

Appendix B

Aspide

Here we describe a query-answering system implementing STUDENT. The system is incorporated into an integrated development environment for ASP called ASPIDE (Febbraro, Reale, and Ricca, 2011), which is designed for program development, computing answer sets, and running queries.

ASPIDE is not a solver in itself, but an interface. At the time of this writing, the query interface of ASPIDE could only be used with DLV (see Appendix A). However, ASPIDE is being actively developed and is designed to be extendable for use with other solvers. As usual, please see the documentation for updates.

To begin, download DLV from <http://www.dlvsystem.com>. ASPIDE can be found at <https://www.mat.unical.it/ricca/aspide/index.html> under the Download tab. Installation instructions are under the Documentation tab. Note that, when the ASPIDE Settings box shows up during the installation process, it should be sufficient to just set the DLV path and ignore the other settings, unless, of course, you want to use extensions of DLV such as DLVDB, DLT or a profiler. All paths can also be set later by choosing Preferences from the File menu.

The next window to pop up asks you to select a workspace in which ASPIDE will store your projects. Specify a path for the new directory or use the default. (ASPIDE will expect you to work with the files through its interface, so it is best, at least for now, not to modify the contents of this directory directly.)

To start working on a new project, select “New ► Project” from the File menu and give the project a name. The project name will appear on the left-hand side of your screen in the “Workspace Explorer” panel. To create a new file in an existing project, select “New ► File ► DLV File with Arithmetic Expressions” from the File menu.¹ ASPIDE will pop up

¹ There are some examples in the text that require this mode because DLV does not yet understand some notation by itself.

a window and ask you to select the project in which you want to create the file. Once this is done, you will see an editor and will be able to type in your program. If you are planning to work on an old file in an existing project, click on the arrow to the left of the project's name in the Workspace Explorer panel, causing the names of the project's files to appear below. To display a file in the editor, double-click the file name.

Once you have created and saved your file, you are ready to query your program or compute its answer sets. ASPIDE views all files in your project as comprising a single program. For instructions on querying or running a program contained in one or more selected file(s), see the section on configuring a run/query.

Running Queries

To run a query, select "Query" from the Execute menu (or click on the toolbar button that has a question mark). This will bring up a new window. Choose the checkbox labeled "Epistemic Mode." (The default query mode does not match the definition of query given in this book.) Your choice will be remembered for the duration of the ASPIDE session, but you will need to make this selection each time you restart the application.

Once this is done, type your query in the query input box. Make sure to end it with a question mark. To see the results, click the "Execute" button that appears next to the input box. The possible answers to a ground query are *true*, *false*, or *unknown*. If the query contains variables, the system will display the values of variables that make the query true and those that make the query false (it clearly labels which are true and which are false). ASPIDE does not display values of variables for which the answer to the query is *unknown*. (You may find it useful to select "Single Run" to display only the values for which a query is true.)

ASPIDE allows conjunctive queries where the conjuncts are separated by commas. For example, query

$p, q?$

will be true iff both p and q are true in all answer sets of the program.

The query input box also allows you to enter facts and rules followed by a query. For example, you can input

$p.$
 $q :- p.$
 $q?$

This is equivalent to asking query q to the original program expanded by the first two rules. This is useful if you want to add some information before you ask a query, but do not wish to make changes to your actual program.

Computing Answer Sets

To compute the answer sets of your program, select “Run” from the Execute menu (or click on the play button with your project’s name on it in the toolbar). The default display will show you the output in table mode. On the left is a list of the predicates in your answer set; on the right are the parameters of the highlighted predicate (if they exist). To view an answer set represented as a collection of literals, select “Answer Set 1” shown above the predicates (or whichever answer set you wish to see).

Configuring a Run/Query

As we mentioned, by default ASPIDE treats all the files in a project as one program. Since you may be running many small programs, you will, most likely, wish to avoid creating too many projects and to have the ability to run only one file of the project at a time. To do this, select the file you wish to run/query in the Workspace Explorer, right-click,² and select “Run ► Run Directly” or “Run ► Query Directly” from the pop-up menu. Once this is done, “Run” and “Query” will remember your selection and only run the chosen file.

To run a program consisting of several files, select “Show Run Configuration” from the Execute Menu (or click on the “Show Run Configuration” button found on the toolbar between the “Query” button and the “Run” button). This action brings up a new window. Near the bottom you will see a large box with a list of files to be included in your configuration; if no files were previously selected, you will see a message saying that the default configuration consists of all files in your project. Pressing the green plus icon to the right of this box will allow you to add files to the list; clicking on the file name and pressing the red minus icon will remove the chosen file. The selected files will from then on be treated as one program by the “Run” and “Query” commands. Note that deselecting all files will result in the project being treated as a unit once again.

² For a one-button mouse, use Ctrl-Click.

Importing Projects and Files

If you wish to import files located outside of ASPIDE into an existing project, choose “Import DLV File” from the list in the gray panel on the main ASPIDE screen. (If you are currently working on a file, closing it will get you there.)³ A pop-up allows you to select the project you want and browse for your file. ASPIDE makes a copy of the file and adds it to the list of files in the project.

You may also choose to create a new project consisting of an entire directory of files. In that case, choose “Import Project” and select the folder you wish to import. The name of the folder becomes the name of a new project.

There is a lot more you can do with ASPIDE and more than one way to do things, but we hope this introduction will allow you to run and query the examples and exercises given in this book.

³ Note that if you have arithmetic operators in the parameters of your predicates, you will not be able to run the program that you import. Instead of using the import feature, copy and paste your original into a file created with the “Arithmetic Expressions” option.