KUTAISI INTERNATIONAL UNIVERSITY

Numerical Linear Algebra

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Topics

1. QR factorization
2. Classic Gram-Schmidt and modified Gram-Schmidt methods
3. Least Squares and Constrained Least Squares
4. Applying methods to practical problems

Connections with PLOs

- PLO7: an ability to search for, process and analyze information from a variety of sources and to communicate in a professional way orally and in written form)
- PLO5: an ability to design mathematical models in a broad range of intellectual domain
- PLO4: an ability to identify, formulate, abstract and solve mathematical problems applying analytical, symbolic and computational methods together with computing facilities
- PLO3: understanding of limitations of mathematical methods and the constraints on their applicability

Problem 2.1

Solve Least Squares and Constrained Least Squares Problems

Tasks

1. Formulate mathematical models of practical problems in the form of
   - 1.1 Least Squqres Problem
   - 1.2 Constrained Least Squares Problem
2. Solve each problem using
   - 2.1 inverse of the corresponding matrix
   - 2.2 QR factorization with classic Gram-Schmidt method
   - 2.3 QR factorization with modified Gram-Schmidt method
3. For each problem
   - 3.1 compare results obtained with different methods
   - 3.2 explain why one method is better then other method; provide evidence supporting your explanation

Assessment

- CP is worth of 12 points
- Each sub-task is worth 1 point for one type of input file
- Each item/sub-problem should be documented including inputs and outputs of important intermediate steps
- The problem/sub-problem is assigned 0 point if
  - same set of student defined parameters are used by two or more students
  - answer cannot be replicated
  - solution of sub-problem is submitted without explanation/proof
  - code fails: does not produce correct results on new tests