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Reflected resolvents in the Douglas-Rachford algorithm: order of the operators and linear convergence

The Douglas-Rachford algorithm is a popular method for finding zeros of sums of monotone operators. By its definition, the Douglas-Rachford operator is not symmetric with respect to the order of the two operators. In this talk we report a systematic study of the two possible Douglas-Rachford operators. We show that the reflectors of the underlying operators act as bijections between the fixed points sets of the two Douglas-Rachford operators. Some elegant formulae arise under additional assumptions. Results on linear rates of convergence are also presented. Various examples illustrate our results.