Higher-Order reactive Programs

Haai -> Bytecode -> Haai Vm in Elixir -> Distribute Haai Vm

Haai, a pure reactive programming language

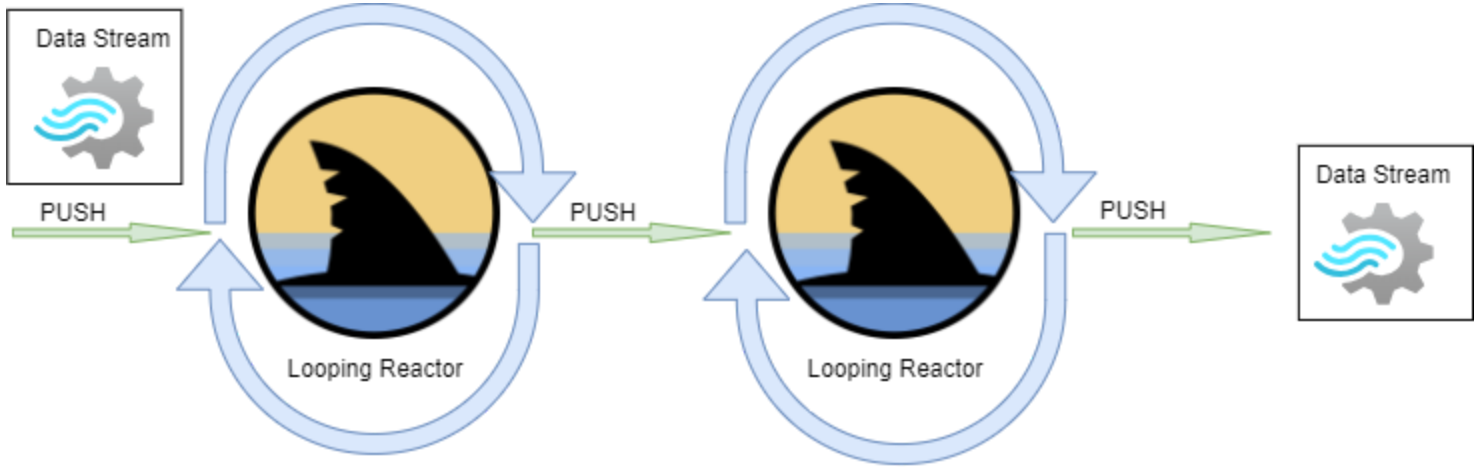
- This is not an Embedded Domain Specific Language, eg: no lifting.

Haai, a pure reactive programming language

- Push-based, Haai updates signals in a glitch-free manner.

Haai, a pure reactive programming language

- A reactor loops, pushing the sources altered by the reactor to the sinks.

