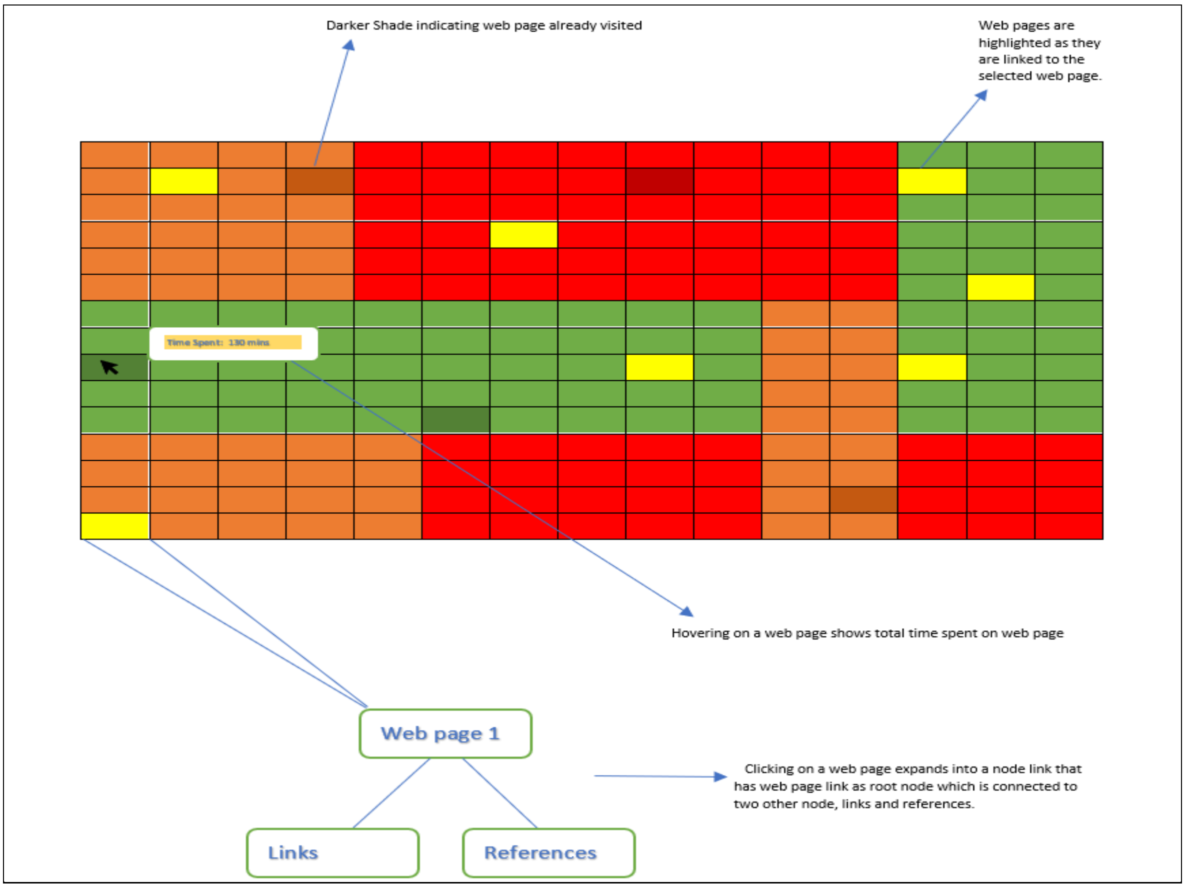
7. Visualization Task: Suppose you want to produce a visualization that summarizes and helps as a guide to a web-based course. The course is composed by series of linked web pages plus external links and references. Pages can be classes, tasks or additional information. The user must understand the general structure of the course, verify what pages he/she visited and for how long, and quickly find references given for each class. Describe the elements of your visualization and discuss the possible interactive functionalities the user would have in this context. Draw a schema for your visualization. Justify your choices of visual elements. What would change if the visualization were designed to support the teacher in improving the course?


Darker Shade indicating web page already visited
Web pages are highlighted as they are linked to the selected web page.
Time Spent: 130 mins
Hovering on a web page shows total time spent on web page
Web page 1
Links
References
Clicking on a web page expands into a node link that has web page link as root node which is connected to two other node, links and references.

For this task, we are going to use two types of visualization namely node-link diagram and Treemaps. Here, we are going to merge these two types of visualization, creating an elastic hierarchy.

Here, the web-based course consists of multiple linked web-pages with external links and references. For this particular requirement, node-links are suitable. Node-link diagram is a visualization technique where entities are represented as nodes and relationship between entities are represented as lines between them called as links. Here, as multiple web pages are linked, we can represent the web pages as nodes and connect them with lines if they are linked. However, the key drawback of node-links is that, they do not scale well if a network has large number or nodes or has large number of edges because, the edges will start to overlap. Here, the web-based course might have many linked web-pages and hence, relying solely on node-links will not work. Another tree-based visualization that optimize the use of space is Treemap.

Treemap is primarily used to visualize data that is grouped and nested in a hierarchical structure. Tree maps typically have the appearance of horizontally-oriented rectangles subdivided by size into the major categories and subcategories - so as to convey the part-to-whole relationships. Here, we can represent all web pages as equal sized rectangles inside the tree map. This solves the space efficiency problem as it can represent all the web pages in a small space, also allowing the user to view all web pages in a single view. It is mentioned that, the pages can be classes, tasks or additional information. So, we can colour the rectangles in the tree map depending on their type (Here, three different colours can be given to the rectangles as we have three different web pages). Now that we have constructed our tree map, we can combine node-links to navigate different web pages. When, we click on a rectangle (web page in a tree map), a node link diagram gets displayed. Here, the root node will be the web page we selected and it is connected to two other nodes, which are links and references for that web page. Also, when a rectangle (web pages) in a tree map is selected, the pages (other rectangles) linked to that rectangle should be highlighted in the tree-map. Now, when a user visits a web page, the rectangle should turn into a darker shade of its colour, indicating that the web page is visited. On hovering over any rectangle, it should display the total amount of time, the user has spent on that website.