Poing Impératif: Compiling Imperative and Object Oriented Code to Faust

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About Faust (background info)

- Faust is a programming language
  - ...for making programs which process audio signals.
- High level language.
  - Code is more compact and cleaner than C or C++.
  - Less fiddling with details. (less bugs and easier to read)
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  - Write once, run everywhere. (even on your gfx board!)
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Description of the problem

1. Faust requires the programmer to immediately start thinking in fully functional terms.
   - A 400Hz sine oscillator can not be made like this in faust:

     ```
     phase = 0.0;
     process(){
       phase = phase + 400*(pi*2/samplerate);
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   - A special recursive operator (tilde) must be used instead:

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Solution to the problem

- A new compiler called Poing Impératif. This compiler
  - Extends Faust with imperative and object oriented features.
  - Outputs pure Faust code.
- Now, a 400Hz sine oscillator can be implemented like this:

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Example 1. Oscillator

```
class Oscillator(float frequency){
    float phase;

    float process(){
        phase += frequency*3.14*2/44100;
        return sin(phase);
    }
}

freq = hslider("freq",400.0,10,3000,1);

process = Oscillator(freq);
```

Example 2. Oscillator with local method

```
class Oscillator(float frequency){
  float phase;

  increase_phase(float how_much){
    phase += how_much;
  }

  float process(){
    this.increase_phase(frequency*3.14*2/44100);
    return sin(phase);
  }
}

freq = hslider("freq",400.0,10,3000,1);
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```

Example 3. Oscillator using a separate Phase class

```
class Phase{
  float phase;

  increase_phase(float how_much){
    phase += how_much;
  }
}


class Oscillator(float frequency){
  Phase phase;

  float process(){
    phase.increase_phase(frequency*3.14*2/44100);
    return sin(phase.phase);
  }
}

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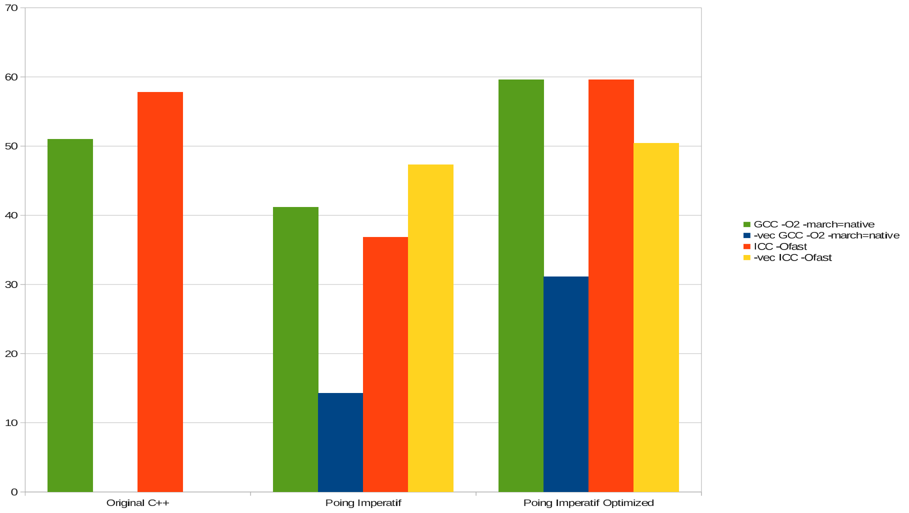
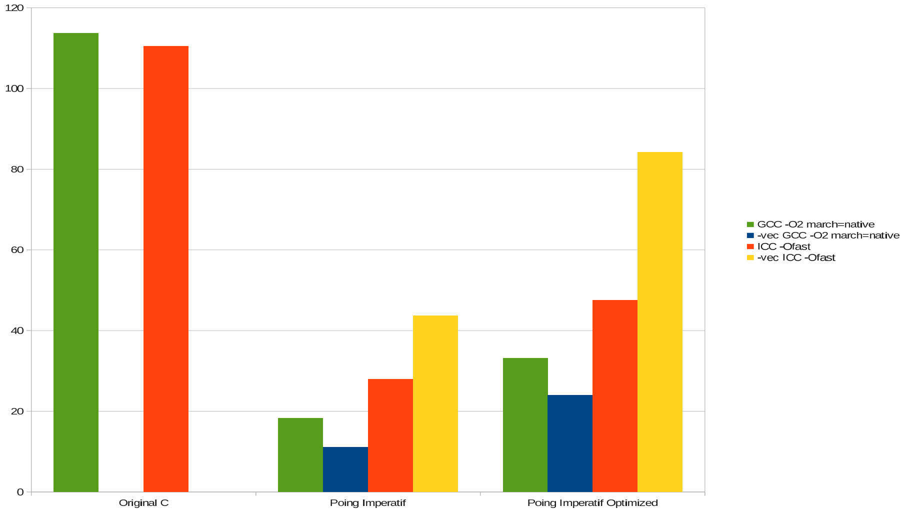
Example 4. Freeverb

Benchmark 1: Freeverb



Example 5. LADSPA am_pitchshift

Benchmark 2: LADSPA am_pitchshift



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- In C or C++ you can do this:

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process(a,b){
  a[i]   += a;     // Statement 1
  a[i+1] += b;     // Statement 2
  return [i+2];
}
```

- But in Poing Impératif you can only do this:

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     int faculty = 1;
     for(int i=2; i<len; i++){
       faculty *= i;
     }
     return faculty;
   }
   ```

   This is not supported in Poing Impératif. (and is quite unlikely to be in the future.)

2. In C++ you can do this:

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1. Faust generate no jumps.
   Faust uses ?: as value selectors.
   (For instance $a = b\ ?\ 3 : 4;$)

2. Example:

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if(a==1){
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Future work

- Implement *for* loops.
- Reduce compilation time.
  - Freeverb takes 20-40 seconds to compile.
  - Worse: small changes in the freeverb code causes Faust never to finish. (apparently)

Q/A

Any questions?

Bakgrunn og problem

Utgangspunkt: Ønsket å bruke Stalin Scheme eller Bigloo Scheme for å programmere lyd i sanntid.

- Stalin Scheme og Bigloo Scheme bruker Hans Boehm's konservative søppeltømmer for C og C++ (BDW-GC).

Problem 1: BDW-GC virker dårlig i sanntid.

- Programmene må vente til "mark" er ferdig å kjøre.

  Uberegnelig pausetid

Problem 2: BDW-GC krever ikke read barrier eller write barrier.

- Alle kjente sanntids-søppeltømmere krever read barrier eller write barrier.
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