

Propositional Argument Order

by Sven Nilsen, 2020

In this paper I present a technique to assign an order to arguments of propositional logic.

Proofs in propositional logic are normally used to check that they return `true` for all possible inputs. However, there is another use case where one wants to find a sort given by some map `f`:

$f : \text{nat} \rightarrow \text{nat}$

Such that (interpreted informally):

$\forall A, B \{ \text{imply}(\text{imply}(A, B), \text{le}(f("A"), f("B"))) \}$

Where `imply` is material implication and `le` is the ` \leq ` operator (less or equal).

Here I use quotes to refer to the argument `A` (this is usually impossible because it is a proposition).

I suggest counting the number of cases when an argument is `true` and the output is `true`.

For example, for material implication itself:

A	B	A => B
0	0	1
0	1	1
1	0	0
1	1	1
1	2	

Here, `A` is `true` 1 time when `A => B` is `true`.

`B` is `true` 2 times when `A => B` is true.

Another example:

A	B	C	(A => B) ^ (B => C)
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1
1	2	3	