Abstract Data Types

Lecture 14

Modules

Chapter 7 of HR book

Data Abstraction

- Data abstraction is perhaps the most important technique for structuring programs.
- Provides an *interface* that serves as a **contract** between the *client* and the *implementor* of an abstract type.
  - The interface specifies what the client may rely on for its own work, and, simultaneously, what the implementor must provide to satisfy the contract.

Data Abstraction 2

- The interface isolates the client from the implementor so that each may be developed in isolation from the other
  - *data hiding*
- In particular, one implementation may be replaced by another without affecting the behavior of the client, provided that the two implementations meet the same interface.

ADT

- An abstract data type (ADT) is a type equipped with a set of operations for manipulating values of that type.
- ADT is implemented by providing a **representation** type for the values of the ADT and an **implementation** for the operations defined on values of the representation type.
- What makes an ADT abstract is that the representation type is **hidden** from clients of the ADT. Consequently, the only operations that may be performed on a value of the ADT are the given ones.
- This ensures that the representation may be changed without affecting the behavior of the client.

ADT in F#

- In F# this can be achieved via the use of *signatures* and *modules*
  - sig files (file.fsi) specify the interface/API
  - module declarations (standard file.fs files) represent the implementors side
- They are "matched" by the compiler, which compiles a library file (file.dll)
- Then, the dll is opened and used, possibly interactively

Howto: using **fsc**

- Open a terminal (in Windows cmd, or better use git bash) and go to the directory containing your files
- For our working example: run
  - fsc -a set.fsi listFS.fs
- This will produce a library file listFS.dll. To use it you can run F# interactive from the shell like that
  - fsi -r listFS.dll s.fsx or
  - #r “ListFs” in s.fsx
- Now you can open the module and use it in your script file

Howto: **VS**

- "*Open*" a new project and choose F# library. Choose the name and location of the *dll* to be generated
- Go to Solution Explorer, remove for hygiene reasons the *fs and *fsx that VS generates for you.
- "*Add existing files*" (right click) namely the *fsi and *fs. Move the *fsi to be first. "*Build*" the project
- To use the *dll*, you need to reference it in your *.fsx file
  - #r @"directory\name.dll"
- Note that the dll will be under bin\debug in the folder that VS builds for you.