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Processed numerical methods for the SCIR epidemic model

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In mathematics there are several problems which can be described by differential equations with a particular, highly complex structure. For example, the epidemic models, which play an important role, as these models help in the analysis of the behaviour of diseases. Nowadays, the analysing of these models is becoming more and more important, due to the Covid-19 pandemic in previous years. Most of the time, we cannot produce the exact solution of these problems, therefore we approximate them numerically by using some numerical method. In this talk we analyse some methods, based on operator splitting, which approximate the exact solution of original ODE systems well while having a low computational complexity. The two most popular methods include the sequential splitting (SS) and the Strang–Marchuk (SM) splitting. We analyse the relationship between these methods and at the same time we discuss the properties of processed integrator methods (PIM). Then we generalize these methods and introduce the new extended processed methods (EPM) and the economic extended processed methods (EEPM) with low computational complexity. We test these methods in epidemic models. We solve the SCIR model numerically and compare the runtimes and errors.