Asymmetric Velocity Logic

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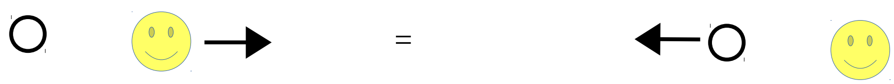
In this paper I present a logic based on asymmetric velocity reference frames.

Galilean invariance means that physical laws look the same in all velocity reference frames.
A way to picture this is that when the observer is moving in one direction relative to a stationary object, it looks to the observer as if the stationary object is moving in the opposite direction.



What if there was a universe where the object observed could do the following:

1. stay (looks as if it is stationary)
2. push (can not move closer)
3. pull (can not move away)
4. follow (keeps same distance)

When an object `a` is an observer, it is written `a`.
When an object `a` is not an observer, it is written `¬a`.
For any two objects `a` and `b`, there are two binary relations `a ∧ ¬b` and `¬a ∧ b`.
The relation `a ∧ ¬b` is interpreted as `a` can move away from `b`.

In matrix form, these 2-relations are defined as:

stay	a	b
¬a	0	0
¬b	0	0

push	a	b
¬a	0	0
¬b	1	0

pull	a	b
¬a	0	1
¬b	0	0

follow	a	b
¬a	0	1
¬b	1	0

If `a` is an observer and can not move away from `b`, then the analogue of Galiliean invariance means that from the perspective of `b`, it looks as if it "pushes" `a`, relative to stationary objects.

Therefore, the truth value is the same for both observers, since it depends on the direction of motion.

There is a natural way of assigning every 2-relation a function of type `bool → bool`:

\false	<=>	stay	random motion results in random distances
not	<=>	push	random motion increases distance between two objects
id	<=>	pull	random motion brings two objects together
\true	<=>	follow	random motion results in constant distance

In one dimensional asymmetric velocity logic, there are two operations on functions `bool → bool`:

$f_0 \wedge f_1$	**join** end point of one path to the start point of another path
$f_0 \vee f_1$	**meet** two paths in higher dimensions with same start and end points