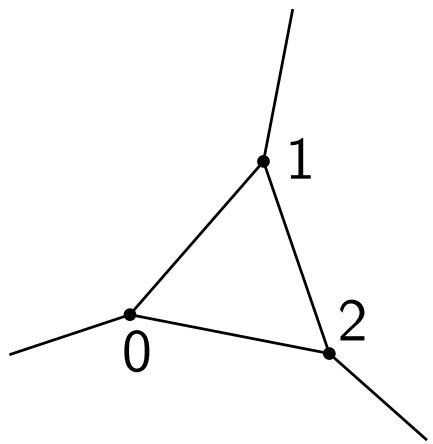
Construction of the Adjacency List

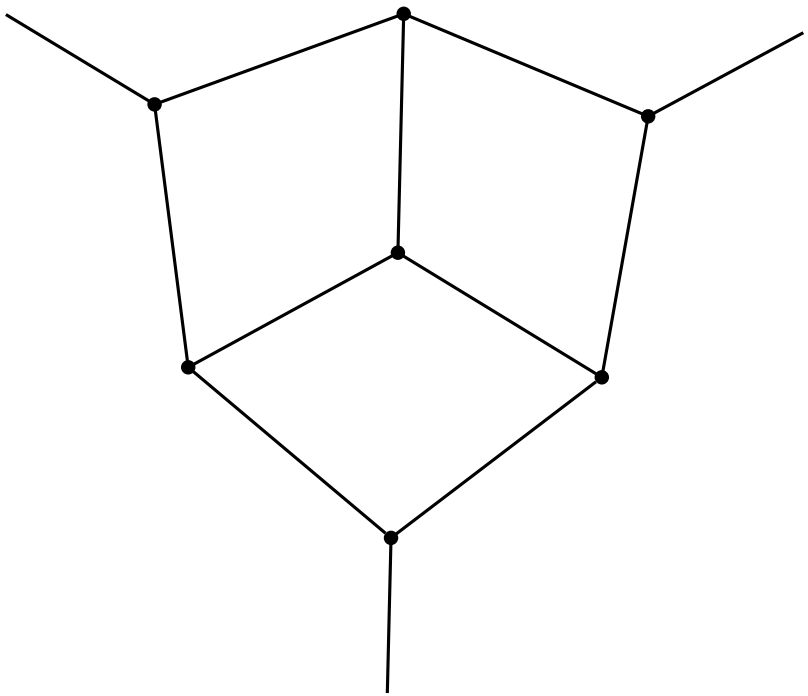
Adjacency List:
"[-1, 0], [0, 1], [0, 2], [-1, 1], [1, 2], [2, -1]"



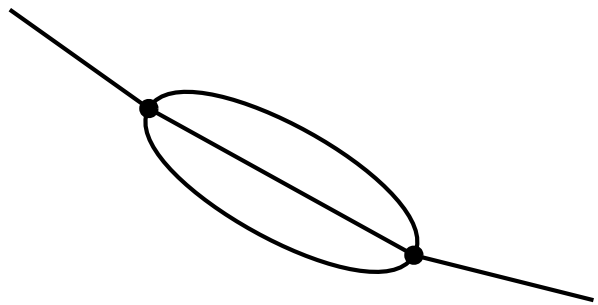
Rules:

- Number vertices with non-negative integers
- List all connections (lines)
- External connections (external legs) are **all** denoted with "-1"

Further Examples



Nickel: $e12|34|35|6|e6|e6||$
Adjacency list:
$[-1,1],[1,2],[1,4],[2,3],[3,4],$
$[4,6],[3,5],[2,7],[6,-1],[6,5],$
$[5,7],[7,-1]$



Nickel: $e111|e|$
Adjacency list:
$[-1,1],[1,2],[1,2],[1,2],[2,-1]$

Nickel | Loopedia Test - Mozilla Firefox (Private Browsing)

Nickel | Loopedia …

https://www.mpp.mpg.de/~papara/loopediatest/

Search

Loopedia Test

Home

Nickel

The Nickel index "e12|e23|e3|e|" is correct!

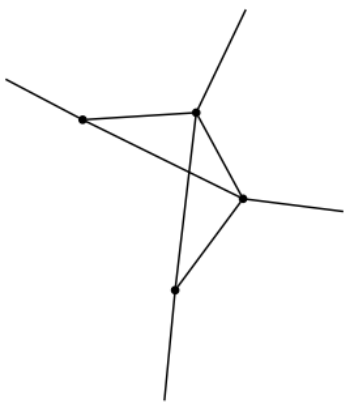
Help

Choose if you want to provide a Nickel Index or an Adjacency List

- (•) Nickel Index
- ( ) Adjacency List

Nickel Index

e12|e23|e3|e|



Click Here!

Nickel | Loopedia Test - Mozilla Firefox (Private Browsing)

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Loopedia Test

Home

Nickel

Help

Choose if you want to provide a Nickel Index or an Adjacency List

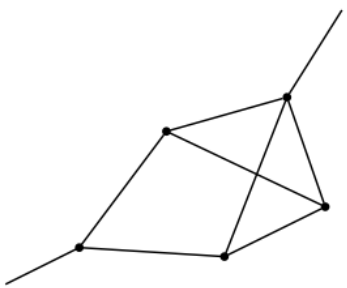
Nickel Index

Adjacency List

Adjacency List

[-1, 1], [1, 2],[1, 3], [2, 4], [3, 4], [2, 5], [4, 5], [3, 5], [5, -1]

