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Visualizing type-E root systems

Root systems are highly symmetrical finite collections of vectors in Euclidean space that encode the structure of a complex semisimple Lie algebra. Two important relations on a root system are the partial ordering and the orthogonality relation, and it can be very useful to be able to calculate easily and quickly with these. For exceptional root systems, a computer can easily calculate these relations, but it is not so obvious how a human can get a useful intuitive grasp of both simultaneously. However, in the case of the E_6 and E_7 root systems, a remarkable numerical accident occurs, which allows us to map the root system to a vector space over a finite field and maintain the important structure. This leads to a useful way to visualize type-E root systems.