

Numerical Solution of a Variation Problem

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Introduction

This document was created in addition to ‘Control Theory’ subject third laboratory work ‘Numerical Solution of a Variation Problem’. This document on GitHub is [here](#). It contains performance of the task according to variant.

The Task

- 1) Chosen example (variant 1 as 15-2*7) of variation problem to solve: $\int_0^1 ((x')^2 + x^2) dt \rightarrow \min, x_0 = x(0) = 0, x_N = x(1) = 1$.
- 2) To choose number of approximation points N .
- 3) To code function $J_N(x_1, \dots, x_{N-1})$.
- 4) To choose optimization method (non-gradient or gradient) for minimization $J_N(x_1, \dots, x_{N-1})$.
- 5) To apply chosen method to minimize $J_N(x_1, \dots, x_{N-1})$ and build plot of function value dependence on iteration number.
- 6) To visualize got solution as part-line plot by points $(t_i, x_i), i = 0 \dots N$.
- 7) To compare visually (by plots) got numeric solution and analytic one.
- 8) To research approximation accuracy dependently on number of approximation points N .
- 9) To prepare the report.