– визуализация и копирование готового кода;

– добавление в графическое отображение различных элементов;

– преобразование графического отображения в интерактивную модель на основе определения необходимых элементов управления, набора данных, изменяемых переменных, начальных значений, диапазонов изменений значений.

– оформление интерактивной модели;

– преобразование интерактивной модели в формат CDF.

Интерактивные модели, полученные в результате символьных вычислений моделирует различные аспекты Textual Analysis и School Language Arts и могут быть использованы в иллюстративном качестве для исследовательской или образовательной деятельности, они также могут представлять интерес в качестве объектов изучения и основы для собственного лингвистического моделирования на основе символьных вычислений, особенно в контексте преподавания компьютерной лингвистики для студентов гуманитарных специальностей.

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ON P-NONINVARIANT EQUATION FOR SPIN 1/2 PARTICLE WITH ANOMALOUS MAGNETIC MOMENT

We start from the following spin-tensor system (let $\hat{\partial} = \partial_\mu \gamma_\mu$)

$$i\gamma_5 \left\{ b_1 \hat{\partial}(\gamma_\mu \Psi_\mu) - \frac{4b_2}{\sqrt{6}} \left[-\frac{1}{4}\hat{\partial}(\gamma_\mu \Psi_\mu) + (\partial_\mu \Psi_\mu) \right] \right\} + M(\gamma_\mu \Psi_\mu) = 0,$$

$$i\gamma_5 \left\{ b_3 \hat{\partial}\Psi_0 - i\frac{4b_4}{\sqrt{6}} \left[(\partial_\mu \Psi_\mu) - \frac{1}{4}\hat{\partial}(\gamma_\mu \Psi_\mu) \right] \right\} + M\Psi_0 = 0,$$

$$\frac{2i}{\sqrt{6}}\gamma_5 \left\{ b_5 \left[\partial_\lambda(\gamma_\mu \Psi_\mu) - \frac{1}{4}\gamma_\lambda \hat{\partial}(\gamma_\mu \Psi_\mu) \right] - \right.$$

$$\left. -ib_6 \left[\partial_\lambda \Psi_0 - \frac{1}{4}\gamma_\lambda \hat{\partial}\Psi_0 \right] + M\{\Psi_\lambda - \frac{1}{4}\gamma_\lambda(\gamma_\mu \Psi_\mu) \right\} = 0, \qquad (1)$$

where parameters b_i obey restrictions

$$b_1 + b_3 = 1, \quad b_1 b_3 - b_2 b_5 - b_4 b_6 = 0, \quad b_2 b_3 b_5 + b_1 b_4 b_6 = 0.$$

These equations describe a particle with spin 1/2 and some additional intrinsic structure. From this equation, for the main bispinor component

$$\Phi(x) = b_5 \gamma_\mu \Psi_\mu(x) - ib_6 \Psi_0(x)$$

a modified Dirac-like *P*-noninvariant equation was found

$$\left\{ i\gamma_5(\gamma_\mu \partial_\nu) + M \right\}\Phi(x) = 0.$$

Concomitant bispinors (see (1)) may be constructed through the main component

$$\gamma_\mu \Psi_\mu(x) = \frac{b_1^2}{b_5(b_1^2 - b_3^2)}\Phi(x), \quad \Psi_0(x) = \frac{-ib_3^2}{b_6(b_1^2 - b_3^2)}\Phi(x).$$

In presence of electromagnetic fields, the component $\Phi(x)$ is the same, and it obeys the following *P*-noninvariant equation for a particle with anomalous magnetic moment

$$\left\{ i\gamma^5 \gamma_\mu (\partial_\mu + ieA_\nu) - \frac{4b_1b_3}{M} ieF_{\mu\nu} \frac{\gamma_\mu\gamma_\nu - \gamma_\nu\gamma_\mu}{4} + M \right\} \Psi = 0.$$

