Package: mixedfact (via r-universe)

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Type Package

Title Generate and Analyze Mixed-Level Blocked Factorial Designs

Version 0.1.1

Description Generates blocked designs for mixed-level factorial experiments for a given block size. Internally, it uses finite-field based, collapsed, and heuristic methods to construct block structures that minimize confounding between block effects and factorial effects. The package creates the full treatment combination table, partitions runs into blocks, and computes detailed confounding diagnostics for main effects and two-factor interactions. It also checks orthogonal factorial structure (OFS) and computes efficiencies of factorial effects using the methods of Nair and Rao (1948) <doi:10.1111/j.2517-6161.1948.tb00005.x>. When OFS is not satisfied but the design has equal treatment replications and equal block sizes, a general method based on the C-matrix and custom contrast vectors is used to compute efficiencies. The output includes the generated design, finite-field metadata, confounding summaries, OFS diagnostics, and efficiency results.

License GPL-3

Encoding UTF-8

RoxygenNote 7.3.3

Suggests rmarkdown, testthat (>= 3.0.0)

Config/testthat/edition 3

NeedsCompilation no

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`mixedfact` *Generate and Analyze Mixed-Level Blocked Factorial Designs*

Description

Constructs blocked designs for mixed-level factorial experiments for a given block size using finite-field based, collapsed, and heuristic methods. The procedure creates the full treatment combination table, partitions runs into blocks, and computes detailed confounding diagnostics for main effects and two-factor interactions. The analyzer normalizes blocks into canonical labels, checks balance and Orthogonal Factorial Structure (OFS), and computes efficiencies of factorial effects. When OFS does not hold but the design has equal treatment replications and equal block sizes, a general method based on the C-matrix and custom contrast vectors is used to compute efficiencies. The output includes GF-related metadata (when applicable), confounding summaries, OFS diagnostics, and efficiency results.

Usage

```
mixedfact(levels_vec, block_size, method = "auto", verbose = TRUE)
```

Arguments

`levels_vec`	Integer vector of factor levels (e.g., `c(2, 3, 4)` for a $2 \times 3 \times 4$ design).
`block_size`	Integer giving the number of runs per block. Must divide the total number of treatment combinations.
`method`	Character string specifying the generator method: • `"auto"` (default): try GF, then collapsed, then heuristic. • `"gf"`: finite-field based optimized generator. • `"collapsed"`: random collapsed blocks. • `"heuristic"`: heuristic ordering and blocking.
`verbose`	Logical; if `TRUE`, prints progress, summaries, and efficiency output.

Details

Internally, the algorithm:

- Generates candidate block structures (GF-based, collapsed, or heuristic).
- Computes confounding summaries for main effects and two-factor interactions.
- Normalizes blocks and checks balance and OFS.
- Computes efficiency factors for main and interaction effects.

Value

A list with components:

code1 Output from the generator, including `blocks`, `confounding`, and (if applicable) `gf_info`.

code2 Output from the analyzer, including OFS and efficiency results.

factor_levels The vector `levels_vec` supplied.

block_size The block size used.

blocks_numeric List of blocks with numeric factor values `F1`, `F2`, ...

blocks_labels List of blocks as character labels (e.g., `"012"`).

References

K. R. Nair and C. R. Rao (1948). *Confounding in Asymmetrical Factorial Experiments.* Journal of the Royal Statistical Society: Series B (Methodological), **10**(1), 109-131.

Gupta, S. and Mukerjee, R. (1989). *A Calculus for Factorial Arrangements.* Lecture Notes in Statistics, Volume 59. Springer-Verlag.

Examples

```
out <- mixedfact(c(2, 3, 4), block_size = 12)
str(out$code1)
str(out$code2)
```

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