Computational IT Tool Application for Modeling COVID-19 Outbreak

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Abstract Infection is an important problem in clinical medicine. Emerging infectious disease outbreak usually causes public health problem. Coronavirus disease 2019 (COVID-19) is a new emerging coronavirus infection that causes pandemic in 2020. The outbreak affects more than 200 countries around the world, causing illness in more than 11 million of world population. To understand the outbreak, in the depth epidemiological analysis is important. The use of novel information technology for assessment of the outbreak is interesting. The informatics technology is accepted for its advantage in public health. One of the important advantages is the clarification of the public health phenomenon. The IT tool and technique are applicable for study on outbreak of emerging infectious disease. The IT approach can help clarify the pattern of outbreak and can further give important data for disease containment. The IT tool can identify the descriptive details of the outbreak and it can also show the interrelationship between emerging infection to time and place. Additionally, the IT tool can also help further predict the trend or progression of the outbreak. This is a useful application for further public health policies planning for outbreak containment. In this chapter, the authors summarize and discuss on the usefulness and application of IT technology and tool for managing COVID-19. The examples are also given to help readers recognize the IT application for corresponding to COVID-19 outbreak. Using the standard tools, the clarification and prediction for the COVID-19 outbreak can be
successfully done. The IT tools are helpful for clinical epidemiological manipulation in public health management against COVID-19. Nevertheless, the use of the IT tool requires good primary data and there might be a problem if the collection technique of primary data from field work is not good.

**Keywords** COVID-19 • IT • Outbreak • Model

1 Introduction

Of the several groups of medical disorders, infection is an important group of disease. There are several kinds of infections such as bacterial, virus and parasitic infection. Some infectious diseases are endemic while the others sporadically occur. The occurrence of the new infectious that has never existed is an important consideration. The occurrence of a never existed infectious disease is known as “emerging infectious disease”. A new emerging infectious disease is usually an important concern in public health. Since the new emerging infection is a new thing and there is usually no knowledge of it, therefore, it is difficult to diagnose, treat and prevent for the new emerging infection.

Emerging infectious disease outbreak usually causes public health problems and if there is no good control, a wide outbreak might occur [1]. Within the past decade, there are many new emerging infectious diseases. Many new infections become big problems globally. The good example is Zika virus infection, which is an arbovirus infection that is related to the congenital anomaly. However, a more problematic situation has just been caused by a new emerging coronavirus infection. The disease was firstly reported from Wuhan, China and it was firstly called Wuhan novel coronavirus infection. After its first occurrence in China, it was spread to many countries, starting from Thailand and others. The disease becomes the global public health issue and it is presently named as Coronavirus disease 2019 (COVID-19) [2].

COVID-19 is a new emerging coronavirus infection that already caused pandemic in 2020. At present (11 July 2020), the COVID-19 outbreak affects more than 200 countries around the world, causing illness in more than 11 million of world population. As a new emerging disease, scientist has to work hard to collect data on this new disease and seek the way to diagnose, treat and prevent the disease. Since the disease is a respiratory tract infection that can be easily transmitted via respiratory contact, the outbreak can easily occur and the rapid spread from a patient to the other/others is possible. The outbreak already occurs worldwide and there is an urgent need to contain it. In public health, the first step to contain any outbreak is the realization of its nature. To understand the outbreak, in the depth epidemiological analysis is necessary. Data collection, analysis and interpretation is the basis process in epidemiological assessment of any outbreak.

The classic approach for epidemiological assessment might be time consuming and requires a lot of the workforce. It is possible to use of novel information technology for assessment of the outbreak. Indeed, the informatics technology is
accepted for its advantage in medicine and public health [3]. Theoretically, the combination between computational science and biomedicine is possible and can result to a new useful science. Biochemioinformatics is the good example of bridging science that conjoins between computational science and biomedicine. The medical informatics approach is proven for its usefulness in public health. One of the important advantages is the clarification [4]. The medical informatics can help clarify the nature of public health problem. Additionally, medical informatics can be used for prediction of the public health phenomenon. This is a useful application for future trend analysis and policy planning. The medical informatics can be applied for managing many medical problems, including infectious disease.

