Transformations of Space-time frames

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INTRODUCTION

Transformations allow an observer to analyse different space frames. They contain four general types: translation, dilation, reflection and rotation. I propose there exists similar transformations between space-time frames. One of which has already been proposed by Einstein in "The theory of relativity" which observes translations between space-time frames.

Relativity at it's mathematical foundation is describing translations between space-time frames. Perspectivity is describing dilation transformations between space-time frames. Symmectrivity describes reflection transformations between space-time frames. Imaginivity describes rotational transformations between space-time frames.

RELATIVISTIC TRANSLATIONS OF SPACE-TIME

Einstein proposed that via Lorentz transformations from x, y, z, t to x', y', z', t' it is possible to observe two different space-time frames. The following equations describe the translations between two space-time frames,

$$x' = \frac{x - vt}{\sqrt{1 - \frac{v^2}{c^2}}}, \tag{1}$$

$$y' = y, \tag{2}$$

$$z' = z, \tag{3}$$

$$t' = \frac{t - \frac{xv}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}}, \tag{4}$$

When the velocity of light c becomes infinitely large, the Galilei transformations are obtained:

$$x' = x - vt, \tag{5}$$

$$y' = y, \tag{6}$$

$$z' = z, \tag{7}$$

$$t' = t, \tag{8}$$

Special relativity

If a light signal is sent in positive x-direction we find

$$x = ct, \tag{9}$$

and so using Lorentz transformations we find that,

$$x' = \frac{(c - v)t}{\sqrt{1 - \frac{v^2}{c^2}}}, \tag{10}$$

$$t' = \frac{(1 - \frac{v}{c})t}{\sqrt{1 - \frac{v^2}{c^2}}}. \tag{11}$$

PERSPECTIVE DILATION OF SPACE-TIME

X, Y and Z are the set of positions in the corresponding x,y and z dimensions. If we take a single (x,y,z,t) point and transform it at the speed of light in x-direction using perspective dilation of space-time, we obtain (X', Y', Z', t') where using interval notation,

$$X' = [x, x'],\ where\ x' = \frac{x - vt}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{12}$$

$$Y' = [y, y'],\ where\ \ y' = y \tag{13}$$

$$Z' = [z, z'],\ where\ \ z' = z \tag{14}$$

$$t' = \frac{t - \frac{xv}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}}, \tag{15}$$

Now let's repeat this method but with sets X, Y and Z, where V is a set of velocities for all x in X and T is a set of points in time,

$$X'' = X \cup X', \; where \; X' = \frac{X - Vt}{\sqrt{1 - \frac{V^2}{c^2}}} \tag{16}$$

$$Y'' = Y \cup Y', \; where \;\; Y' = Y \tag{17}$$

$$Z'' = Z \cup Z', \; where \;\; Z' = Z \tag{18}$$

$$T' = \frac{t - \frac{XV}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}}, \tag{19}$$

if all v in V are the same for all x then,

$$t' = \frac{t - \frac{XV}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}}, \tag{20}$$

We can repeat k times to obtain,

$$X^k = \cup_{i=1}^k X^i, \; where \; X^{i+1} = \frac{X^i - V^i t}{\sqrt{1 - \frac{(V^i)^2}{c^2}}} \tag{21}$$

$$Y^k = \cup_{i=1}^k Y^i, \; where \;\; Y^{i+1} = Y^i \tag{22}$$

$$Z^k = \cup_{i=1}^k Z^i, \; where \;\; Z^{i+1} = Z^i \tag{23}$$

$$T^k = \frac{t - \frac{X^k V^k}{c^2}}{\sqrt{1 - \frac{(V^k)^2}{c^2}}}, \tag{24}$$

if all V in V^k are the same for all X then,

$$t = \frac{t - \frac{X^k V^k}{c^2}}{\sqrt{1 - \frac{(V^k)^2}{c^2}}}, \tag{25}$$

Similar Perspectivity

If x'/x = y'/y = z'/z, then the dilation is uniform across all space-time and so everything remains the same in perspective of each other,

$$X' = Ax, \tag{26}$$

$$Y' = Ay, \tag{27}$$

$$Z' = Az, \tag{28}$$

$$t' = t, \tag{29}$$

Quantum to classical to relativistic space-time frames

SYMMETRIC REFLECTIONS OF SPACE-TIME

Supersymmetry, parallel universes in opposite time, parallel universes in opposite space

IMAGINATIVE ROTATIONS OF SPACE-TIME

Imaginary numbers, waves, universes.

TRANSFORMATION COMBINATIONS

Relative perspective transformations

Perspective frames can be compared using relativity.

CONCLUSION

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