

Axiomatic of Majorana Theory

Alexander A. Ivanov

December 18 - 22, 2011

Imperial College of Science, Technology and Medicine, London

E-mail: a.ivanov@imperial.ac.uk

Abstract

The ground breaking theorem of S. Sakuma initiated a research aiming to classify certain subalgebras in the Conway–Griess–Norton algebra of the Monster group (commonly known as the Monster algebra). This research bridges the profound information on the Monster algebra unearthed mainly by J. Conway and S. Norton with the information on the Moonshine module. Each of these two approaches have developed its specific terminology, and in order to unify them we have introduced a new one under the name of Majorana theory. When interested in a specific subalgebra in the Monster algebra one can either conduct calculations inside the Monster group making use of all the available information, the crucial one being the character table. Alternatively one might rely exclusively the fusion rules for the Majorana axes. The second approach is certainly more general and hopefully in its ultimate form the Majorana theory will justify the Monster algebra as the universal Majorana algebra (in a sense which is still to be stated rigorously). Although, in order to make progress on the abstract axiomatic level one requires some further axioms besides the fusion rule. For example the vectors introduced to close the product in the two-generated Norton–Sakuma algebras have to be identified whenever they correspond to the same cyclic subgroup of the Monster. This new axiomatic has given a way to classify a very important class of subalgebras.