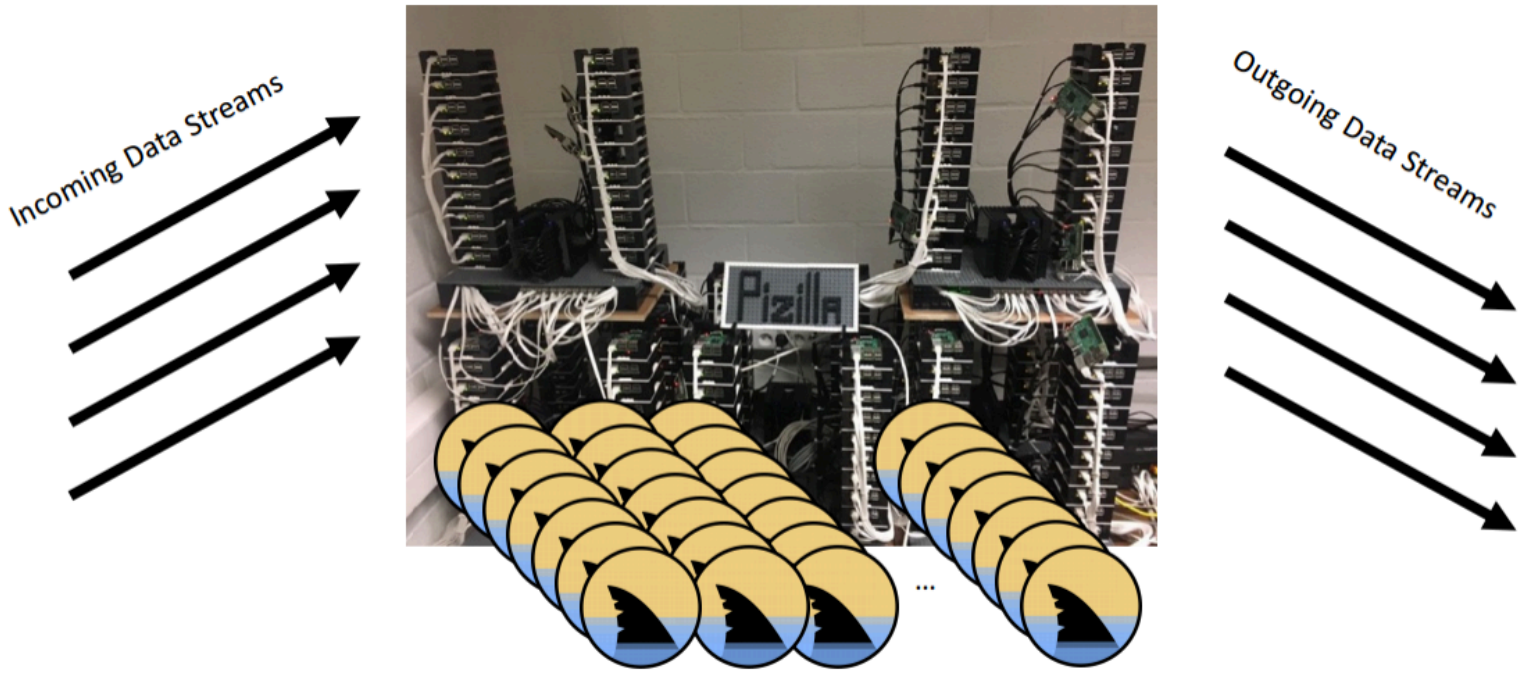


Cluster environments

- Make reactive programming with Haai available to cluster environments.
- Discover coordination problems.

Cluster environments

- Many Haai interpreters.



Many (connected) Haai interpreters

Use case, musical reactors

- Microtonal melody generator. (eg: 31-EDO, 24-EDO, pure intonation)

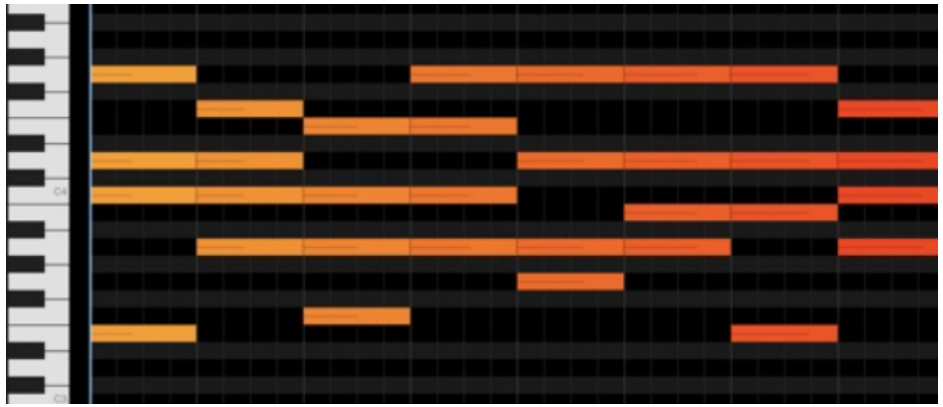
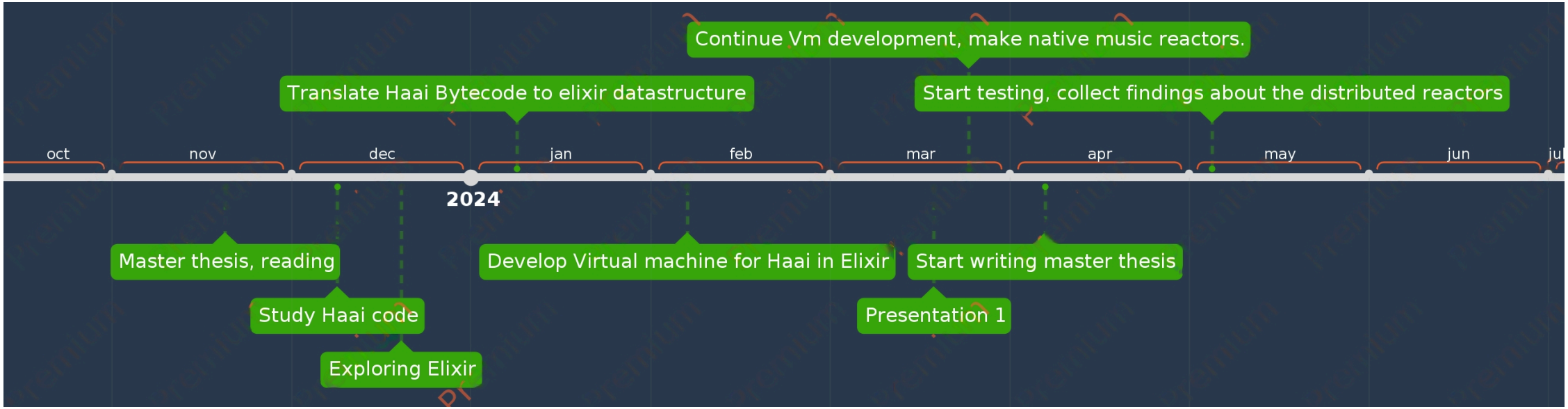


