



International conference on  
**MODULES AND REPRESENTATION THEORY**  
Cluj-Napoca, July 7 – 12, 2008



## Leech lattice, Conway group $Co_2$ and associated binary codes

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The Leech lattice is a certain 24-dimensional  $\mathbb{Z}$ -submodule of the Euclidean space  $\mathbb{R}^{24}$  whose automorphism group is the double cover  $2 \cdot Co_1$  of the Conway group  $Co_1$ . The Conway groups  $Co_2$  and  $Co_3$  are stabilizers of sublattices of the Leech lattice. We give a brief discussion of the Conway group  $Co_2$ . The group  $Co_2$  admits a 23-dimensional indecomposable representation over  $GF(2)$  obtained from the 24-dimensional Leech lattice by reducing modulo 2 and factoring out a fixed vector. On the other hand, reduction modulo 2 of the 23-dimensional ordinary irreducible representation results in a decomposable 23-dimensional  $GF(2)$ -representation. We construct this decomposable 23-dimensional  $GF(2)$ -representation as a binary code. Furthermore, we show that this code contains a binary code of dimension 22 invariant and irreducible under the action of  $Co_2$ .