Constructing an E8 Based Standard Model (SM)

An approach to a Theory of Everything (ToE)

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E8 Petrie Projection and H4+H4ϕ
Golden Ratio ($\Phi^n = f_n \Phi + f_{n-1}$)

Fibonacci Sequence ($f_n$)

- Point: {1, 0, 0, 0, 0, 0, 0, 0, 0}
- T(ime): {1, 1}
- Length: {1, 2, 1}
- P(arity): {1, 3, 3, 1}
- C(harge): {1, 4, 6, 4, 1}
- Mass: {1, 5, 10, 10, 5, 1}
- Space: {1, 6, 15, 20, 15, 6, 1}
- CP: {1, 7, 21, 35, 35, 21, 7, 1}
- CPT: {1, 8, 28, 56, 70, 56, 28, 8, 1}

Pascal Triangle Construction

- 480 = 16 * 30 sets of 7 (of 35) triples that cover 21 pairs

Excluded (Dim + AntiDim)

- Binary 1:1 w/ Permutations
  - Permutations[$\{1,1,0,0,0,0,0,0\}$]
  - Permutations[$\{0,0,0,0,0,0,-1,-1\}$]
  - Permutations[$\{1,0,0,0,0,0,-1\}$]

E8

- 2^8 = 256 = 128 + 112 + 8 + 8
- 240 vertices

Dimension or Rank n

- (2n excluded generator vertices)

BC8 = 8-demicube

- (128 int./2 vertices = 16 Hamming + 112) (112 vertices)

C8s = D8

- (128 int./2 vertices = 16 Hamming + 112) (112 vertices)

Pascal Triangle

- Real, Complex, Quaternion, Octonion
- Cayley-Dickson doubling

1 Subsets [Range@7, {0}]
7 Subsets [Range@7, {1}]
21 Subsets [Range@7, {2}]
35 Subsets [Range@7, {3}]

1, 2, 3, 5, 8, 13, 21, 34, ...
The Algorithms and Resulting Symmetries

Note: For a more detailed explanation of new particle notation, this model is a modification of: http://arxiv.org/abs/0711.0770.

E8 QUANTUM PARAMETER
PARTICLE ASSIGNMENTS

Standard Model
E8 Particle Assignment Symmetry

Projection from physics rotation of Split Real Even (SRE) E8:

\[ X = \left\{ 2 - \frac{4}{\sqrt{3}}, 0, 0, \sqrt{\frac{2}{3}} \left(\sqrt{3} - 1\right), 0, 0, \sqrt{2}, 0 \right\} \]

\[ Y = \left\{ 0, \frac{4}{\sqrt{3}} - 2, \sqrt{2} \left(\frac{1}{\sqrt{3}} - 1\right), 0, 0, 0, -\sqrt{2} \right\} \]
E8 Particle Assignment Symmetry

$256 = 2(\text{anti}) \times 2(\text{pType}) \times 4(\text{spin}) \times 4(\text{color}) \times 4(\text{generation})$

Each blue equilateral triangle represents a rotation matrix operation applied 3 times to a vertex. They are all particles or anti-particles.

Rotation by $\pi$ (180°) around (or reflection through) {0,0} for anti-particles.

8 (XY) axis are E8 “generators” added to the 240 vertex “dimension count.”
Fermions: $192 = 2a \times 2p \times 4s \times 4c \times 3g$ (128 \frac{1}{2} \text{Integer E8 gen 1,3})
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Bosons: \[ 48 = 2a \cdot 2p \cdot 4s \cdot 3c \] (Integer E8 vertices)
Fermions: \(192 = 2^a \cdot 2^p \cdot 4^s \cdot 4^c \cdot 3^g\) (128 \(\frac{1}{2}\)Integer E8 gen 1,3)

Bosons: \(48 = 2^a \cdot 2^p \cdot 4^s \cdot 3^c\) (Integer E8 vertices)

Excluded: \(16 = 2^a \cdot 2^p \cdot 4^s\) (E8 generators 8-orthoplex axis)

Gluons

Leptons

Quarks

\(e_s \phi / \omega_R - W\)

\(e_t \phi / \omega_L - B\)

\(\chi \phi_{123}\)
Each triality rotates clockwise through 3 colors and stays within a particular particle/antiparticle type.
Fermion Generational Triality

spin(\(^L\wedge R\wedge L^\vee R\)) and pType (\(uct-\gamma_{e\mu\tau}/dsb-e\mu\tau\))

Each triality rotates clockwise through 3 generations and stays within a particular spin, color and particle/antiparticle type.

Rotation by \(\pi\) (180°) around (or reflection through) \(\{0,0\}\) for AntiParticles.