Quantum type system

in H-hat quantum programming language

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Summary

What is H-hat?

Quantum type system

Q&A

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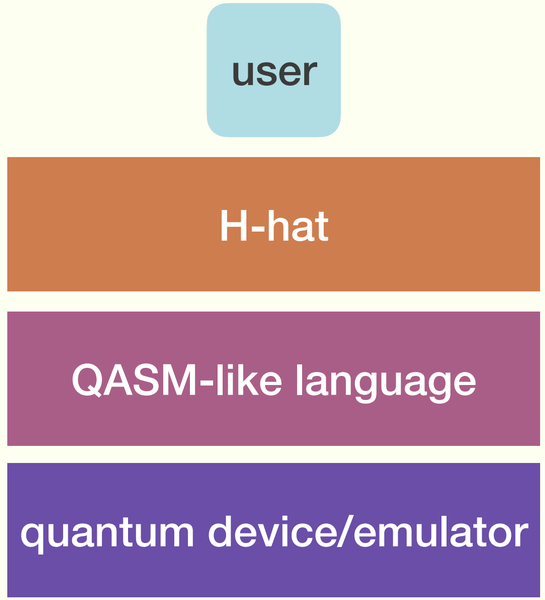

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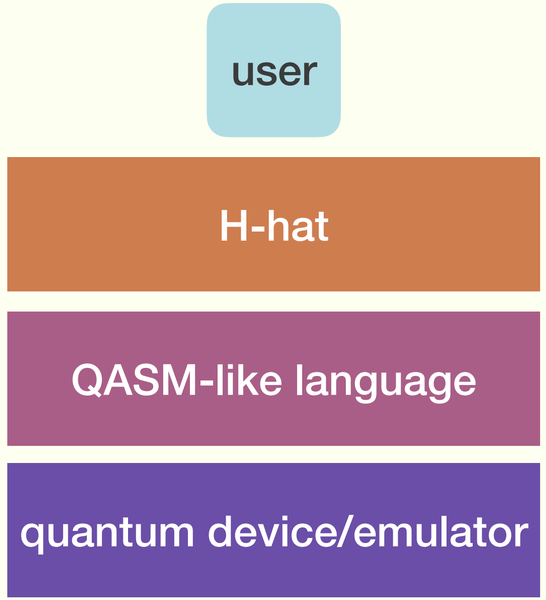
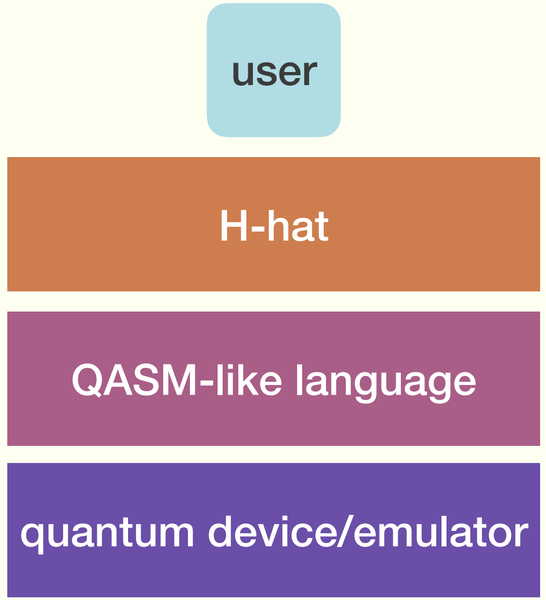


What is H-hat ($\hat{H}$) ?

- A high-level abstraction quantum programming language
- user-facing layer of the quantum stack
- data-oriented approach
- closer to what programmers currently are used to



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type @syncd_bool_t { @source:@bool @target:@bool }
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```
type @teleport_bool_t {
    @data:@bool
    @remote:@conn_teleport_bool_t
}
```

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```
@q:@bool = @redim(@false)
```

```
@q<@bool>.data = (
  @bool::@ALLOC_INDEX,
  @bool::@REDIMENSIONALIZE(@bool::@FALSE)
  )
```

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```
OPENQASM 2.0;
include "qelib1.inc";
qreg q[2];
creg c[2];
x q[0];
x q[1];
h q[0];
h q[1];
measure q[0] -> c[0];
measure q[1] -> c[1];
```

Quantum type system

```
cast(u32 @redim(@3<@u2>))
```

- `cast`:

    2. executes them on emulator/QPU and retrieves measurement (dict):

```
{"00": 500, "01": 500, "10": 500, "11": 500}
```

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    3. transforms the result according to a protocol (raw, weighted average, highest or lowest value):

```
raw => {"00": 450, "01": 510, "10": 550, "11": 490}

weighted_average (1.54) => "10"

highest (550) => "10"

lowest (450) => "00"
```

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cast(u32 @redim(@3<@u2>))
```

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    4. casts it to the chosen classical type:

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```
raw, dict => not compatible with u32

weighted_average, "10" => 2<u32>

highest, "10" => 2<u32>

lowest, "00" => 0<u32>
```

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Reach me out to know more about the project!

github.com/hhat-lang