VOCABULARIES IN CREOLE FORTH

JOSEPH M. O’CONNOR

WHAT FORTH VOCABULARIES ARE

- Customary method of namespacing
- In many Forths vocabularies are implemented as a separate linked list of words
- Allows reuse of names, just as spoken language allows the same word to have a different meaning depending on the context.
- Common Forth vocabularies : ONLY, FORTH, EDITOR, ASSEMBLER

SOME TERMINOLOGY

- Current vocabulary – vocabulary where new words will be defined
- Context vocabulary – vocabulary that is first in the search order
- DEFINITIONS – this is a word used to set the current vocabulary to the context vocabulary
- The context vocabulary is set by mentioning the vocabulary by name
- So ASSEMBLER DEFINITIONS sets the ASSEMBLER vocabulary to be the first in the search order, and then directs that new words be assigned to that vocabulary.

VOCABULARY STACK

- In his book **Mastering Forth**, Martin Tracy mentioned the idea of a vocabulary stack.
- This was an idea originated by Bill Ragsdale.
- A vocabulary mentioned by name pushes it onto this stack, which determines search order.
- The word ONLY empties the vocabulary stack and pushes the ONLY vocabulary onto it.
- To make this work the other vocabularies need to be defined in the ONLY vocabulary.

VOCABULARY STACK SPECIFICS IN CREOLE FORTH

- Five words are defined in the ONLY vocabulary
- Three of them are vocabularies : ONLY, FORTH, and APPSPEC
- The other two are NOP and __#EOL#__.
- NOP is a do-nothing operator used as a placeholder and __#EOL#__ is used in single-line commenting

HOW THE INTERPRETER INTERACTS WITH THE VOCABULARY STACK

- (1) The interpreter goes through each vocabulary on the vocabulary stack from top to bottom.
- (2) Each token on the input stream has the current vocabulary being searched appended to it.
- (3) This combined token + vocabulary name is looked up in the dictionary.
- (4) If the search is successful, the lookup process completes and the word found is executed.
- (5) If it is not, then the interpreter repeats the process with the next vocabulary in the search order.
- (6) If all vocabularies have been searched and nothing found, the interpreter pushes the token onto the stack.
- (7) Unlike most Forths, it does not attempt a numeric conversion by default.

THE COMPILER

- New words defined will have the context vocabulary appended to it in the fully qualified name field.
- As with most Forths, the IMMEDIATE word marks words as IMMEDIATE.
- In Creole Forth, an immediate word is simply a word in the IMMEDIATE vocabulary.
- During compilation, the IMMEDIATE vocabulary is pushed onto the vocabulary stack.
- This step ensures that this vocabulary will always be searched first during compilation.
- When compilation is complete the IMMEDIATE vocabulary is popped off.
- This step seals off immediate words from usage except during compilation.

ORDINARY WORDS VS IMMEDIATE WORDS

- Ordinary words are tagged with a COMPINPF action.
- Immediate words are tagged with an EXECUTE action.
- Actions appear in the dictionary as the CompileAction field in the word's definition.
- Words with a COMPINPF action have their address appended to the current parameter field.
- Words with an EXECUTE action generate code which is inserted into the parameter field.
- This methodology is needed to do tasks such as inserting branching information.

MORE ON COMPILING WORDS

- A compiling word should have two actions : a compile-time action and a run-time action.
- In Creole Forth both actions are normally placed in the IMMEDIATE vocabulary.
- At compile-time the colon compiler executes compiling words.
- These words generate code which includes the run-time action and any other information needed.
- An example is a JUMP instruction which needs an address to jump to.

THE DISADVANTAGE(S) OF COMPILING WORDS

- They break the “linearity” property of Forth where one word is compiled as one entry into the parameter field.
- So does literal compilation.
- Compiling words, compiling literals, and DOES> have been the most challenging parts of developing a Forth in my experience.

THE ADVANTAGES OF COMPILING WORDS

- I don’t see an alternative to them if you want control structures.
- Suggestion : create and use them when you’re sure you need them.
- Just be aware of the tradeoffs you’re making with additional complexity.

APPEALS TO AUTHORITY AND CREOLE FORTH COMPILER SETUP

- Forth experts such as Leo Brodie and M. Anton Ertl have suggested using “state-dumb” words as much as possible.
- These are words that are unaware of compilation state.
- In Creole Forth the interpreter is what is used to compile.
- It builds a list of tokens that consume a single stack parameter and are executed by the interpreter.
- There is therefore no need for it to have a state.

COMPILATION VS METACOMPILATION

- In Forth, normal compilation targets the parameter field.
- Metacompilers have a separate address space as a target.
- Metacompiling words do not compile, they execute.
- Their execution is what compiles code and/or data into the target address space.
- In this respect the Creole Forth compiler operates in a manner very similar to a metacompiler.
- It could be thought of a special case of a metacompiler whose target address space is the parameter field.

REFERENCES

- Brodie, Leo. Starting Forth. Copyright 1981.
- Brodie, Leo. Thinking Forth. Copyright 1984, 1994.
- Tracy, Martin, Anderson, Anita, and Advanced Micromotion, Inc. Mastering Forth. Copyright 1989.
- Ertl, M. Anton. State-smartness | Why it is Evil and How to Exorcise it

QUESTIONS?