Supplementary Materials: E2BMO: Facilitating User Interaction with a BioMimetic Ontology via Semantic Translation and Interface Design

```
<!-- http://purl.obolibrary.org/obo/BMO_0009005 -->

<owl:Class rdf:about="http://purl.obolibrary.org/obo/BMO_0009005">
    <owl:equivalentClass>
        <owl:Class>
            <owl:intersectionOf rdf:parseType="Collection">
                <owl:Class>
                    <owl:unionOf rdf:parseType="Collection">
                        <owl:Restriction>
                            <owl:onProperty rdf:resource="http://purl.obolibrary.org/obo/parameter"/>
                            <owl:someValuesFrom rdf:resource="http://purl.obolibrary.org/obo/BMO_0000009"/>
                        </owl:Restriction>
                        <owl:Restriction>
                            <owl:onProperty rdf:resource="http://purl.obolibrary.org/obo/parameter"/>
                            <owl:someValuesFrom rdf:resource="http://purl.obolibrary.org/obo/BMO_0000025"/>
                        </owl:Restriction>
                        <owl:Restriction>
                            <owl:onProperty rdf:resource="http://purl.obolibrary.org/obo/parameter"/>
                            <owl:someValuesFrom rdf:resource="http://purl.obolibrary.org/obo/BMO_0000037322"/>
                        </owl:Restriction>
                    </owl:unionOf>
                </owl:Class>
                <owl:Class>
                    <owl:unionOf rdf:parseType="Collection">
                        <owl:Restriction>
                            <owl:onProperty rdf:resource="http://purl.obolibrary.org/obo/parameter"/>
                            <owl:someValuesFrom rdf:resource="http://purl.obolibrary.org/obo/BMO_0000027"/>
                        </owl:Restriction>
                        <owl:Restriction>
                            <owl:onProperty rdf:resource="http://purl.obolibrary.org/obo/parameter"/>
                            <owl:someValuesFrom rdf:resource="http://purl.obolibrary.org/obo/BMO_0000028"/>
                        </owl:Restriction>
                        <owl:Restriction>
                            <owl:onProperty rdf:resource="http://purl.obolibrary.org/obo/parameter"/>
                            <owl:someValuesFrom rdf:resource="http://purl.obolibrary.org/obo/BMO_0000029"/>
                        </owl:Restriction>
                        <owl:Restriction>
                            <owl:onProperty rdf:resource="http://purl.obolibrary.org/obo/parameter"/>
                            <owl:someValuesFrom rdf:resource="http://purl.obolibrary.org/obo/BMO_00000314"/>
                        </owl:Restriction>
                        <owl:Restriction>
                            <owl:onProperty rdf:resource="http://purl.obolibrary.org/obo/parameter"/>
                            <owl:someValuesFrom rdf:resource="http://purl.obolibrary.org/obo/BMO_0000037"/>
                        </owl:Restriction>
                    </owl:unionOf>
                </owl:Class>
            </owl:intersectionOf>
        </owl:Class>
    </owl:equivalentClass>
    <rdfs:subClassOf rdf:resource="http://purl.obolibrary.org/obo/BMO_0009000"/>
    <rdfs:label>speed-accuracy trade-off</rdfs:label>
</owl:Class>
```

Figure S1. This is the XML-RDF format of the OWL exported file from Protégé. <owl:Class> and </owl:Class> show the start and end of a subject, in here 'speed-accuracy' class.

```
query_with_placeholder=""" PREFIX obo_term: <http://purl.obolibrary.org/obo/>
SELECT  ?subclassPrinciples ?someValuesFrom
where{
?s rdfs:label '$ENTITY_CODE$' .
?s a owl:Class .
{?s rdfs:subClassOf _:b. _:b rdf:first ?restriction}

UNION { ?s rdfs:subClassOf/(rdf:rest+/rdf:first+)*  ?restriction.}

?restriction   rdf:type owl:Restriction.

?restriction   owl:onProperty ?onProp.

FILTER(regex(str(?onProp), "use_the_principle", "i"))


?restriction   owl:someValuesFrom ?someValuesFrom.

?someValuesFrom rdfs:label ?subclassPrinciples .

}
"""
if query_with_placeholder != None:
    new_query=query_with_placeholder.replace("$ENTITY_CODE$",newSearch)
    predicate_query = g.query(new_query)
```

Figure S2. Red section of the code is SPARQL query. This query looks for objects connected to a class/subject using their properties. 'query_with_placeholder' passes the query string to 'g.query' from 'rdflib' library. "$ENTITY_CODE" is a placeholder for the name of class provided by the user or other queries.

```
|toad vision::F_37 Signal-to-noise ratio::F_09  Resolution::Rod phototransduction determines the
foraging pheromone::F_25     May have to be done quickly in an emergency::F_27     Find best cor
ant-lion::F_09   Strike speed is relatively low::F_28  The strike can be more accurate::Modulati
false alarms::F_25 Less time for foraging::F_28    Bees survive predators::Speed-accuracy trade
post-error dynamics::F_09   Speed::F_29   Accuracy::Can post-error dynamics explain sequential r
synaptic depression::F_37   Sensitivity::F_27   Reliability::Functional roles for synaptic-depre
piano finger::F_29   Accuracy::F_09 Speed::Rate effects on timing, key velocity, and finger kir
ant decisions::F_31     Loss of accuracy::F_09  more rapid decision::Consensus decision making i
neural threshold::F_28 . . . you're more likely to make mistakes::F_09  If you try to do somethi
gene network size::F_29  in a slowly-changing environment better adaptations will have the advar
optimal sensory processing::F_09     Speed::F_28     Accuracy::The optimality of sensory processir
```

Figure S3. This is an example of contents in final text file for 'speed-accuracy trade-off', each variable is separated by '::' which helps when extracting data from the file. It starts by name of biological model, its TRIZ thesis and antithesis, abstract of the paper, followed by IPs and Sub IPs and any other information needed.

```javascript
function readTextFile(file)
{
    var rawFile = new XMLHttpRequest();
    rawFile.open("GET", file, false);
    rawFile.onreadystatechange = function ()
    {
        if(rawFile.readyState === 4)
        {
            if(rawFile.status === 200 || rawFile.status == 0)
            {
                var allText = rawFile.responseText;
                var newData = (allText.split("\n"));

                dataTable = new google.visualization.DataTable();

                // determine the number of rows and columns.
                var numRows = newData.length-1;

                var rowData = newData[0].split(",");

                dataTable.addColumn('number', rowData[0]);
                dataTable.addColumn('string', rowData[1]);
                dataTable.addColumn('number', rowData[2]);
                dataTable.addColumn('number', rowData[3]);
                dataTable.addColumn('string', rowData[4]);

                // now add the rows.
                for (var i = 1; i < numRows-1; i++)
                {
                    var rowData = newData[i].split(",");
                    var thisdata = [parseInt(rowData[0]), rowData[1], parseInt(rowData[2]),parseInt(rowData[3]),rowData[4]]
                    dataTable.addRow(thisdata);
                    console.log(newData[i]);
                }

                var options = {
                    colors: ['black', 'red', 'blue','green','grey','orange','purple'],
                    maxFontSize : 20,
                    fontName: 'Times-Roman',
                    wordtree: {
                        format: 'explicit',
                        type: 'suffix'
                    }
                };

                var wordtree = new google.visualization.WordTree(document.getElementById('wordtree_explicit'));
                wordtree.draw(dataTable, options);
            }
        }
    }
```

Figure S4. This is a portion of JavaScript code in HTML where E2BMO graph is created, we are using google Word-Tree visualization to develop the hierarchical graph shown in Figure 7.