In general, an emerging infectious disease usually caused the problem. As a new problem, there is usually a lack of knowledge on the new disease. It is usually not possible to give the correct diagnosis and treatment of the disease during the early outbreak period. Gathering of data of the disease is very important for public health manipulation. The data collection from classic public health surveillance is necessary. Applying new technologies for data management is important. The new technology can facilitate the process and help further analyze of the collected data. Without a good data analysis, it is difficult to appropriately management of the public health problem. The new tool might help clarify the nature of the new public health problem. Additionally, it can also help predict the future based on limited presently available data.

Regarding infectious disease, the advantage of medical informatics is approved. The medical informatics can help clarify and predict for problems on infectious disease [4]. This is also applied for the case of new emerging infectious disease. Since the emerging infectious disease is usually a big public problem. During the pandemic, such as COVID-19 pandemic, it requires a good and effective tool for data analysis for further clarification or prediction purpose. The classical techniques might be applied but the old techniques usually take time and it might not properly correspond to the rapid change during the outbreak crisis. To manage the influx of data and rapid change of the situation during an outbreak, a new computational technology might be helpful. The technology might shorten turnaround time for data manipulation and help provide useful data for containment of the outbreak.

In general, the IT tool and technique is applicable for assessment on outbreak of emerging infectious disease. The IT approach is helpful for clarifying the pattern of outbreak and it can further give important data for disease control and outbreak containment. The IT tool can identify the pattern of the outbreak and it can also show the time and place dimensions of the emerging infection. Additionally, the IT tool can also help further predict the trend of the outbreak. This means a scientific forecast of the outbreak is possible. The application of medical informatics for managing emerging infectious disease outbreak is a useful application for further public health policies planning for outbreak containment [5]. In this chapter, the authors summarize and discuss on the usefulness of applied medical informatics technique for managing COVID-19. The examples are also given to help reader better understand the IT application for corresponding to COVID-19 outbreak.
2 Application of IT Technology for Infectious Disease Outbreak Management

An application of IT technology for managing infectious disease is an interesting topic. It can be applied in case of infectious disease outbreak management (Table 1). There are several applications that are useful. The purpose of the application might be for clarification or prediction of the outbreak [4]. The classic IT technique can be well applied to achieve the aim on infectious disease outbreak containment.

The important concepts of medical IT for managing infectious disease outbreak include (a) database, (b) IT tool, (c) concept of clarification on infectious disease outbreak and (d) concept of prediction for infectious disease outbreak.

a. Database

Data is important for any IT manipulation. The data on the outbreak is an important source for further analysis and interpretation. The IT technology is useful for data collection, analysis and management. Several classic computer programs are useful for data management, such as Dbase, Excel, SPSS, etc. Additional, the IT database is also developed as data source for further mining.

In public health, there are many important databases on infectious disease. The example of a well-known public available database is PubMed (www.pubmed.com) [6]. The public database is the basic requirement for any further IT manipulation.

b. IT tool

IT tool is an important instrument for computational manipulation. At present, several IT tools are developed an available. Some IT tools are freely available and

| Purpose     | Examples of application                                      |
|-------------|-------------------------------------------------------------|
| Clarification | • Natural history of infection                              |
|             | • Spreading pattern                                          |
|             | • Host characteristic and pathogen characteristic            |
|             | • Background genetic and genomic pattern of infection         |
|             | • Endemic area and affected area of outbreak identification  |
|             | • Geographical distribution of outbreak                      |
|             | • Chronological pattern of outbreak                          |
|             | • Seasonal fluctuation of outbreak                           |
| Prediction  | • Trend of disease transmission                              |
|             | • Analysis of mutation possibility                           |
|             | • Economic impact prediction                                 |
|             | • Cost effectiveness and cost utility analysis               |
|             | • Prediction of outbreak containment policies                |
helpful for medical informatics application for managing infectious disease outbreaks. The groups of IT tools that are useful for managing infectious disease outbreaks include database tool and manipulation tool. Database tool is the computation database. The database tool that is freely accessible via the internet is actually useful for medical informatics research. The good example is PubMed as already mentioned. This is an example of many IT manipulation tools that are freely available [6]. The tools in bioinformatics are good examples. The genomics tool can be helpful for comparative analysis and prediction. The molecular epidemiology of the pathogen that causes infectious disease outbreaks might be assessed by the biochemioinformatics tool. The phylogenetic research and gene ontology research are good examples [4].

