

My implementations of the functions in `expr.ml` and evaluation follow the spec with only one real significant difference. I have to functions that can convert an expression into a string: `exp_to_string_AST` and `exp_to_string_CON` which will turn an expression into either an abstract syntax tree or the concrete syntax respectively.

So for my extension of **MiniML** I added floats, strings, the unit type, and lists to the language. Floats work exactly as they do in standard OCaml. A float is a number from 0 to 9 followed by a `'.'` and then possibly another number. I also added the division operator `/` for both floats and ints.

Strings can contain any sequence of alphanumeric characters and `_` but notably not spaces and are demarcated by a pair of `"` marks. So the format is, `"<string>"`. The empty string is `""`.

Units can be used in functions, as arguments to functions, and in `let` expressions but not `let rec` expressions. Units are represented by `()` and a function that accepts a unit must take a unit as an argument. By which I mean, that if a user enters `let f = (fun () -> fun x -> x + x) in f 42 3` `miniml` will throw an error because the first argument of `f` has to be of unit type (solution: change `42` to `()`). This is the only time when any of the types are checked in `MiniML`.

Lists work similarly to lists in OCaml – expressions (lists or otherwise) can be added to another list using the `::` operator and two lists can be concatenated using the `@` operator. The lists however can contain expressions that OCaml would consider to have different types. The concrete syntax of a valid list in `Miniml` would be `[1; 2; "a"; 3+4; 4.8; let f = fun x -> x + 1 in f 4]` even though this list wouldn't be valid in OCaml because each element of the list has a different type. Since these are all represented as "expressions" they are all effectively the same type. The format of a correct list is `[<exp>;<exp>;...]`, with expressions separated by `;` and enclosed by `'['` and `']'`. An empty list is just `[]`. Calling one of the evaluate functions on the list will result in a list with all the internal expressions evaluated. So the list above would evaluate to `[1; 2; "a"; 7; 4.8; 5]`. Because `MiniML` lacks pattern matching statements it's impossible to implement functions that map lists to other lists or get elements out of a list once they've been put in. The last element in a list cannot be followed by a semicolon like it can be in OCaml.

One other difference between lists in OCaml and my implementation of `MiniML` is that in OCaml a `"let"` or `"let rec"` can only come at the end of a list because in OCaml, if there is a `"let"` or `"let rec"` expression followed by a semi-colon, even one meant to act as a list separator must return unit. In my implementation, even if you have a `let` or `let rec` expression followed by a semi-colon, `MiniML` still processes it. So for example in OCaml, the list:

```
[let rec f = fun x -> if x = 0 then 1 else x * f (x - 1) in f 4; 10]
```

is not a syntactically correct list because the `let rec` expression does not evaluate to unit and OCaml just returns `[10]` but throws a warning about the `let rec` not evaluating to unit. In my implementation, this same input would become `[24; 10]`.