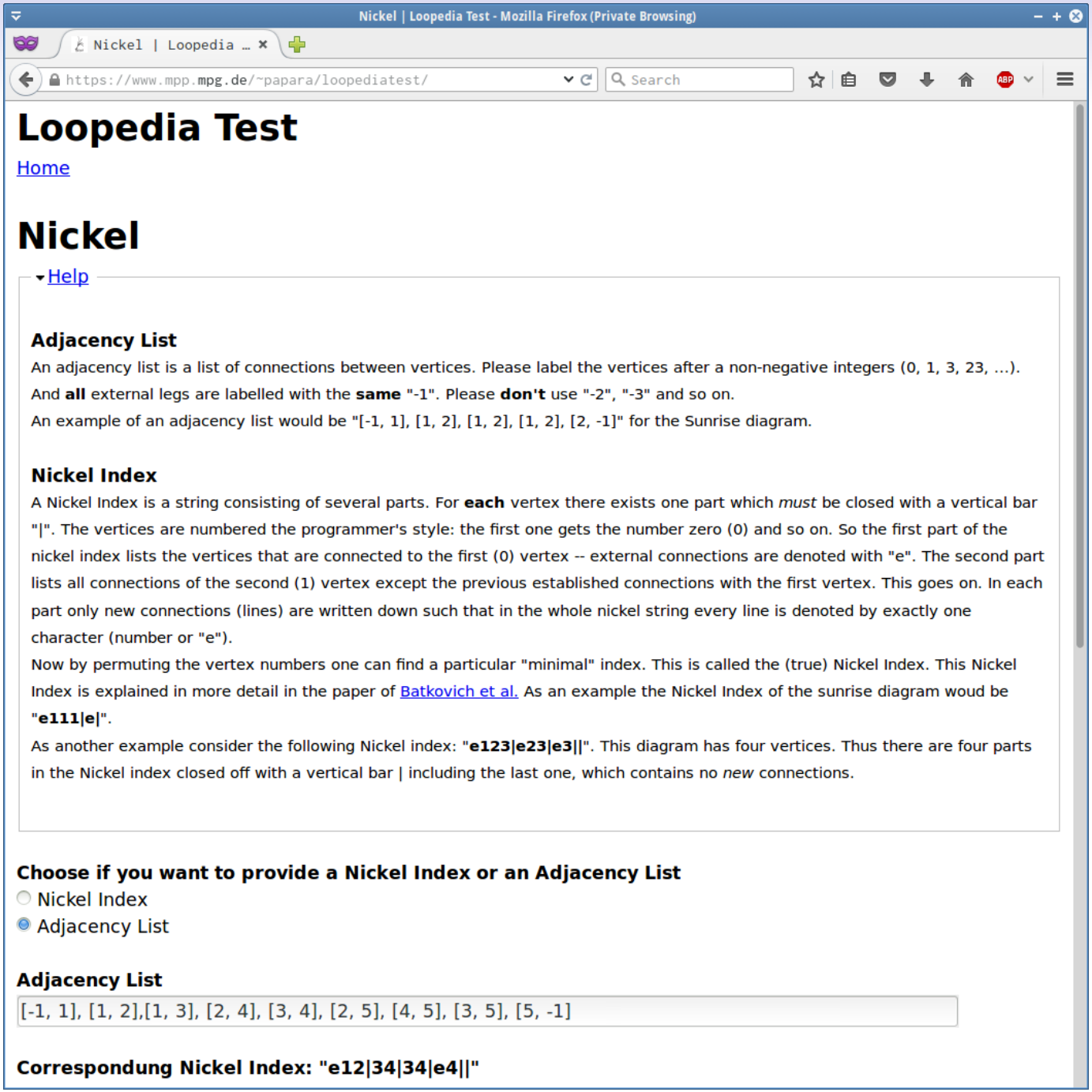
Correspondung Nickel Index: "e12|34|34|e4||"



Click Here!

User login

Username *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Adjacency List
An adjacency list is a list of connections between vertices. Please label the vertices after a non-negative integers (0, 1, 3, 23, ...).
And all external legs are labelled with the same "-1". Please don't use "-2", "-3" and so on.
An example of an adjacency list would be "[-1, 1], [1, 2], [1, 2], [1, 2], [2, -1]" for the Sunrise diagram.
Nickel Index
A Nickel Index is a string consisting of several parts. For each vertex there exists one part which must be closed with a vertical bar "|". The vertices are numbered the programmer's style: the first one gets the number zero (0) and so on. So the first part of the nickel index lists the vertices that are connected to the first (0) vertex -- external connections are denoted with "e". The second part lists all connections of the second (1) vertex except the previous established connections with the first vertex. This goes on. In each part only new connections (lines) are written down such that in the whole nickel string every line is denoted by exactly one character (number or "e").
Now by permuting the vertex numbers one can find a particular "minimal" index. This is called the (true) Nickel Index. This Nickel Index is explained in more detail in the paper of Batkovich et al. As an example the Nickel Index of the sunrise diagram woud be "e111|e|".
As another example consider the following Nickel index: "e123|e23|e3||". This diagram has four vertices. Thus there are four parts in the Nickel index closed off with a vertical bar | including the last one, which contains no new connections.
Choose if you want to provide a Nickel Index or an Adjacency List
Nickel Index
Adjacency List
Adjacency List
[-1, 1], [1, 2],[1, 3], [2, 4], [3, 4], [2, 5], [4, 5], [3, 5], [5, -1]
Correspondung Nickel Index: "e12|34|34|e4||"

Conclusion

Summary

- Unique identifier of a graph: Nickel Index
- First version of Loopedia: Graph generation and transformation between Nickel Index and Adjacency List

Outlook

- Set up integral submission system

Thank you!