A Semantic Web Framework for Integrating Relational Neuroscience Databases

Huajun Chen[5,1,*], Luis Marenco[1,2], Nian Liu[1,2], Ernest Lim[1],
Jinming Tang[5], Chunyin Zhou[5], and Kei Cheung[1,2,3,4,*]

Yale Center for Medical Informatics[1] , Department of Anesthesiology[2], Department of Genetics[3],
Department of Computer Science[4],Yale University, New Haven, 06511, USA
College of Computer Science[5], Zhejiang University, Hangzhou, 310027, China

This presentation demonstrates a semantic web application [1] for neuroscience database integration. The system uses a common RDF ontology (based on the extension of SenseLab [2] ontology) to mediate queries across nine neuroscience-related databases including NeuronDB, CellProDB, BrainPharm, CCDB, CoCoDat, EntrezGene, UniProt, Pfam, and Gene Ontology. The system provides semantic data retrieval and navigation in an integrated fashion. The major features of our demo system are as follows: **a).Semantic query mediation and translation.** In the system, the common RDF ontology is semantically mapped to the relational schemas of the component databases. Users can pose semantic queries against the RDF ontology, and the RDF queries will be automatically translated into a set of SQL queries against the component databases. The query results returned from the component databases will be integrated according the RDF ontological structure, which supports additional inference capabilities (e.g., *rdfs:subClassOf*). **b).Database registration and semantic mapping creation.**New databases can be registered in the system by using our *semantic registration and mapping tool*. Typically, it is the database integrator who interacts with the component database administrator and uses the tool to create the relational-RDF mapping specifications. **c).User interface for ontology viewing and data querying.** The system provides a dynamic interface for browsing the RDF ontology. For data retrieval, it provides an interactive form-based interface to allow the user to construct RDF queries. In addition, the system provides a programmatic interface that allows programmers to use API to access the data.
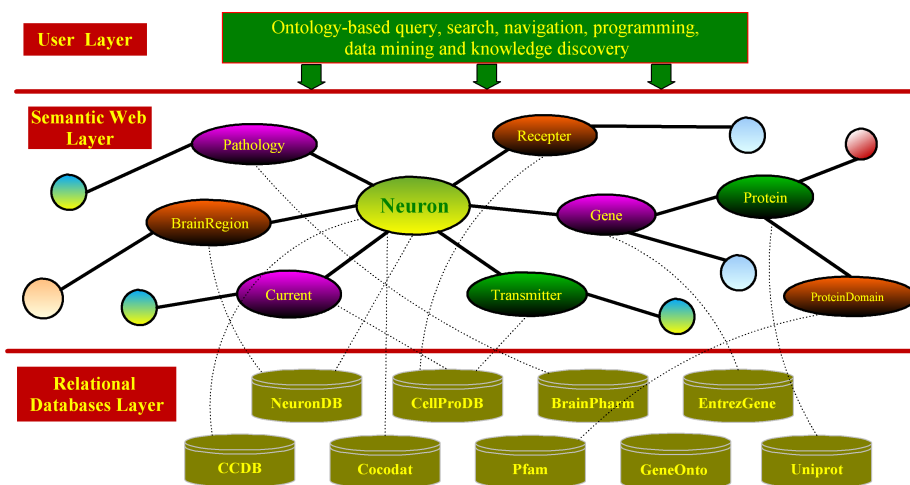

Fig. 1. Databases and the Ontology.