

Combibase
*Building a library of combined roundtrips
from a network of routes*
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Abstract

Combibase is a variant of *combitrack* program that constructs combinations of track segments from a network of routes. **Combibase** selects a portion of these combinations, within a given length range, to create a library of directly usable tracks.

Motivation

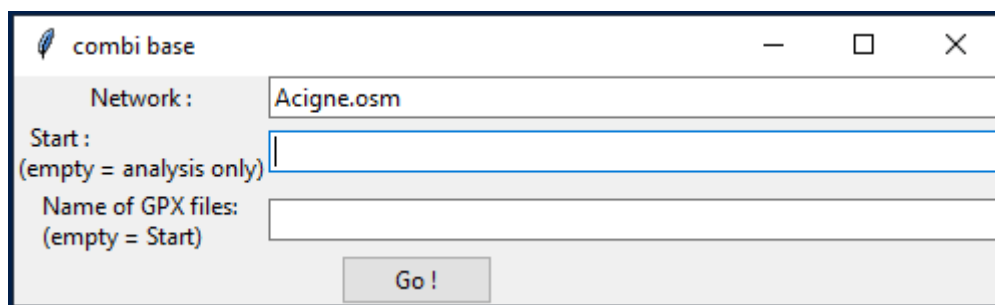
Hiking trails in a given area makes a network of interesting paths, usually signposted, that can be followed from listed starting points. Official trails do not always meet the needs of hikers, particularly in terms of their length. By putting sections of various routes end to end, it is possible to construct combinations close to the desired length. The *combitrack* software uses an OpenStreetMap (OSM) representation of the trail network to calculate all combinations from a starting point and within a given length range.

To avoid interested hikers having to run this software, the *combibase* variant builds a library of directly usable combined roundtrips, in the form of GPX track files. The OSM network is provided as input, as well as one of the starting points defined in this network. The calculated combinations cover a range of lengths between 5 and 30 km, corresponding to the most common needs. A selection is made among the calculated combinations (which can be very numerous!): this choice takes into account a good distribution of lengths, the quality of the routes, as well as the diversity of the routes (not too close to each other in a range of lengths).

Usage

Like *combitrack*, the *combibase* software is written in *Python*. Its main input is an OSM file representing the route network. See also the method for constructing this network and its use in *combitrack*.

Launch *combibase*. In the form, enter the network name and click Go!



The software analyzes the network, and displays the names of the starting points defined in this network.

```
NETWORK ANALYSIS

Possible Start points :
Acigne
Mi-Foret
Juteauderies

26 branches. Network in GPX format on _Acigne.gpx
```

If any anomalies are reported, refer to the *combitrack* documentation or to the network builder.
Run the software again. In the *Start* line, add the name of a starting point (or simply its first letters):

```
Start : Mi-Foret
GPX files : Mi-Foret_....km.gpx

121 combination(s)

Shortest : L = 5.94 km
Longest : L = 29.97 km

16 output combination(s), listed on A_Mi-Foret.txt
```

The software calculated the 121 possible combinations from the starting point called *Mi-Foret*, with a length between 5 and 30 km, and a quality of at least 5/10. For quality calculations, refer to the *combitrack* documentation. It then made a selection according to length ranges: 3 combinations maximum between 5 and 9 km, 5 at most between 9 and 12 km corresponding to the most common half-day hikes, etc. In the actual case, the 121 combinations include a single roundtrip of 5.94 km in the first range,... and none in the second! However, there are many combinations beyond 15 km, and the selection process is therefore applied. This results in 16 preserved combinations, the list of which is produced in the text file **A_Mi-Foret.txt**:

```
L = 05,9km Qual = 9.3
L = 12,1km Qual = 8.6
L = 13,6km Qual = 8.9
L = 16,4km Qual = 7.5
L = 17,3km Qual = 8.2
etc.
```

The 16 corresponding GPX files are also produced with the names *Mi-Foret_05.9km*, *Mi-Foret_12.1km*, etc.

The default name for the GPX files is that of the starting point, but a different name may be specified in the third line of the form. For example, this location *Mi-Forêt* is also the starting point for many other routes, to other parts of the forest. It would therefore be useful to specify that the selected combinations only apply to the direction of Acigné: for instance *Mi-Foret_Acigne*. Then, the names of the files will be *Mi-Foret-Acigne_05,9km.gpx* etc.

Beware: if several runs are made with the same network and starting point, remember to first **delete** the GPX files produced by previous attempts: only existing files with the same name as the new files will be replaced! Other files may contain incorrect or irrelevant data resulting from previous runs. Make sure that the number of GPX files present matches the number announced by the software. The **A_xxx.txt** file, however, is recreated with each attempt.

Distribution

May be distributed to interested clubs or hikers, for each network:

- a map of the network showing the starting points (map to be created separately, from the GPX representation of the network, for example with the module “Imprimer la trace” of VisuGPX)
- the text files **A_xxx.txt** with the list of combinations produced and their quality; roundtrips may have similar lengths, but very different qualities
- the selected roundtrips, in the form of GPX files

These data can be copied into a subfolder specific to the network, the contents of which will ultimately be transferred to a public Drive. This subfolder will be cleaned before each new attempt,

for example in the event of a network update.

It may be useful to maintain and distribute a table of starting points, with the name of the network to be used for each. The number of combinations available, as well as their minimum and maximum lengths, could be added to this table.

Combination selection method

For a given network and starting point, the number of combinations calculated can be large, and their length range very wide. A selection must be made to obtain a reasonably sized sample, with a good variety of lengths and routes.

The length ranges are defined at the beginning of the *combibase.py* program by the line:

Tranches = [5, 9, 12, 15, 20, 25, 30]

This defines six ranges corresponding to the needs of the main hiking categories: 5 to 9 km, 9 to 12 km, 12 to 15 km, 15 to 20 km, 20 to 25 km, and 25 to 30 km.

The following line defines the maximum number of roundtrips to retain for each of these ranges:

Nb_traces = [3, 5, 4, 5, 4, 4]

This means 3 roundtrips for the first range, 5 for the second, 4 for the third (12 to 15 km), etc., giving a maximum of 25 roundtrips for a pair (network, starting point).

The following line of the program sets the minimum quality that a combination must meet to be selected (currently 5/10):

QualMin = 5.0

Below, lines such as:

mark["unclassified"] = 2

define the score out of 10 assigned to the different ways according to their *highway* attribute in OSM. A *track* without a *tracktype* is rated 6/10.

The *tracktype* attribute allows you to adjust the quality of such a track:

mark_tracktype = [4, 5, 7, 8, 9]

For a *tracktype* = *grade1*, the final score is 4, *grade2* (*bare stone road*) => score = 5, *grade3* => 7, *grade4* => 8, *grade5* => 9.

For a given length range, the selection of tracks to be retained takes into account two equal criteria: the *quality* of the roundtrip, and its *diversity* relative to other roundtrips in the same range with better quality (the roundtrip with the best quality is always retained).

The **diversity** between two roundtrips is calculated as follows: for the longest roundtrip, it is the ratio of the total length of the sections not present in the other roundtrip, divided by the total length of this longest roundtrip. So, if the two roundtrips are identical, the diversity is 0; if they have no common sections, this diversity is 1.

This diversity is multiplied by 10 and added to the quality—itself between 0 and 10—to obtain the score used for ranking. In descending order of quality, each new roundtrip is compared to the roundtrips already retained, and possibly replaces the one with the lowest score.