

CHW3

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Q1. Optimal evacuation:

The optimization problem we are trying to solve is as follows:

With variables and.After we solve the problem, the optimal evacuation would be 17.

Q2. Optimal circuit design:

To get what we seek, the following optimization problem must be solved:

Thus we have found a solution that meets the specifications by solving the LP feasibility problem. Is the solution.

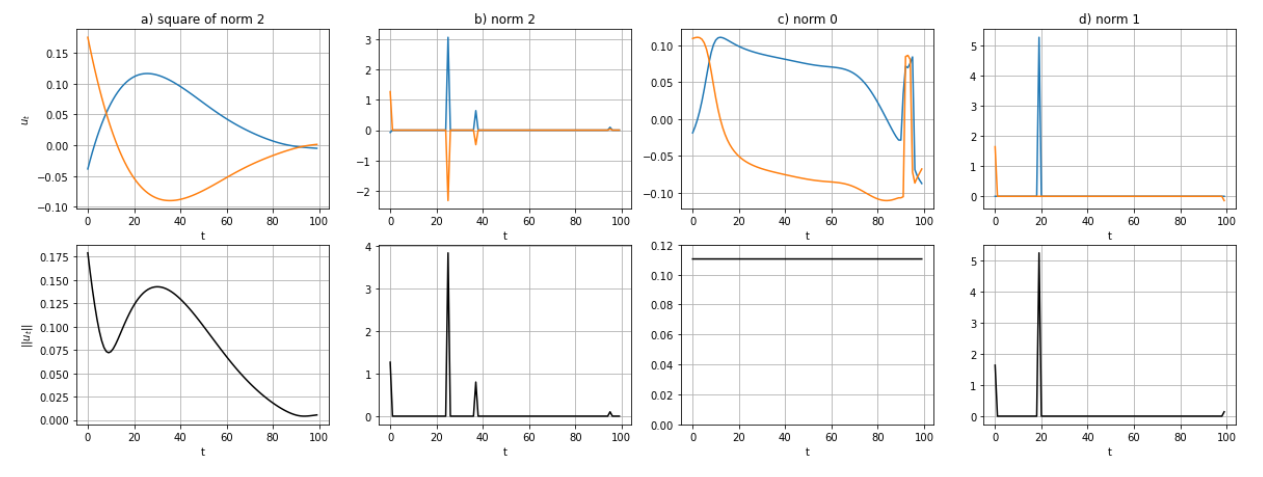
Q3. Filling covariance matrix:

Part a: Let’s take. Then we will have:

Since is not positive definite (PSD), it cannot be a covariance matrix.

Part b: would be the answer of the problem, if it is PSD, because:

Q4. Control using different objective functions:



Look at the results obtained from code. From left to right we discuss about control inputs:

1: The control inputs are small; but not sparse. This is what we expect with the least squares.

2: The control input is sparse; and when control is nonzero, both components are nonzero.

3: The second norm of the control input is constant over time, the direction of the control input changes over time however.

4: The control input is sparse; the different components are nonzero in different times.

Q5. Portfolio optimization:

The mean worst case risk portfolio problem can be written as a convex optimization problem:

Now we apply KKT conditions for optimality:

In a similar way, the KKT conditions for the problem:

Are

= 0

Where is a dual variable for the equality constraint.