Code Description

All simulation results in the paper titled "**Phase Retrieval with One or Two Diffraction Patterns by Alternating Projections of the Null Vector**" are generated by the m-file named "code_PROTDPAPNV". The important notations used in the code are listed as follows.

Notation for the parameter setup

$N \times N$**:** the size of test image. Five images can be tested:

> **image_type 1:** 256×256 Cameraman
>
> **image_type 2:** 256×256 Barbara
>
> **image_type 3:** 256×256 Phantom
>
> **image_type 4:** RSCB (random signed Cameraman + i random signed Barbara)
>
> **image_type 5:** RPP (Phantom with random phases)

number_illumination: the number of coded diffraction patterns used in the SAP, PAP and WF algorithms. For image_type=1,2,3, number_illumination=1; otherwise, number_illumination=2.

oversampling_ratio: the oversampling ratio of the Fourier magnitude data for each coded diffraction pattern. Initially, we set oversampling_ratio=4.

mask_box: the kth phase mask is stored at matrix **mask_box(: , : ,** k**)**, $k = 1, 2$.

data_box: the kth coded diffraction pattern is stored at matrix **data_box(: , : ,** k**)**, $k = 1, 2$.

input_SAP, input_PAP, input_WF: the initial inputs for the SAP, PAP and WF algorithms. Three methods for generating these initial inputs can be tested (1: execute 0: idle):

- spectral_method (with index 1)
- truncated_spectral_method (with index 2)
- null_vector_method (with index 3)

initial_selection: indicating which method is used to generate **input_SAP, input_PAP**, and **input_WF**. Initially, we set initial_selection=3, i.e., all initial inputs are generated by the null vector method with the median parameter setup.

max_iterate_powermethod: the number of iterations for **null_vector_method**, **spectral_method**, and so on.

max_iterate the number of iterations for **SAP**, **PAP** and **WF** algorithms.

serialAP, parallelAP, WF: determining whether to execute the SAP, PAP, and WF algorithms. Initially, we set serialAP=parallelAP=WF=1, i.e., all algorithms are tested.

Output in the command window

- the relative residual and relative error of initial inputs.

- the relative residual and relative error of the final outputs of the SAP, PAP, and WF algorithms.

Output (figures)

- the selected test image
- the relative residual of the initial guesses generated by the selected method (which depends on the setup of spectral_method, truncated_spectral_method and null_vector_method above)
- the visualization of the initial input generated by the selected method
- the relative residual of reconstructions (red curve: SAP, green curve: PAP and blue curve: WF)
- the relative error of reconstructions (red curve: SAP, green curve: PAP and blue curve: WF)