UNIFIED FIELD PROPOSAL

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Abstract. In this short paper i present a simple possible way to unified field theory. It uses scalar field as mathematical model that comes from use of five dimension rotation operators with five dimensions tensor field. Four dimensions are space and fifth is time. I did not present solutions to field equations only all mathematics need to make it work.

1. Spin field matrix

Spin field can be thought as sum of matrix elements. There are two basics states of energy that can describe any system, first one says that zero energy state is equal to zero $\Phi_0 = 0$ so system is massless. Second one says that energy levels are not equal- so system does evolve and have many possible energy states $\Phi_n \neq \Phi_{n-1} ... \neq \Phi_0$. I can write those as states of matrix that has all possible combination of those:

$$\sigma_{nm} = \begin{bmatrix} +\frac{1}{2}\sigma_{11} & +\frac{1}{2}\sigma_{12} \\ -\frac{1}{2}\sigma_{21} & +\frac{1}{2}\sigma_{22} \\ +\frac{1}{2}\sigma_{31} & -\frac{1}{2}\sigma_{32} \\ -\frac{1}{2}\sigma_{41} & -\frac{1}{2}\sigma_{42} \end{bmatrix} \tag{1.1}$$

Where each component of that matrix can have value equal to zero, one or minus one. Sum of those matrix elements is equal to spin state number:

$$s = \sum_{n,m} \sigma_{nm} \tag{1.2}$$

If i have a minus sign of symmetry it means its not fulfilled so the opposite is true, energy zero state is not equal to zero, all energy states are equal. Each elementary particle can be thought as state of that matrix. For example i can write photon and graviton as:

$$\hat{\sigma}_\gamma = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \quad \hat{\sigma}_G = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix} \tag{1.3}$$

And for each particle there is anti-particle that has opposite state and moves backwards in time compared to normal particle moving foward in time. So for photon and graviton those anti-particles are:

$$\hat{\sigma}_{\overline{\gamma}} = \begin{bmatrix} -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \quad \hat{\sigma}_{\overline{G}} = \begin{bmatrix} -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ -\frac{1}{2} & -\frac{1}{2} \end{bmatrix} \tag{1.4}$$

So anti-photons have mass and only one energy state. Same with anti-gravitons, they have mass and one energy state. But this picture still lacks interaction and energy of that field. I need to define how those states interact. Before i move to it i can write anti-matter state as opposite state of sum of spin field matrix.

2. Elementary particles

From spin field matrix I can recover all Standard Model [1] particles and others not predicted by it.

$$H^0 = \begin{bmatrix} +\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ -\frac{1}{2} & +\frac{1}{2} \end{bmatrix} \quad Z^0 = \begin{bmatrix} -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ +\frac{1}{2} & -\frac{1}{2} \end{bmatrix} \quad W^- = \begin{bmatrix} +\frac{1}{2} & -\frac{1}{2} \\ -\frac{1}{2} & -\frac{1}{2} \\ -\frac{1}{2} & 0 \\ +\frac{1}{2} & 0 \end{bmatrix} \tag{2.1}$$

$$g_1 = \begin{bmatrix} +\frac{1}{2} & +\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ -\frac{1}{2} & +\frac{1}{2} \end{bmatrix} \quad g_2 = \begin{bmatrix} +\frac{1}{2} & +\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ +\frac{1}{2} & -\frac{1}{2} \end{bmatrix} \quad g_3 = \begin{bmatrix} +\frac{1}{2} & 0 \\ 0 & 0 \\ 0 & 0 \\ +\frac{1}{2} & 0 \end{bmatrix} \tag{2.2}$$

$$e^- = \begin{bmatrix} 0 & 0 \\ -\frac{1}{2} & +\frac{1}{2} \\ -\frac{1}{2} & 0 \\ 0 & 0 \end{bmatrix} \quad \mu^- = \begin{bmatrix} 0 & 0 \\ +\frac{1}{2} & -\frac{1}{2} \\ -\frac{1}{2} & 0 \\ 0 & 0 \end{bmatrix} \quad \tau^- = \begin{bmatrix} 0 & 0 \\ -\frac{1}{2} & -\frac{1}{2} \\ +\frac{1}{2} & 0 \\ 0 & 0 \end{bmatrix} \tag{2.3}$$

$$u = \begin{bmatrix} -\frac{1}{2} & 0 \\ -\frac{1}{2} & +\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \quad c = \begin{bmatrix} -\frac{1}{2} & 0 \\ +\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \quad t = \begin{bmatrix} +\frac{1}{2} & 0 \\ -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \tag{2.4}$$

