NOVEL LINEAR ALGEBRA ABSTRACTIONS WITH RUST*

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Abstract. Since its first stable release in 2015 Rust has quickly developed into a widely used systems programming language. It is based on a modern language design with a unique memory safety model. Many of the Rust features also make this language ameniable for scientific computing applications. In this paper we discuss Rust features in the context of scientific computing and then discuss their application to the design of novel linear algebra abstractions based on the Traits system in Rust, which allows a very convenient way to express linear algebra independently of underlying implementations, making it possible to design high-performing linear algebra frameworks independently on whether the underlying objects are vectors or functions.

Key words. example, LaTeX

MSC codes. 68Q25, 68R10, 68U05

1. Introduction.

2. An overview of Rust.

3. Low-level matrix abstractions.

- Traits that define matrices
- Expression templates
- Interfacing with Lapack/etc.

4. Generalising from vectors and matrices.

- Matrices vs quasi-matrices, function spaces, etc.
- Traits for generic function spaces, bases, inner products, etc.

5. Generic algorithmic design.

- Householder QR Decomposition
- Arnoldi Method and GMRES
- Other nice examples?

6. Applications to orthogonal polynomials. Worked out code example for e.g. Chebychev polynomial spaces, etc.

7. Conclusions.

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