Betweenness Centrality (BC)

Betweenness centrality is defined as

$$BC(v) = \sum_{s \neq v \neq t} \frac{n_{st}(v)}{n_{st}}$$

where n_{st} is the total number of shortest paths between a node *s* and a node *t* and $n_{st}(v)$ is the number of those paths that pass through v. The ***normalization*** formula for undirected graphs is defined as

$$2/((N-1)(N-2))$$

where N is the number of nodes in a graph G.

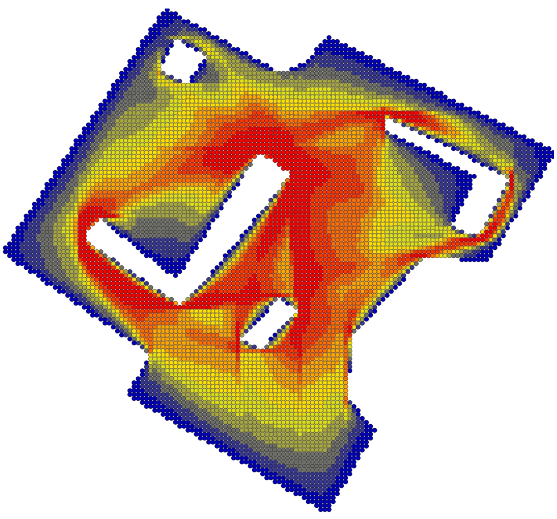
In order to compute BC values, one has to decide whether it has to be computed on the ***nodes*** or the ***network*** edges. Notice that when the network is selected, one has the choice between two possible ***implementation methods***. The ***normal*** one refers to the actual betweenness of the network edges, while the ***mean*** one is computed by first calculating the betweenness on the nodes, and in a second step, for each edge its BC value is deducted by averaging the values of its two nodes.

The option ***weighted*** defines whether you take the length of each edge or whether you consider that they all possess the same weight. Notice that this option is not provided for a grid project since the length of all the edges of regular grid network are equal by definition.

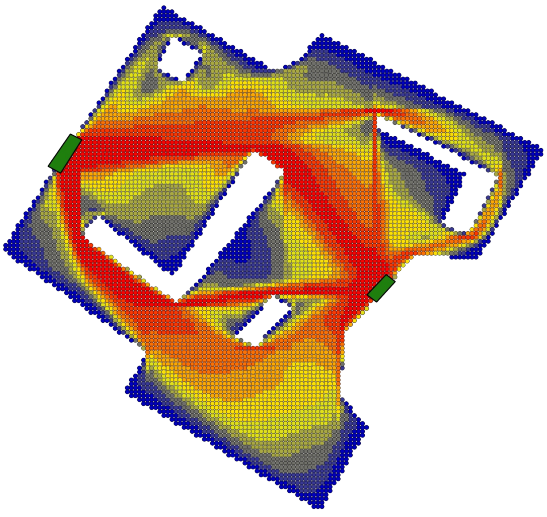
The ***normalization*** of the results is defined by the formula presented in the previous section.

Notice that when the betweenness is computed on the nodes or on the network but using the mean implementation method, one can choose to approximate the betweenness values by selecting a ***random sample*** of nodes.

Select the **access** option to compute the partial betweenness. With this approach one can decide to select a subset of nodes by uploading a separate polygon layer. Then only the nodes intersecting those polygons are used to compute BC. If one is working on a grid project, it is possible to use lines instead of polygons. In this case, a buffer of the resolution grid is created around the provided lines which in turn are used to define the subset of nodes that should be used.



BC on regular gird network



Partial BC on regular gird network (doors in green)