c. Concept of clarification on infectious disease outbreak

The basic concept of clarification on infectious disease outbreak is to identify the characteristics and natural course of infectious disease outbreak. The first step is data collection by any technique, manual or electronic recording. The data collection is primarily performed and it has to be further manipulated by computational IT tool. The IT tool is useful for categorizing and grouping of data. It is also useful to identify interrelationships in time and place (space) dimension. A good example is the construction of GIS map showing infectious disease outbreak pattern using IT tool. This is an applicable for modelling geographical pathology of infectious disease outbreak. The IT tool is also useful for modeling the path of disease spreading or flow of outbreak which is a useful data for planning proper plan for outbreak containment.

d. Concept of prediction for infectious disease outbreak.

The basic concept of prediction for infectious disease outbreak is to present the possibility or trend of infectious disease outbreak. Similarly, the data collection is primarily performed and data must be further manipulated by computational IT tool. The IT tool is useful for finding relationship and construction of predictive model for prediction on the trend of infectious disease outbreak. A good example is the prediction of future size and area coverage of infectious disease outbreak.

3 Applied IT Technology for Modeling COVID-19 Outbreak

As already mentioned, applied IT tool is useful for understanding the emerging infectious disease outbreak. Modelling of outbreak is a useful application of IT tool. It is applicable for any outbreak including to new emerging disease outbreak. Regarding COVID-19, it is also useful. For modeling of the outbreak, the basic concept is to find a representative of the course and nature of infectious disease outbreak. Classically, the modelling of an outbreak is possible by using simple
mathematical and statistical technique [6]. This is applicable for both clarification and prediction purposes. With advanced computational IT technology, the IT tool can play role in modeling of infectious disease outbreak. The application for the COVID-19 outbreak is also possible.

To create a mathematical model, the primary data from data collection on outbreak situation is necessary. The good data collection and verification for correctness is an important step. If there is error, or it is not reliable, further steps will not be acceptable. The important collected data will be used as primary parameters for further modeling process [7]. To create a mathematical model, finding for interrelationship among parameters has to be done. The mathematical equation will be written to represent the situation. The new IT tool will be useful for mathematical manipulation in modelling for infectious disease outbreak [7]. Regarding COVID-19 outbreak, there are some new reports on using medical informatics technology for modeling [8]. Those important reports are useful for public health policies planning against the COVID-19 pandemic. Due to the present uncontrolable COVID-19 pandemic, any available that might be applied for managing the problem should be used. The IT application might be a solution that helps about data manipulation regarding COVID-19 outbreak. How to apply a new computational technology for managing of the COVID-19 pandemic is an interesting research question. Here, the authors briefly discuss and present some examples of the IT application aiming at public health manipulation against COVID-19.

4 Examples of IT Application for Corresponding to COVID-19 Outbreak

As already mentioned, IT technology can be applied for corresponding to COVID-19 outbreak. This is for clarifying or predicting on COVID-19 outbreak. Here, the authors will give some brief examples of IT application for corresponding to COVID-19 outbreak that can help reader generate ideas for further application. The primary data for IT manipulation in all examples are public available data and the used dataset are the specific data of Thailand, a tropical country in Indochina, which is the standard official report recorded in referencing COVID-19 Time Series Data (https://data.world/shad/covid-19-time-series-data). Since all studied are in silico study without any human or animal subject involvement, the ethical approval by ethical committer is not required. The basic tools are used for these examples (Table 2).

a. IT tool for GIS modelling for COVID-19 outbreak

Here, the authors would like to present the example on GIS modeling by Map Check in for COVID-19 outbreak in Thailand. At first, the new virus was first discovered in an outbreak in Wuhan, Hubei Province, China, in late 2019 and quickly spreads to many countries. The first affected country outside China is
Thailand [9]. Therefore, the Ministry of Public Health by the Department of Disease Control of Thailand. They prepared a situation report on the webpage Corona Virus Disease (COVID-19) domestically and globally, media knowledge, advice, including operational guidelines for agencies, related parties, and the general public to receive information thoroughly. Nowadays, People can use mobile phones to access to news information places including the status display and the coordinates that they live through the services of social media, whether Facebook, Instagram with check-in, and use the map service from Google Maps altogether.

