$$S = \int d^M x \sqrt{|g|} \left[Q(\varphi) R_M + \frac{1}{2} g^{AB} \partial_A \varphi_\alpha \partial_B \varphi_\alpha + \mathcal{L}^{matter} \right] \tag{1}$$ FN2)

($\hbar = c = 1$ units are chosen)

In eq. (1) $Q(\varphi)$ denotes a quadratic function of φ_α subject to restrictions unposed by iii).

We denote coordinates in $\mathcal{M}$ by x^A, A = 0, 1,...M - 1; space-time coordinates by x^μ, μ = A = 0,1,2,3 and the remaining internal coordinates by

z^r, r = A - 3 = 1,2, ..., D = M - 4.

The vector-index set $\{A\}$ shall similarly be devided

$$\{A\} = \left\{ \begin{array}{ll} \mu & \text{for } A = 0,1,2,3 \\ r & \text{for } A = 3+r,\ r = 1, \cdots, D \end{array} \right\}$$

The signature of the metric g_{AB} shall be

$$g_{00} > 0, \quad Det \begin{Vmatrix} g_{A_{i_1} A_{i_1}} & g_{A_{i_1} A_{i_2}} & \cdots & g_{A_{i_1} A_{i_m}} \\ g_{A_{i_2} A_{i_1}} & g_{A_{i_2} A_{i_2}} & \cdots & g_{A_{i_2} A_{i_m}} \\ \vdots & & & \\ g_{A_{i_m} A_{i_1}} & g_{A_{i_m} A_{i_2}} & \cdots & g_{A_{i_m} A_{i_m}} \end{Vmatrix} < 0 \tag{2}$$

for all subsets (A_{i_1} ---- A_{i_m}), m = 1, ..., M - 1 of space like indices A_{i_K} = 1,,..., M - 1.

Eq. (2) implies that there exists a symmetric M-bein such that

$$g_{AB} = v_{AR} \eta^{RS} v_{BS}, \quad v_{AR} = v_{RA}$$

$$\eta^{RS} = \begin{pmatrix} 1 & & & 0 \\ & -1 & & \\ & & -1 & \\ 0 & & & \ddots \\ & & & & -1 \end{pmatrix}; \quad A, B, R, S = 0, 1, \cdots, M-1 \tag{3}$$