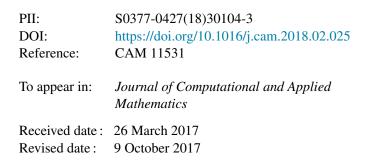
## **Accepted Manuscript**

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## Extending an iterative orthogonal projection method towards least-squares solutions

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## 1. Introduction

The Kaczmarz method [1] is an iterative method for solving large systems of equations that projects iterate orthogonally onto the solution space of each equation. In contrast to direct methods such as Gaussian elimination or QRfactorization, this algorithm is efficient for problems with sparse matrices, as encountered in constraint-based user interface (UI) layout specifications.

Starting with an initial guess, the Kaczmarz algorithm selects a row index of the matrix and projects the current iterate onto the solution space of that equation, refining the solution until a sufficient precision is reached. The Kaczmarz algorithm does not need any pivot assignment, and it is ideal for highly over-determined linear systems, as in many linear problems including the constraint-based UI layout. In our paper [2], we proposed extensions to the linear relaxation method to deal with this issue. Our analysis showed that the Kaczmarz method is more suitable for solving non-square matrices as they occur in UI layout.

Despite Kaczmarz's efficiency for sparse systems, it is seldom used for generating constraint-based UI layouts. The reasons are as follows. First, constraintbased UI layout contains linear *equality* and *inequality constraints* for specifying relationships among objects such as "inside", "above", "below", "left-of",

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