

FORECAST ON COVID-19 CASES IN MALAYSIA USING SIRS MODEL AND ADAMS PREDICTOR-CORRECTOR METHOD

(Ramalan Kes COVID-19 di Malaysia dengan Menggunakan Model SIRS dan Kaedah Peramal-Pembetulan Adams)

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ABSTRACT

A new severe acute respiratory syndrome coronavirus 2 had become a significant threat to public health by 2020. The pandemic began in a city named Wuhan in China. It then spread throughout the rest of the world, including Malaysia. COVID-19 virus can spread between people in close contact because it spreads through droplets in the air. The virus can spread in small liquid particles from an infected person's mouth or nose when they cough, sneeze, speak, sing, or breathe. To reduce the number of cases in the nation, the Malaysian government created a new order named Movement Control Order (MCO). This paper presents a SIRS model to forecast the COVID-19 cases 100 days after the MCO held in Malaysia. MCO's impact was thought to have the potential to reduce COVID-19 cases. The model then generated a system of differential equations for the calculation proposed. 4-Step Adams-Bashforth-Moulton Predictor-Corrector method is used to predict the early COVID-19 outbreak in Malaysia. The number of corrector steps will be determined by the tolerance value. Then, the result from the numerical model using various step sizes is compared with the actual data. The outcome of a computer simulation in which the computation and graphing were done using MATLAB. The numerical method's performance in performing the early COVID-19 outbreak in Malaysia is discussed in terms of mean absolute percentage error (MAPE) and standard deviation absolute percentage error. The simulation results indicate that the computation should only use two corrector steps to optimize the forecast and computational time, regardless of the value of step size.

Keywords: COVID-19; Malaysia; SIRS model; predictor-corrector

ABSTRAK

Pada tahun 2020, novel sindrom pernafasan akut teruk coronavirus 2 telah menjadi ancaman utama kepada kesihatan awam. Pandemik bermula di Wuhan, China. Kemudian ia merebak ke seluruh dunia termasuk Malaysia. Virus COVID-19 boleh merebak antara kenalan rapat kerana ia merebak melalui titisan bawaan udara. Virus ini merebak sebagai zarah cecair kecil dari mulut atau hidung orang yang dijangkiti apabila orang yang dijangkiti batuk, bersin, bercakap, menyanyi, atau bernafas. Dalam usaha mengurangkan jumlah kes di negara ini, kerajaan Malaysia telah melaksanakan perintah baharu iaitu Perintah Kawalan Pergerakan (PKP). Kertas kerja ini membentangkan model SIRS untuk meramalkan kes COVID-19 100 hari selepas PKP di Malaysia. Model tersebut menjana sistem persamaan pembezaan biasa untuk pengiraan. Kaedah peramal-pembetulan Adams-Bashforth-Moulton 4-langkah digunakan untuk meramal wabak awal COVID-19 di Malaysia. Bilangan langkah pembetulan ditentukan oleh nilai toleransi. Kemudian, hasil model berangka menggunakan pelbagai saiz langkah dibandingkan dengan data sebenar. Simulasi komputer dijalankan dengan menggunakan MATLAB untuk tujuan pengiraan dan graf. Prestasi kaedah berangka semasa wabak pertama COVID-19 di Malaysia dibincangkan dari segi min peratusan ralat mutlak dan sisihan piawai peratusan ralat mutlak. Keputusan simulasi menunjukkan bahawa pengiraan hanya perlu menggunakan dua langkah pembetulan untuk mengoptimalkan ramalan dan masa pengiraan, tanpa mengira nilai saiz langkah.

Kata kunci: COVID-19; Malaysia; model SIRS; peramal-pembetul

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Received: 8 February 2023

Accepted: 4 March 2023

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