Figure: Standard 12 tone equal temperament, 12 tet

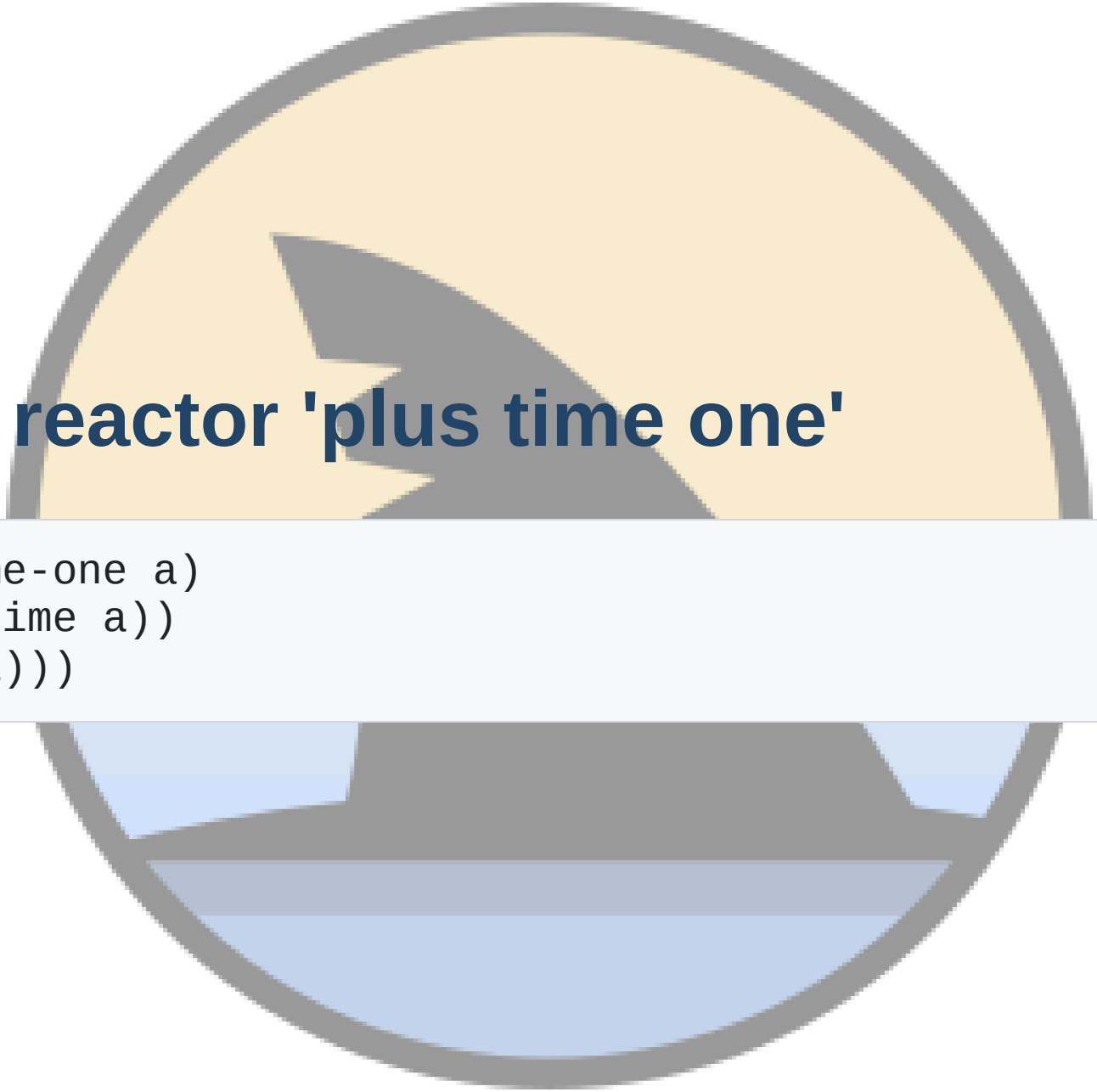
- Open sound control (OSC) communication with Supercollider server.

Master thesis, Timeline



Haai virtual machine

- Haai compiles to bytecode (S-expression) to [elixir [nested lists]].



Haai code, reactor 'plus time one'

```
(defr (plus-time-one a)
    (def x (+ time a))
    (out (+ x 1)))
```

Virtual machine

- [name, sources, dtm, rtm, sinks].
- GenServer to maintain state. (eg: dtm, rtm, src)
- Sources in, Sinks out.

Virtual machine

```
defp run_reaktor(dtm, rtm, rti) do
  # reset the genserver (state) when starting
  case GenServer.whereis(:memory) do
    nil ->
      IO.puts("GenServer :memory is not running.")
    pid ->
      GenServer.stop(:memory)
      IO.puts("GenServer :memory (PID: #{inspect(pid)}) stopped successfully.")
  end
  Memory.start_link(dtm, rtm, [0, 9])
  # execute each rti
  Enum.each(Enum.with_index(rti), fn {instruction, rti_index} ->
    hrr(instruction, rti_index)
    Memory.show_state()
   end)
end
```

Higher-Order reactive Programs

- Haai -> Bytecode -> Haai Vm in Elixir -> Distribute Haai Vm
- BEAM VM runs the HAAI VM in a distributed setting.
- Researching issues that arise from distributing Haai reactors.
- Usecase, musical reactors.