$$d = \begin{bmatrix} -\frac{1}{2} & 0 \\ -\frac{1}{2} & 0 \\ 0 & +\frac{1}{2} \\ 0 & 0 \end{bmatrix} \quad s = \begin{bmatrix} -\frac{1}{2} & 0 \\ +\frac{1}{2} & 0 \\ 0 & -\frac{1}{2} \\ 0 & 0 \end{bmatrix} \quad b = \begin{bmatrix} +\frac{1}{2} & 0 \\ -\frac{1}{2} & 0 \\ 0 & -\frac{1}{2} \\ 0 & 0 \end{bmatrix} \tag{2.5}$$

$$\nu_e = \begin{bmatrix} -\frac{1}{2} & +\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ -\frac{1}{2} & 0 \end{bmatrix} \quad \nu_\mu = \begin{bmatrix} +\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ -\frac{1}{2} & 0 \end{bmatrix} \quad \nu_\tau = \begin{bmatrix} -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ +\frac{1}{2} & 0 \end{bmatrix} \tag{2.6}$$

$$\gamma = \begin{bmatrix} +\frac{1}{2} & +\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \quad G = \begin{bmatrix} +\frac{1}{2} & +\frac{1}{2} \\ 0 & 0 \\ 0 & 0 \\ +\frac{1}{2} & +\frac{1}{2} \end{bmatrix} \tag{2.7}$$

Where additional particle here is graviton. Electric charge does work for spin matrix elements $\sigma_{21}, \sigma_{22}, \sigma_{31}, \sigma_{32}$ and its 2/3 for same row entries and 1/3 for row/column mix- where i count each pair as equal to 2/3 or 1/3 charge and it does not matter do they sum to minus two or zero or plus two. If there are mix elements charge is negative is there are only row elements it's positive. It's opposite way for anti-particles, if there are mix elements charge is positive if not it's negative.

3. Spin scalar field

From spin field matrix and new object that is spin field tensor i can create equation of scalar field. I will use rotation operator with indexes $\alpha\beta$ that means what plane is rotated. Spin field tensor says how many symmetries are per given area where that area are its indexes, now i can write whole scalar field equation as:

$$\sum_{i,j\neq n,m}\sum_{n,m\neq i,j}\sum_{k,l}\kappa\Phi_{ijnmkl}(\mathbf{x})\,\sigma_{ijnmkl}(\mathbf{x})$$
$$=\int\sum_{i,j\neq n,m}\sum_{n,m\neq i,j}\sum_{k,l}\prod_{\alpha=0}^{4}\prod_{\beta=0}^{4}R^{\mu\nu}_{\gamma\delta\alpha\beta}\left(2\pi\partial_\alpha\partial_\beta\sigma^{\alpha\beta}_{ijnmkl}(\mathbf{x})\right)$$
$$\times R^{\gamma\delta}_{\mu\nu\alpha\beta}\left(2\pi\partial_\alpha\partial_\beta\sigma^{\alpha\beta}_{ijnmkl}(\mathbf{x})\right)\partial_\gamma\partial_\delta\sigma^{\gamma\delta}_{ijnmkl}(\mathbf{x}))d^4\mathbf{x} \tag{3.1}$$

Where field is summed over indexes i, j, n, m, k, l they mean that i take first elements of spin matrix i, j, n, m with particle system k, l for one system only $k = l = 1$. Where R is rotation matrix, and Φ is energy scalar function. So i sum all spin matrix field interaction with all possible systems. From field equation i can move to probability, probability of system to be in some part of space a, b is equal to spin scalar field integral summed from A to B divided by integral over whole space. Where both A and B are points in four dimension space. I can write it as:

$$P(A,B)=\frac{\sum_{i,j\neq n,m}\sum_{n,m\neq i,j}\sum_{k,l}\kappa\Phi_{ijnmkl}(\mathbf{x})\,\sigma_{ijnmkl}(\mathbf{x})\Big|_{A}^{B}}{\sum_{i,j\neq n,m}\sum_{n,m\neq i,j}\sum_{k,l}\kappa\Phi_{ijnmkl}(\mathbf{x})\,\sigma_{ijnmkl}(\mathbf{x})\Big|_{-X^4}^{+X^4}} \tag{3.2}$$

After measurement field changes state from integral over whole space to integral over that two measured points. Last part is time that is measured by clock of observer. I can write proper time as integral for spin scalar field:

$$\tau(\mathbf{x})=\int_P\sqrt{\frac{\hbar\left(1-\frac{\sigma(\mathbf{x})\Phi(\mathbf{x})}{E_P}\right)}{\sigma(\mathbf{x})\Phi(\mathbf{x})}}dt \tag{3.3}$$

That is integrated over some path P. Those equations form a complete model of spin scalar field that could be idea to unified all elementary particles.

References

[1] https://www3.nd.edu/~cjessop/research/overview/particle_chart.pdf