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The ``Clockwise/Spiral Rule''

By David Anderson

There is a technique known as the ``Clockwise/Spiral Rule'' which enables any C programmer to parse in their head any C declaration!

There are three simple steps to follow:

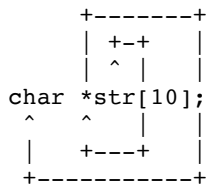
1. Starting with the unknown element, move in a spiral/clockwise direction; when ecountering the following elements replace them with the corresponding english statements:

   [X] or []
   => Array X size of... or Array undefined size of...
   (type1, type2)
   => function passing type1 and type2 returning...
   *
   => pointer(s) to...

2. Keep doing this in a spiral/clockwise direction until all tokens have been covered.

3. Always resolve anything in parenthesis first!

Example #1: Simple declaration



Question we ask ourselves: What is str?

``str is an...

- We move in a spiral clockwise direction starting with `str' and the first character we see is a `[' so, that means we have an array, so...

  ``str is an array 10 of...

- Continue in a spiral clockwise direction, and the next thing we encounter is the `*' so, that means we have pointers, so...

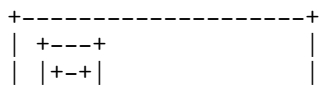
  ``str is an array 10 of pointers to...

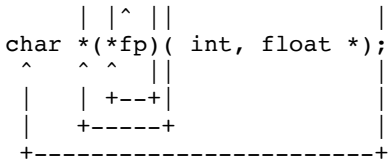
- Continue in a spiral direction and we see the end of the line (the `;'), so keep going and we get to the type `char', so...

  ``str is an array 10 of pointers to char''

- We have now ``visited'' every token; therefore we are done!

Example #2: Pointer to Function declaration





Question we ask ourselves: What is fp?

> ``fp is a...

- Moving in a spiral clockwise direction, the first thing we see is a `)'; therefore, fp is inside parenthesis, so we continue the spiral inside the parenthesis and the next character seen is the `*', so...

  > ``fp is a pointer to...

- We are now out of the parenthesis and continuing in a spiral clockwise direction, we see the `('; therefore, we have a function, so...

  > ``fp is a pointer to a function passing an int and a pointer to float returning...

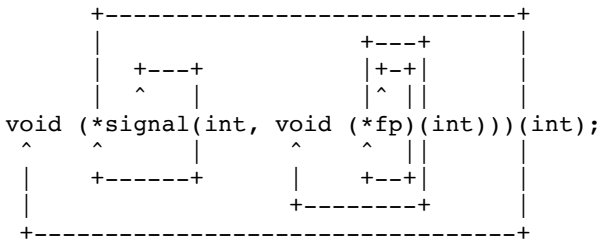
- Continuing in a spiral fashion, we then see the `*' character, so...

  > ``fp is a pointer to a function passing an int and a pointer to float returning a pointer to...

- Continuing in a spiral fashion we see the `;', but we haven't visited all tokens, so we continue and finally get to the type `char', so...

  > ``fp is a pointer to a function passing an int and a pointer to float returning a pointer to a char''

Example #3: The ``Ultimate''



Question we ask ourselves: What is `signal'?

Notice that signal is *inside* parenthesis, so we must resolve this first!

- Moving in a *clockwise* direction we see `(' so we have...

  > ``signal is a function passing an int and a...

- Hmmm, we can use this same rule on `fp', so... What is fp? fp is also inside parenthesis so continuing we see an `*', so...

  > fp is a pointer to...

- Continue in a spiral clockwise direction and we get to `(', so...

  > ``fp is a pointer to a function passing int returning...''

- Now we continue out of the function parenthesis and we see void, so...

  > ``fp is a pointer to a function passing int returning nothing (void)''

- We have finished with fp so let's catch up with `signal', we now have...

``signal is a function passing an int and a pointer to a function passing an int returning nothing (void) returning...

- We are still inside parenthesis so the next character seen is a `*', so...

  ``signal is a function passing an int and a pointer to a function passing an int returning nothing (void) returning a pointer to...

- We have now resolved the items within parenthesis, so continuing clockwise, we then see another `(', so...

  ``signal is a function passing an int and a pointer to a function passing an int returning nothing (void) returning a pointer to a function passing an int returning...

- *Finally* we continue and the only thing left is the word `void', so the final complete definition for signal is:

  ``signal is a function passing an int and a pointer to a function passing an int returning nothing (void) returning a pointer to a function passing an int returning nothing (void)''

The same rule is applied for const and volatile. For Example:

```
const char *chptr;
```

- Now, what is chptr??

  ``chptr is a pointer to a char constant''

How about this one:

```
char * const chptr;
```

- Now, what is chptr??

  ``chptr is a constant pointer to char''

Finally:

```
volatile char * const chptr;
```

- Now, what is chptr??

  ``chptr is a constant pointer to a char volatile.''

Practice this rule with the examples found in K&R II on page 122.
