Extending the TPTP Language to Higher-Order Logic with Automated Parser Generation

System Description

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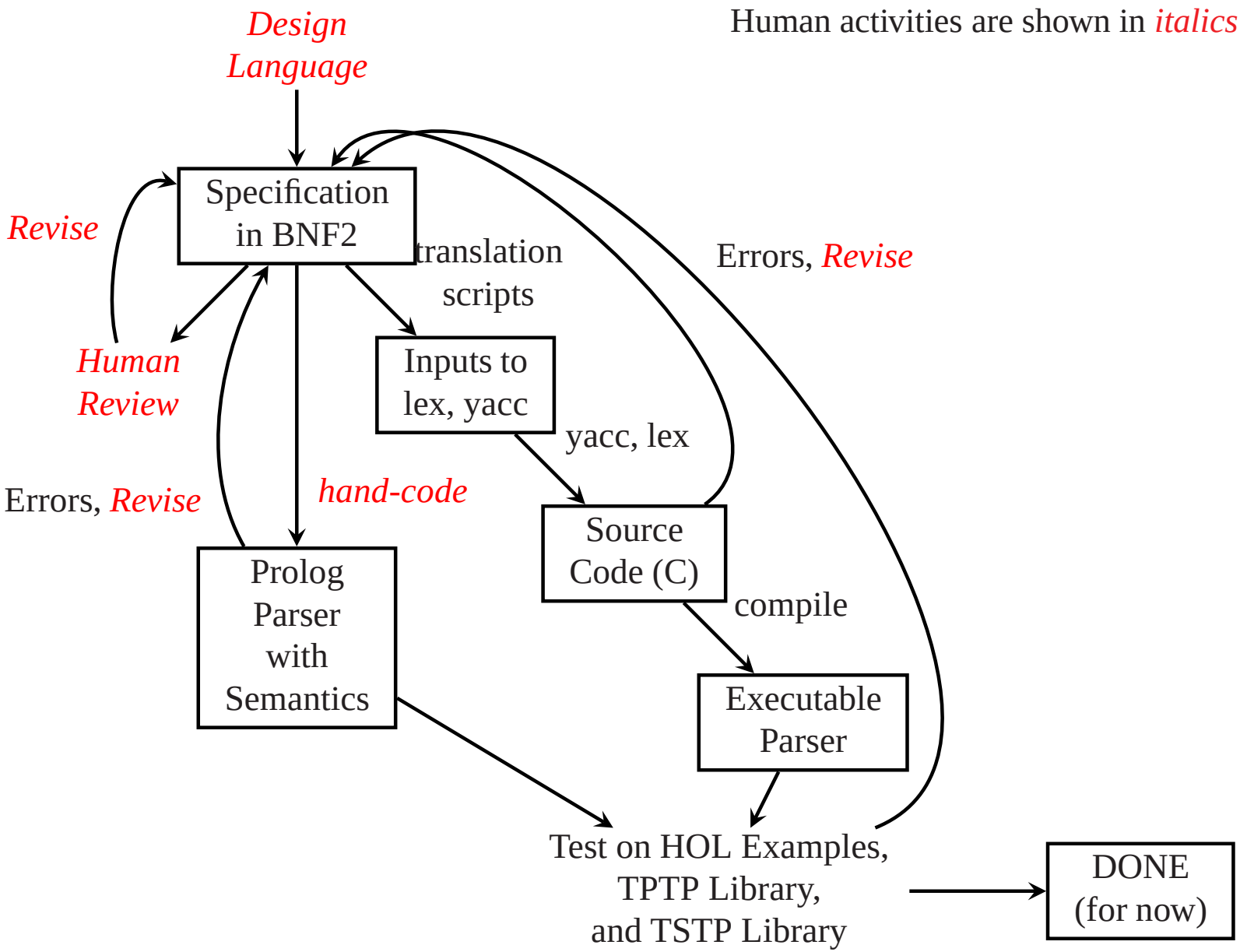
Overview of the System to Evaluate a Proposed HOTPTP Language



BNF2 – A Two-Level Specification Language

Traditional BNF (Backus-Naur Form) has one syntax for all grammar symbols.

Modern practice uses two levels of symbols

- *tokens* are defined by regular expressions, and
  are treated as terminal symbols in the context-free part of the grammar.
- *grammar symbols* are the nonterminal symbols of the context-free grammar.

Meta-Symbol	*Rule Type*	*Examples* (some are simplified from the TPTP language)

`::=`	Grammar	`<TPTP input> ::= <annotated formula> | <comment>`
		`<nonassoc op> ::= <=> | => | <= | <~>`
		`<formula role> ::= <lower word>`

`::==`	Semantic	`<formula role> ::== axiom | conjecture | lemma |` `theorem | negated_conjecture`
`::-`	Token	`<lower word> ::- <lower><alphanum>*`
`:::`	Macro	`<lower> ::: [a-z]` `<alphanum> ::: [A-Za-z0-9_]`

Proposed HOTPTP Syntax, Extending TPTP to Higher-Order Logic

New operators continue TPTP tradition that operators are logical symbols:

- Lambda abstraction: `^` (synonym `lambda`)
- Function application: `@`
- "Maps to" for types: `->` (synonym `>`)
- "Defined as": `:=` (Hudak [1989] uses ≡ which looks reflexive.)

Colon operator (`:`) has several new meanings.

```
hof(1, definition,
    set_union := lambda [A: $type]: lambda [D: ((A-> $o)-> $o), X: A]:
                 ? [S: (A-> $o)]: ( (D @ S) & (S @ X) ) ).
```

The lambda expression shown is:
$\lambda A{:}\tau.\ \lambda D{:}((A \to o) \to o).\ \lambda X{:}A.\ \exists S{:}(A \to o).\ ((D\ @\ S) \wedge (S\ @\ X))$.

More details and examples at http://www.cse.ucsc.edu/∼avg/TPTPparser/.

To be discussed at TPTP Tea Party.