Besides, the business community has adjusted marketing strategies to encourage customers to check-in at restaurants and various stores including product and service reviews. To be public relations, information and news that customers are interested in and want to receive services as well. Google Maps is a web mapping service developed by Google. It offers satellite imagery, aerial photography, street maps, 360° interactive panoramic Street View, real-time traffic conditions, and route planning for travel option consist of foot, car, bicycle, and air (in beta). In 2020, and in 2020, more than 1 million people are interested in using Google Maps each month [10], a User can display both browser and smartphone, both Android and IOS systems without any charge at all. Consequently, users prefer to use due to being convenient and easily accessible. In addition, Google has special projects such as improving public safety by helping users find convenient drug disposal locations, making invisible with project Air View, Get training and update with the Google News Lab, Discover your savings potential with Project Sunroof, Revealing the World’s Fishing Fleet with Global Fishing Watch, Applying unique Google data and modeling capabilities to create new insights and action oriented tools to reduce GHG emissions, Earth Engine create a living map of forest loss, and Powering conservation science and storytelling using Google’s mapping technologies, AI and the Cloud etc. [11]. The technique can help support GIS approach for geographical pathology application [12].

| No. | IT software tools          | Descriptions                                                                 |
|-----|----------------------------|-----------------------------------------------------------------------------|
| 1.  | Google Earth Pro 7.3.3     | Use Google Earth Pro Version 7.3.3                                         |
|     |                            | – Map Check in                                                               |
|     |                            | – Report data Detection Screen                                              |
|     |                            | – Report Confirmed COVID-19                                                 |
|     |                            | – Follow-Up Quarantine person                                               |
| 2.  | Excel 2013 Database        |                                                                             |

### Table 2 Basic software tools used in the examples

| No. | IT software tools          | Descriptions                                                                 |
|-----|----------------------------|-----------------------------------------------------------------------------|
| 1.  | Raptor version 4.1.0.0001  | Rapid algorithmic prototyping tool for ordered reasoning: RAPTOR            |
|     | 15 November 2019           |                                                                             |
|     |                            | – Raptor is the software to use problem solving tool that enables the user to generate executable flowcharts and introduced to the computing discipline in order to develop problem solving skills and improve algorithmic thinking |
Here, the authors give an example on using the Google Maps tool developed by Google. Here, it focuses on how to apply the map check-in the area where Coronavirus Disease is found in Thailand by simulating check-in data from screening reports in Thailand at Suvarnabhumi Airport, Don Mueang Airport, Phuket Airport, Chiang Mai Airport and notifications from Erawan Medical Centre, University, Hotel, Guide Center and show the number of patients accumulated Number of new cases Number of deaths. The number of patients recovered and the Number of patients who can travel home from 1st February 2020 to 5th March 2020 as a guideline in applying technology to distribute information to the public Up to date on the situation of the novel coronavirus outbreak 2019. The Coronavirus 2019 detection map creation is from the Department of Disease Control of Thailand within 2 February 2020–5 March 2020, and there are steps for creating a check-in Covid-19 as followings.

The operation tools are Microsoft Excel 2010 software for database and Open-source Google Map application for applying medical informatics tool development. This paper Data used to create the maps check-in taken from Covid-19 infection status report by the Division of Disease Control of Thailand since 2 February, 2020 to 5 March 2020 (Department of Disease Control, 2020) and create a database with Microsoft Excel filename as “report.xlsx” In the first line, specify the desired field. In which we have defined 36 fields to collect data as Fig. 1. The coordinates can check by using a smartphone to notify the COVID-19 infection through the LINE application, as in Fig. 2. Longitude and latitude can send the location thought LINE mobile application or Line PC application, and the result will display the desired coordinates as shown in Fig. 3. The user can copy Latitude & Longitude to the file database in Excel. Then Google Sign in is done. The user should sing up the Google Account before start creates maps. Open Google Chrome browser and click browser sign in as Fig. 4 and click maps tools (Fig. 5) for further map construction process (Figs. 6, 7, 8, 9a, b, 10, 11, 12, 13 and 14).

