(g)ROOT
Language Reference Manual

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1 Intro

Ocaml LRM

1.1 How to read manual

The syntax of the language will be given in BNF-like notation. Non-terminal symbol will be in italic font *like-this*, square brackets [...] denote optional components, curly braces { ... } denote zero or more repetitions of the enclosed component, and parenthesis (...) denote a grouping.

2 Lexical Convention

2.1 Blanks

The following characters are considered as **blanks**: space, horizontal tab (‘\t’), newline character (‘\n’), and carriage return (‘\r’).

Blanks separate adjacent identifiers, literals, expressions, and keywords. They are otherwise ignored.

2.2 Comments

Comments are introduced with two adjact characters `(;` and terminated by two adjacent characters `;)`. Nested comments are currently not allowed.

```
(; This is a comment. ;)
```

2.3 Identifiers

Identifiers are sequences of letters, digits, and underscore characters (‘_’), starting with a letter. Letters consist of the 26 lowercase and 26 uppercase characters from the ASCII set.

⟨*ident*⟩ ::= *letter* `(` *letter* | *digit* | `_` `)`

⟨*letter*⟩ ::= `a...z` | `A...Z`

⟨*digit*⟩ ::= `0...9`

2.4 Integer Literals

An integer literal is a decimal, represented by a sequence of one or more digits, optionally preceded by a minus sign.

⟨*integer-literal*⟩ ::= `[-]` *digit* { *digit* }

⟨*digit*⟩ ::= `0...9`

2.5 Boolean Literals

Boolean literals are represented by two adjacent characters; the first is the octothorp character (`#`), and it is immediately followed by either the `t` or the `f` character.

⟨*boolean-literal*⟩ ::= `#` `(` `t` | `f` `)`

2.6 Character Literals

Character literals are a single character enclosed by two ' (single-quote) characters.

2.7 Operators

All of the following operators are prefix characters or prefixed characters read as single token. Binary operators are expected to be followed by two expressions, unary operatprs are expected to be followed by one expression.

⟨*operator*⟩ ::= (*unary − operator* | *binary − operator*)

⟨*unary-operator*⟩ ::= `!`

⟨*binary-operator*⟩ ::= `+` | `-` | `*` | `/` | `mod`
| `==` | `<` | `>` | `≤` | `≥` | `!=`
| `&&` | `||`

2.8 Keywords

The below identifiers are reserved keywords and cannot be used otherwise:

```
if      val         let
leaf?   elm         tree
cld     sib         lambda
```

The following character sequence are also keywords:

```
==      +       &&      >       '
!=      -       ||      mod     #t
<=      *       !       (       #f
>=      /       <       )
```

3 Values

3.1 Base Values

3.1.1 Integer numbers

Integer values are integer numbers in range from -2^{32} to $2^{32}-1$, similar to LLVM's integers, and may support a wider range of integer values on other machines, such as -2^{64} to $2^{64}-1$ on a 64-bit machine.

3.1.2 Boolean values

Booleans have two values. `#t` evaluates to the boolean value `true`, and `#f` evaluates to the boolean value `false`.

3.1.3 Characters

Character values are 8-bit integers between 0 and 255, and follow ASCII standard.

3.2 Functions

Functional values are mappings from values to value.

3.3 Leaf

3.4 Tree

4 Names

4.1 Base Values

4.2 Functions

5 Constants

6 Expressions

⟨*expr*⟩ ::= *literal*
| *ident*
| *unary-operator expr*
| (*binary-operator expr expr*)
| (*ident expr-list*)
| (`val` *ident expr*)
| (`let` *ident expr expr*)
| (`if` *expr expr expr*)
| (`lambda` ({*argument*}) *expr*)

⟨*literal*⟩ ::= *integer-literal* | *boolean-literal* | *character* | leaf

⟨*argument*⟩ ::= ϵ
| *ident* :: *argument*

6.1

6.2 Lambda Expression

7 Functions