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Qubiter now supports Placeholders and Loops at machine language level

Qubiter progress report, Jan 2019, by R.R.Tucci

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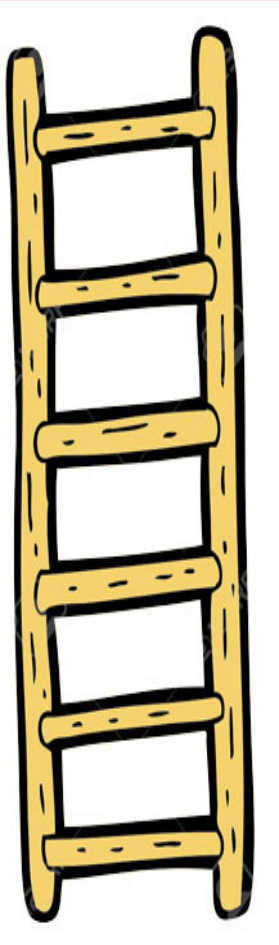
X = Placeholders And Loops At English File level

Quantum Computer



Human

Backend, Simulator, Hardware Manufacturer, in charge of device dependent error correction , optimization + ...

Hardware Manufacturer does more

Qubiter Without-X

Qubiter With-X

With-X and without-X, Qubiter works in both modes

A placeholder is a variable at the English file level

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Qubiter variables and loops at Python library level

```
a = 3
for k in range(2):
    for j in range(4):
        wr.write_Rx(a*k*j*np.pi, 2)
```

Qubiter machine language is called English File, IBM's is called IBM qasm

Qubiter variables and loops at machine language level (in English File) (implemented in classes PlaceholderManager, LoopFileGenerator and LoopyPlaceholderManager)

```
LOOP 10 NREPS=2
    LOOP 20 NREPS=4
        ROTX  function#1 AT 2
    NEXT 20
NEXT 10
```

Variables at machine language level are called placeholders in Qubiter, parameters in Rigetti-PyQuil, Symbol in Google-Cirq

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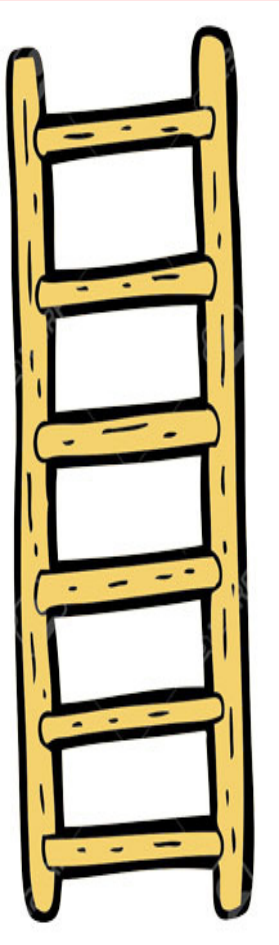
How Quantum Fog Fits In

Quantum Computer



Human

Backend, Simulator, Hardware Manufacturer

Qubiter,
quantum circuits

Quantum Fog,
Quantum Bayesian Networks

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Conclusions, Caveats

X= Placeholders and Loops at machine language level

With-X and without-X modes are both good, depends on what the hardware manufacturer supports (IBM doesn't support placeholders yet, Rigetti and Google do),

Qubiter supports both modes, with-X and without-X

Note, we are speaking of coherent loops, no measurement In between loop repetitions. This is the case for Grover's algo, Trotter's approx and QAOA (arxiv:1411.4028) which require a single coherent loop and Trotter Suzuki approx which requires nested coherent loops

Hybrid quantum-classical computation requires both coherent and incoherent loops