Conclusively, the main idea of this example is using standard IT tool for construction of a GIS-based computational tool that is applicable for epidemiological
surveillance for COVID-19 outbreak. This work can confirm that IT-based GIS tool is useful for managing the outbreak crisis. This kind of IT tool might be designed and applied in any setting. The locally specific tool might be open to everyone in that setting for using as a referencing data for precautions on disease existence during the COVID-19 outbreak. This IT approach might be further adapted to cover
Fig. 4 Google sign in

Fig. 5 Maps tools
**Fig. 6** Menu

**Fig. 7** Your places
Fig. 8 Create map. In this step, change maps named as “Check-in Covid-19” and click “save”.

Fig. 9 a Change untitled map. b Edit map title and description
additional parameters that can help explain a more complex interrelationship between disease incidence and ecological background. For example, a GIS map might be constructed to represent interrelationship between incidence of COVID-19, mortality rate and background ecological factors in different settings [13].
b. Distribution Tree Algorithm model in Southeast Asia’s COVID-19 hotspot due to religious gathering in Malaysia

Malaysia became Southeast Asia’s COVID-19 hotspot due to religious gatherings at the Petak Jamek Seri Petaling Mosque in Kuala Lumpur on 27 February 2020–1 March 2020 [14]. The situation of COVID-19 Infection in Malaysia on 23
March 2020 reported 212 new coronavirus cases, bringing the national total to 1,518. The death toll has also increased to 14 of the new cases, 123 is from the cluster linked to the religious gathering in cluster account for 970. (62% of the total cases in the country), which is the highest number of infections in Southeast Asia. Moreover, it has led to infection in neighboring countries. The Muslim slept in paced tents outside the mosque, waking before down to knee on prayer mats rows lay out in this cavernous central hall. The COVID-19 coronavirus was passed unnoticed among them. Attendees Muslim held for 4 days worship at the Petak Jamek Seri Petaling mosque complex here has emerged as a source of hundreds of new coronavirus infections spanning Southeast Asia and unable to explain the distribution model. Therefore, this work, computational algorithm which is a good IT technique for modeling of outbreak is briefly mentioned [15, 16]. The method of Distribution Tree Algorithm model to explain the phenomenon of spread coronavirus has spread in all directions and uncontrolled. For modeling, a computational research and algorithm design is done. Open source software: RAPTOR software Version 5.129 for flowchart-based programming and output visualization is the instrument. Data source is from reported news since 17–23 March 2020 as in Table 3.

Analysis of the spread of the COVID-19 virus in religious gatherings at the Petak Jamek Seri Petaling mosque in Kuala Lumpur, Malaysia, where people gather for 4 days with people travelling from neighbor countries who do not know they are Infected with the Covid-19 virus. The integration of the infected person and normal people that has exposure to secretions of virus-infected people includes Coughing, sneezing, spit without careful caution by wearing a mask, using alcohol gels to
frequently clean hands, or spacing of at least 6 feet away, causing the virus to spread to many people and uncertain spread model, which can be explained from a tree in Fig. 15.

Distribution tree Analysis Unpredictable spread of the Model in Fig. 15 can explain as follows:

(1) The tree is a mosque that 16,000 religious gather at the ceremony on February 27, 2020–March 1, 1977. According to news reports, various agencies reported that the worshipers slept in the Mosque and tent outside the mosque in which

| Country                  | Attendees | Confirm case |
|--------------------------|-----------|--------------|
| 1. Malaysia              | 14,500    | 970          |
| 2. Singapore             | 95        | 5            |
| 3. Brunei Darussalam     | 74        | 45           |
| 4. Cambodia              | 79        | 25           |
| 5. Philippines           | 215       | 77           |
| 6. Thailand              | 132       | 6            |
| 7. Vietnam               | 130       | 67           |
| 8. Indonesia             | 696       | 30           |
| 9. No country report     | 79        | 0            |
| Total                    | 16,000    | 1225         |

Table 3 The attendees at Petak Jamek Seri Petaling Mosque in Kuala Lumpur, Malaysia

Meaning of symbol

- A Tree is the worshippers who gathering at Petak Jamek Seri Petaling mosque in Kuala Lumpur, Malaysia
- Branches are Volume Infections.
- Arrows are Direction Distribution.
- Brown leaves are Positive COVID-19 case.
- The Green leaves are Negative COVID-19 case.

Fig. 15 Distribution tree analysis unpredictable spread of model
those people have travelling in and out of the mosque and travelling round trip as well, therefore, the yellow arrow shows the direction of infinite spread and cannot predict in which direction it goes.