Expressions for $\Psi_0(x)$ and $(\gamma_\mu \Psi_\mu)$ are

$$(\gamma_\mu \Psi_\mu) = \frac{b_1^2}{b_5(b_1^2 - b_3^2)} \left\{ 1 + \frac{4}{3} \left(\frac{b_1b_3}{M} \right)^2 ieF_{\mu\nu} \frac{\gamma_\mu\gamma_\nu - \gamma_\nu\gamma_\mu}{4} \right\} \Phi,$$

$$\Psi_0(x) = -i \frac{b_3^2}{b_6(b_1^2 - b_3^2)} \left\{ 1 + \frac{4}{3} \left(\frac{b_1b_3}{M} \right)^2 ieF_{\mu\nu} \frac{\gamma_\mu\gamma_\nu - \gamma_\nu\gamma_\mu}{4} \right\} \Phi.$$

In order to follow extension of the model from flat Minkowski space to any Riemannian space-time we should make several modifications. In Riemannian space we use the metric $g_{\alpha\beta}(x)$, so we must make the change: $M --> iM$, and use Dirac matrices γ^a. Derivatives are modified according to the rules

$$D_\alpha(x) = \nabla_\alpha + \Gamma_\alpha(x) + ieA_\alpha(x), \ \hat{D} = \gamma^\alpha(x) D_\alpha(x),$$

where $\Gamma_\alpha(x)$ is bispinor connection, and $\gamma^\alpha(x) = \gamma^a e^\alpha_{(a)}(x)$. Note needed relations

$$\hat{D}(x) = \gamma^\rho(x) D_\beta = D_\beta \gamma^\rho(x), \quad D_\sigma(x) g_{\alpha\beta}(x) = g_{\alpha\beta}(x) D_\sigma(x),$$

$$\hat{D}\hat{D} = D^\alpha D_\alpha - \Sigma(x), \quad \Sigma(x) = -ieF_{\alpha\beta}\sigma^{\alpha\beta}(x) + \frac{R}{4},$$

where $R(x)$ is the Ricci scalar. Recall the definitions for γ^5-matrix:

$$\gamma^5(x) = \frac{i}{4!} \varepsilon_{\alpha\beta\rho\sigma}(x) \gamma^\alpha(x) \gamma^\beta(x) \gamma^\rho(x) \gamma^\sigma(x),$$

$$\varepsilon^{\alpha\beta\rho\sigma}(x) = \varepsilon^{abcd} \ e^\alpha_{(a)}(x) \ e^\beta_{(b)}(x) \ e^\rho_{(c)}(x) \ e^\sigma_{(d)}(x), \quad \varepsilon_{0123} = -1.$$

Levi-Civita object $\varepsilon^{\alpha\beta\rho\sigma}(x)$ changes under tetrad transformations as follows

$$\varepsilon'^{\alpha\beta\rho\sigma}(x) = \det[L_a^{\ b}(x)] \, \varepsilon^{\alpha\beta\rho\sigma}(x).$$

In particular, at the tetrad P-reflection, it transforms as a tetrad pseudoscalar. Analysis for the generally covariant system remains in fact the same. We write down final results:

$$\Phi = b_5(\gamma_\mu \Psi_\mu) - ib_6 \Psi_0,$$

$$\left\{ i\gamma^5(x)\hat{D}(x) - \frac{4b_1b_3}{M} \left[-ieF_{\mu\nu}\sigma^{\mu\nu}(x) + \frac{R(x)}{4} \right] + iM \right\} \Phi = 0.$$

Expressions for concomitant components are given by the generally covariant formulas

$$\gamma^\mu(x)\Psi_\mu(x) = \frac{b_1^2}{b_5(b_1^2 - b_3^2)} \left\{ 1 - \frac{4}{3} \left(\frac{b_1b_3}{iM} \right)^2 \left(-ieF_{\mu\nu}\sigma^{\mu\nu} + \frac{R(x)}{4} \right) \right\} \Phi,$$

$$\Psi_0(x) = -i \frac{b_3^2}{b_6(b_1^2 - b_3^2)} \left\{ 1 - \frac{4}{3} \left(\frac{b_1b_3}{iM} \right)^2 \left(-ieF_{\mu\nu}\sigma^{\mu\nu} + \frac{R(x)}{4} \right) \right\} \Phi.$$

This theory gives a *P*-noninvariant model for spin 1/2 particle with anomalous magnetic moment in presence of external fields, electromagnetic and gravitational.