POSSIBILITY WAVES

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The behavior of circuits can be visualized as the propagation of logical values (binary states) through a network of gates that change those logic values either by inverting them (single-input not gates) or by combining them (multiple-input or/and gates). This viewpoint uses an external, objective metaphor, watching how the propagation of apparent objects (bits) effects their state (high/low).

Alternatively, a circuit can be seen as a constraint system imposed on the freedom of the input. A simple not-gate enforces that its input contradict itself, imposing absolute limits on a signal's choice of self-expression. (The freedom of a binary signal is quite limited, to be in one of two states.) An or-gate enforces a form of joint cooperation, either signal can dominate the outcome of their meeting.

A yet deeper subjective perspective is available from the viewpoint of each gate. Gates see incoming states and act as the environment for those states, effecting their interaction absolutely. A combinatorial gate however, has no access to the working of its neighbors, it is a purely local, parallel agent.

Consider now a different type of thing being propagated. Instead of a specific logical value, either-high-or-low, let the information be a space of possibilities, both-high-and-low. We can no longer watch the behavior of values. We can only know the specific state of a location when there is no choice (freedom) for that state. But we can still do computation on the functionality of the circuit, including minimization, diagnostics, and timing analysis.

A not-gate now no longer sees or acts on a signal-state to absolutely change it. An incoming signal (both-high-and-low) provides nothing to invert. However, the gate can function on other operators, in an algebraic manner. Not-gates can cross-communicate and perform useful computation merely by indicating their presence. When both-high-and-low arrive at a gate, the gate examines the signal for markings of another inverter, and either adds a mark if none is found or removes a mark if it is found. Combining gates no longer determine the dominant signal, they separate and combine redundancies. This change in perspective is perhaps the most unfamiliar, since algebraic gates see as input the entire subgraph below. An or-gate essentially asks if the incoming signal-histories are identical. It so one is superfluous, if not then both signals are passed on. Algebraic circuits thus expand rather than contract the signal propagating through them.

The antecedents-of-modus-ponens circuit

(((a) ((a) b))

propagates two "a" signals through different inverters which mark each as "(a)". The or-space "(a) b" passes its entire space as its expanding value. The or-space "(a) ((a) b)" does not because of the interacting identical subnets "(a)" and "(a)".

We can view the space interaction of identical structures as an interference pattern, not between the values of each structure but between the identicalness of the named patterns. It is the naming of different input signals which determines the rigidities of the system, not the concrete state a particular name is in at a particular time. Traditionally, signals are not named, but envisioned as path (wire) between gates. Gates are named and process signals which vary over time determined by a clock. In this computational model, the effect of the entire circuit is spread over time and required to converge to an instance. Other instances are then pumped through the circuit by the clock, providing a sequence of events (011010010...) which is read out into parallel spatial form for our comprehension.

Consider an algebraic circuit resonating its possibilities/constraints, independent of time. Rather than changing states, its changes constraints as its self-minimizes. When a input-name is bound to a value (either-high-or-low), that concrete intrusion into the possibility harmonic is immediately removed, resulting in a smaller possibility space, since one degree of freedom has been totally removed.

Such a circuit is not constrained by linear propagation of things/values, and will self-modify at any point of grounding, whether it be inputs, "outputs", or internal gates. When all inputs are bound concurrently, the algebraic circuit looses all constraints which hold it up, and it collapses to a single value by the fastest possible path. In contrast, propagating circuits evaluate by their slowest possible path.

Each explicit gate in an algebraic circuit summarizes the subcircuit below it. The possibility space represented by a subcircuit can itself be seen to propagate. Instead of specific states (logic values), an algebraic gate outputs its entire subcircuitry possibility space, as a possibility wave. These waves interact at gates to produce algebraic minimization rather than arithmetical evaluation.

By tracing the propagation of possibility waves from concurrent free inputs up through the circuit on clock tick at a time, we see the dynamic interaction of possibility spaces as they pass through each gate. An optimized algebraic circuit is one in which no interaction between waves occurs. In the above example,

(a) ((a) b)

generates a harmonic interaction, the identical (a) waves interfere. The interference rules are logical/symbolic rather than light/photonic.

```
            (( ) a) ==>                   Absorption
```

Any constants are immediately inverted/absorbed by their environment.

```
            (a a) ==> (a)                 Coalesce
```

Any identical signals are redundant, one absorbs the other.

This basis provides a wave-like model in which identicality reinforces the same signal without value. Call this *pervasive interference*. (Recall that the variable name "a" represents a named signal source propagating the superimposed value both-high-and-low)

Coalesce is independent of environmental inversions, but not symmetrical, in that the outermost signal is dominant.

```
      (a ((((a))))) ==> (a (((( )))))

      (a (a ((a (a))))) ==> (a (  ((  ( )))))
```

When multiple named signals are propagated through an algebraic circuit, the circuit minimizes its possibility space by eliminating identical possibility waves through pervasive interference.

```
      ((a) ((a) b)) ==> ((a) (    b))
```

Thus any (poorly designed) circuit can be logically optimized by treating it as an algebraic circuit and propagating possibility waves through it. Eg:

```
      ((a) (a b))
```

Possibility wave analysis:

```
        a   a b
       (a) (a b)
      ((a)      )
        a
```

ISSUE: What is the possibility evolution of difficult to reduce circuits?