(2) The branches of the tree are volume Infections, that means a volume of infection from worshippers cohabitation behavior can expose to a coronavirus, including close up infected person, who travelled to risk country, leave outwear a mask and social distance, do not clean alcohol gel always, get other risk behavior, congenital disease, elderly, Obese etc.

(3) The arrows are a distribute direction. Coronavirus 2019 can move in any direction and beyond the control. Therefore, the spread of the COVID-19 virus is unpredicted and became Southeast Asia’s COVID-19 hotspot.

(4) Brow leaves are positive COVID-19 cases, after the attendees leave out Malaysia to theirs country and they take screening. The result confirmed the case link to the Mosque Malaysia.

(5) The Green leaves are Negative COVID-19 cases after leaving out Malaysia and taking the screening. This satiation depends on their health and protection behavior or other reasons.

There are 10 variables in an algorithm model (Table 4).

The concepts mentioned from Distribution tree Analysis Unpredictable the spread of the Model in Fig. 1 and create an algorithm as follows.

| No. | Field         | Type of variable | Description                                      |
|-----|---------------|------------------|--------------------------------------------------|
| 1   | c_attendees   | Number           | Country attendee                                |
| 2   | n_attendees   | Number           | Number of attendees                             |
| 3   | sp            | Number           | Number of screening person                      |
| 4   | Result        | Number           | Result of screening type                        |
| 5   | c1            | Number           | Number of close up infected person              |
| 6   | c2            | Number           | Number of the person who traveled to risk country|
| 7   | c3            | Number           | Number of the person who traveled to risk country|
| 8   | c4            | Number           | Number of Not wearing mask and social distance  |
| 9   | confim_case   | Number           | Total of confirm case                           |
| 10  | N             | Number           | Number of positive case                         |

Table 4  Variable of distribution three algorithm model
1) Start.
2) Display 16,000 Attendees Religious assembly at at Petak Jamek Seri Petaling Mosque in Kuala Lumpur Malaysia

3) Display 1 = Malaysia, 2 = Singapore, 3 = Brunei Darussalam, 4 = Cambodia, 5 = Philippines, 6 = Thailand, 7 = Vietnam, 8 = Indonesia, 9 = Not report

4) Input country attendees
5) Display Country attendees
6) Selection country attendees

Set Choice attendees value 1 = Malaysia, value 2 = Singapore, value 3 = Brunei Darussalam, value 4 = Cambodia, value 5 = Philippines, value 6 = Thailand, value 7 = Vietnam, value 8 = Indonesia, 9 = Not report

8) If country attendees =1 then

8.1 Input Number of attendees and display.
8.2 Input number of screen person and display.
8.3 Input Result of screening type
8.4 selection result value 1 = positive covid-19 case, Value 0 or other number =negative covid-19 case.
8.4.1 If result = 1 then (Mean Yes)
8.4.2 Input number of congenital disease and display
8.4.3 Input number of close up infected person and display
8.4.4 Input number of the person who traveled to risk country and display.
8.4.5 Input number of not wearing mask and social distance and display.
8.4.6 Process total of confirmed cases = c1+c2+c3+c4
8.4.7 Display Total of confirmed case.
8.4.8 If result = 0 or other number (Mean No)
8.4.9 Set variable confirm_case = 0
8.4.10 Display Number of negative case.

9) If country attendees =2 then follow as steps 8.1 to 8.4.10 then go 17)
10) If country attendees =3 then follow as steps 8.1 to 8.4.10 then go 17)
11) If country attendees =4 then follow as steps 8.1 to 8.4.10 then go 17)
12) If country attendees =5 then follow as steps 8.1 to 8.4.10 then go 17)
13) If country attendees =6 then follow as steps 8.1 to 8.4.10 then go 17)
14) If country attendees =7 then follow as steps 8.1 to 8.4.10 then go 17)
15) If country attendees = 8 then follow as steps 8.1 to 8.4.10 then go 17)
16) If country attendees = 9 then follow as steps 8.1 to 8.4.10 then go 17)
17) Display Attendees Country
18) Set N = screening person-confirm_case
19) Display Negative number and country attendees
20) End.

This work use Raptor software version 5.129, a flowchart-based programming, designed specifically to visualize the algorithm model and trace the execution through the flowchart (Figs. 16 and 17).

