

GenNav: Visualizing Gene Ontology as a graph

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Most browsers available for visualizing and navigating the Gene Ontology™¹ display its polyhierarchical structure as a list of indented concepts. Figure 1 partially shows, for example, how the AmiGO browser² visualizes the concept *extrinsic plasma membrane protein*. As a result, although all the information needed to transform this representation into a graph structure is present, we argue that the cognitive effort required to do this transformation is probably unnecessary.

In a previous experiment, we developed strategies for visualizing complex, polyhierarchical structures drawn from the Unified Medical Language System® (UMLS®), and found directed acyclic graphs (DAGs) to provide suitable representations. This experiment resulted in the development of an application: the UMLS Semantic Navigator³, based, in part, on the graph visualization package GraphViz⁴.

Applying the same techniques to the visualization of polyhierarchical structures from Gene Ontology, we developed GenNav. Figure 2 shows an example of the graphs produced by GenNav. In this example, the concepts used to annotate the gene *Dystrophin* include the cellular component *extrinsic plasma membrane protein*, also represented displayed in Figure 1, so the representation of this concept can be compared across the two figures.

Term Lineage
GO:0003673 : Gene_Ontology(30674)
GO:0005575 : cellular_component(14402)
GO:0005623 : cell(11523)
GO:0005622 : intracellular(10239)
GO:0005886 : plasma_membrane(2191)
GO:0019897 : extrinsic_plasma_membrane_protein(158)
GO:0016020 : membrane(3909)
GO:0012505 : endomembrane_system(2431)
GO:0005886 : plasma_membrane(2191)
GO:0019897 : extrinsic_plasma_membrane_protein(158)
GO:0019898 : extrinsic_membrane_protein(159)
GO:0019897 : extrinsic_plasma_membrane_protein(158)
GO:0005886 : plasma_membrane(2191)
GO:0019897 : extrinsic_plasma_membrane_protein(158)

Figure 1 – The AmiGO browser.

¹ www.geneontology.org
² godatabase.org/cgi-bin/go.cgi
³ umlks.nlm.nih.gov → Resources → Semantic Navigator
⁴ www.research.att.com/sw/tools/graphviz/

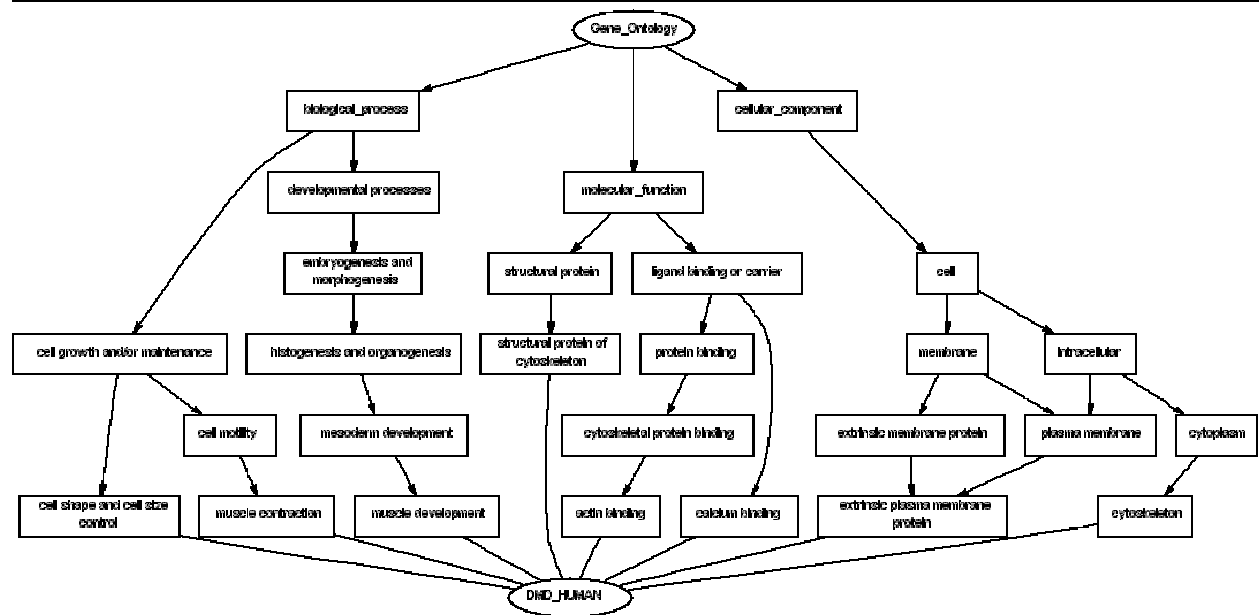


Figure 2 - Graph of the concepts related to “dystrophin” (DMD_HUMAN) in Gene Ontology.