Asymmetric Velocity Logic

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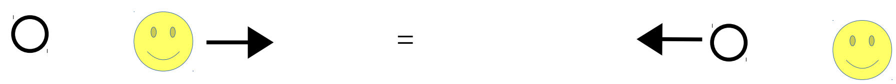
In this paper I present a logic based on asymmetric velocity reference frames.

Galilean invariance means that laws of physics 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)

For any two objects \`a\` and \`b\`, there are two binary relations \`pushes(a, b)\` and \`pulls(a, b)\`.

In matrix form, these 2-relations of velocity constraints 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

This asymmetric velocity logic treats velocity of objects as unknowns, which simplifies physics programming and can be used to prove many common sense problems of physics. The analogue of Galiliean invariance in this theory is that laws of physics look the same for all observers. It turns out that this is possible without velocity being anti-symmetric in two velocity reference frames.

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

These two operations (using Higher Order Operator Overloading) provides consistency. One can also depend on other variables to determine velocity constraints, such as distance or time.