The programs, consist of 4 components as (1) work place (2) Display variables value (3) Output and symbols.

The result of Flowchart after complete generate algorithm. This algorithm uses sequential structure and branch structure to build Distribution Tree Algorithm model reference infection data source 8 countries and the other one no report. Represent the COVID-19 outbreaks in Malaysia that explain at entrance in one way and distribute in multiple exit as Fig. 18.

An algorithm process top to down and working separate modules 1–9 depending on user input attendees country. After the complete test, all modules can show the symbols evaluated and algorithm performance as Table 5.

Conclusively, this example shows an application of IT algorithm development to help explaining the pattern of COVID-19 outbreak. The work can confirm that the IT algorithm can fasten the simple, classic mathematical model technique for

![Fig. 16 Component program](image)
modeling of the outbreak situation. This technique is a system based approach that focuses on the macro-scale data on the study setting. In fact, there might be some previous reports on info epidemiological study. For example, the analysis of data trends on Google or Twitter might be done and further used for referring to the clinical epidemiological data or development of a new clinical tool [17, 18]. For example, Google Trend data might be used for predicting COVID-19 incidence.
Nevertheless, the social media based might have problem with reliability. The algorithm development based on the official public health report might be more reliable.

The present technique can be applied in any setting and it can provide the useful data representing the nature of disease spreading in different settings. For this specific example, it can show that the disease existence in the studied setting is directly due to the importation of the COVID-19 patient. This can give an insight that an effective disease control should be based on strict control of any immigration.

Table 5  Result algorithm performance

| No | Module     | Type of screened | Number of symbol evaluated | Errors | Run complete | Accuracy algorithm |
|----|------------|------------------|-----------------------------|--------|--------------|--------------------|
| 1  | ❶ Malaysia | 1 = confirmed case | 27                          | No     | Complete ✓   |                    |
|    |            | 0 = Normal        | 19                          | No     | Complete ✓   |                    |
| 2  | ❷ Singapore| 1 = confirmed case | 28                          | No     | Complete ✓   |                    |
|    |            | 0 = Normal        | 20                          | No     | Complete ✓   |                    |
| 3  | ❸ Brunei Darussalam | 1 = confirmed case | 29                          | No     | Complete ✓   |                    |
|    |            | 0 = Normal        | 21                          | No     | Complete ✓   |                    |
| 4  | ❹ Cambodia | 1 = confirmed case | 30                          | No     | Complete ✓   |                    |
|    |            | 0 = Normal        | 22                          | No     | Complete ✓   |                    |
| 5  | ❺ Philippines | 1 = confirmed case | 31                          | No     | Complete ✓   |                    |
|    |            | 0 = Normal        | 23                          | No     | Complete ✓   |                    |
| 6  | ❻ Thailand | 1 = confirmed case | 32                          | No     | Complete ✓   |                    |
|    |            | 0 = Normal        | 24                          | No     | Complete ✓   |                    |
| 7  | ❼ Vietnam | 1 = confirmed case | 33                          | No     | Complete ✓   |                    |
|    |            | 0 = Normal        | 25                          | No     | Complete ✓   |                    |
| 8  | ❽ Indonesia| 1 = confirmed case | 34                          | No     | Complete ✓   |                    |
|    |            | 0 = Normal        | 26                          | No     | Complete ✓   |                    |
| 9  | ❾ No country report | 1 = confirmed case | 35                          | No     | Complete ✓   |                    |
|    |            | 0 = Normal        | 27                          | No     | Complete ✓   |                    |
5 Conclusion

Emerging infectious disease is an important problem in medicine. If there is a pandemic, its can widely affect global population. The novel IT technology can be useful for corresponding to the new emerging infection. In this chapter, the author briefly discuss on COVID-19, which is an important global public health problem. Computational IT tool can be applied for modeling COVID-19 outbreak. The application might be for clarification or prediction. The basic IT tools can be selected and applied depending on the different scenarios. The good examples of medical informatics application for managing of COVID-19 outbreak are GIS modeling and algorithm for explaining the outbreak. Also, the IT application can be the fundamental for more advance medical informatics approach for COVID-19 containment such as artificial Intelligence and machine learning tools development.

Conflict of interest None

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