CSE 341: Programming Languages

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Lecture 18—DrScheme modules; abstraction with dynamic types
Modularity

Recall from our ML module lecture some good things about modules:

- Namespace management (help keep names short and separate)
- Make some bindings inaccessible (private functions, data)
- Enforce invariants by using abstract types
  - Data is reachable, but outside the module only limited things can be done with it
- In our example:
  - Rationals are always printed in reduced form.
  - Clients can’t tell if rationals are kept in reduced form.
Scheme vs. DrScheme

“Pure” Scheme (R5RS) has no module system or define-struct

- We’ll investigate how much of modules’ advantages we can get via other means

DrScheme has a module system

- But in a dynamically typed language, there won’t be signatures with abstract types

- We can get abstract types using define-struct instead
  - Because it makes a new type not equal to any other type
  - Quite different than ML approach but both work
Life without modules

- Can hide private things using `let`
  - Workable but awkward
  - Making the `define-struct` “private” is a huge help
The key to define-struct

It is essential to hiding parts of a define-struct that it is a fresh, different type than any other type.

- In our example, hid the accessors, mutators, and constructor.
- Sometimes exposing some accessors makes sense.

Otherwise, someone could use other features (e.g., cons or set-car!) to violate invariants.

It is still the case that any Scheme function can be called with any argument, but we can control invariants on rationals.
DrScheme modules

• provide for explicit list of what is available outside
  – Can be “part” of define-struct
  – Kind of like “part” of an ML datatype (kind of)

• require for using another module
  – With optional prefixing of names for namespace management