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Nearest-Neighbour-Interactions from a minimal discrete flavour symmetry within SU(5) Grand Unification

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A flavour symmetry based on Z_4 is developed in the context of SU(5) Grand Unification with the standard fermionic content plus three right-handed neutrinos. It is demanded for Z_4 to forbid some Yukawa couplings of up- and down-quarks to Higgs scalars so that the quark mass matrices M_u , M_d have Nearest-Neighbour-Interaction (NNI) structure, once they are generated through the electroweak symmetry breaking. The implementation of Z_4 requires the introduction of at least two Higgs quintets, which leads to a two Higgs doublet model at low energy scale. Due to the SU(5) unification, it is shown that the charged lepton mass matrix has also NNI form. However, the effective neutrino mass matrix exhibits a non parallel pattern, because of the type-I seesaw mechanism. Analysing all possible texture zeroes allowed by gauge-horizontal symmetry SU(5) \times Z₄, it is seen that only two patterns are in agreement with the leptonic experimental data and they could be further distinguished by the light neutrino mass spectrum hierarchy.

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