The “nmodl_preprocessor”

- Rewrites nmodl files to run up to 15% faster and use 15% less memory
- Same equations, written slightly differently
- Developed to work with NEURON

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Hard-code the parameters and the temperature

Input File

```
PARAMETER {
    celsius
    temp = 23 (degC)  : original temp
}

INITIAL {
    Q10 = 3^((celsius - temp) / 10)
}
```

Output File

```
PARAMETER {
    celsius
}

INITIAL {
    VERBATIM
        assert(celsius == 37.0);
    ENDVERBATIM

    Q10 = 3^(( 37.0(degC) - 23.0(degC) ) / 10)
}
```

Hard-code the parameters and the temperature

- They can not change at run-time
- Hard-coded values have very fast run-time performance
  - Model runs approx 5% faster

Convert assigned variables into local variables

Input File

```
ASSIGNED {
    rate_A
    rate_B
}

PROCEDURE rates(v) {
    rate_A = function_A(v)
    rate_B = function_B(v)
}

KINETIC kin {
    rates(v)
    ~ A <-> B (rate_A, rate_B)
}
```

Output File

```
ASSIGNED {
}

KINETIC kin {
    LOCAL rate_A, rate_B

    rate_A = function_A(v)
    rate_B = function_B(v)

    ~ A <-> B (rate_A, rate_B)
}
```

Convert assigned variables into local variables

- First in-line all functions and procedures
- After in-lining there will be assigned variables that can now be rewritten as local variables.
- Assigned variables are stored in RAM memory, Local variables are stored in CPU registers

Convert assigned variables into local variables

- Only private variables can be optimized away
  - By default assigned variables are private
  - Range and Global variables are public

Optimize Q10

Input File

```
ASSIGNED {
    Q10
}

INITIAL {
    Q10 = 1.23456789
}

BREAKPOINT {
    data = Q10 * function(v)
}
```

Output File

```
ASSIGNED {
}


INITIAL {
}


BREAKPOINT {
    data = 1.23456789 * function(v)
}
```

Optimize Q10

- First hard-code the parameters and temperature
- Then detect temperature adjustment factors and convert them into hard-coded values

Caveats

- Don’t spam Range and Global variables
- VERBATIM statements can’t be analysed which may prevent these optimizations
- This program has had limited testing

Questions?

- Try it today!

  https://github.com/ctrl-z-9000-times/nmodl_preprocessor