WEBSCALE Synthesizer

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What is Program Synthesis?

Given a **program specification**, **automatically generate** a program that is **mathematically guaranteed** to implement the given specification.

Why is this useful?

Often times excellent for **filling in unknown constants**, e.g. computing the **mask** when extracting bits from a **bit field**.

```
10010101
00001111
10100101
00000101
```

Specification

```
r = 0;
done = 0;
repeat i : 4 {
  if ((done == 0) and
      (not
       (x & (1 << i) == 0))) {
    done = 1;
    r = 1 << i;
  }
}
done = 1;
```

A program “sketch”

```
r = (x + ??) & ~(x + ??);
done = 1;
i = 3;
```

An Example: Isolate the rightmost 1 bit

Output

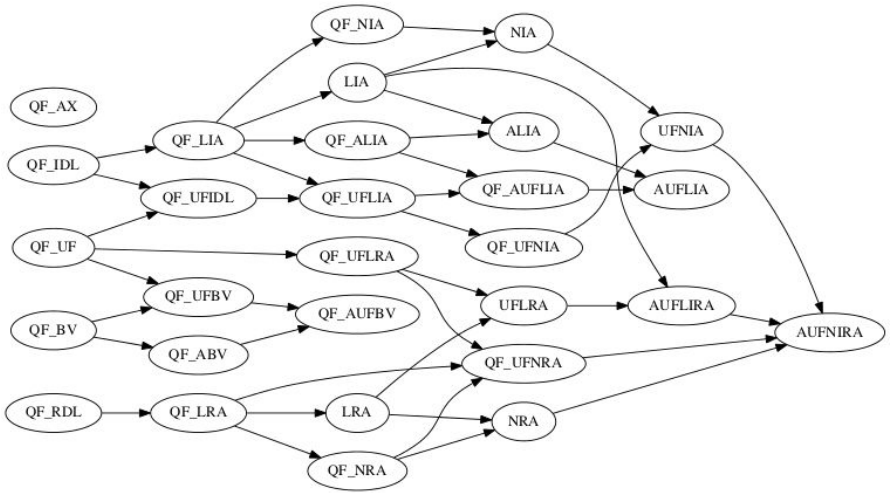
```
r = x + 0 & ~(x + 15);
done = 1;
i = 3;
```

```
r = (x + ??) & ~(x + ??);
done = 1;
i = 3;
```

An Example: Isolate the rightmost 1 bit

How does it work?

Math!



Why is this useful?

- CS230 Students
- C users
- Systems programmers

Easy vs. Hard

Easy:

- Django setup
- HTML/css
- Team collaboration
- Version control

Hard:

- Integrating the Synthesizer
- Google Drive integration
- Search Function
- models

Future Work

- Diversified target audience
- Mobile app
- Text editor helper
- Tutorial

W E B S C A L E Synthesizer

We brought the power of **program synthesis** to the **web**.

DEMO!