# Flight Traffic Visual Analytics during COVID-19

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Abstract—During the spread of COVID-19, one of the businesses that were affected is the flight business. In this situation, each country had its policy to control the spread of the virus that includes international and local transport restrictions that cause many airlines to change their flight schedule. In this work, we collected the flight traffic of each airport and the COVID-19 spread of each country into our database. Its purpose is for analysis to see the behavior of flight traffic for the countries that were affected by COVID-19. We also provided the data visualization website for those whom were interest to answer their hypothesis of the relationship between flights and the COVID-19 infection. The findings were that the date on 13 March had the maximum number of flights with 679 flights while the date on 18 April had the minimum number of flights with six flights, and the number of domestic flights was increasing to 87 during the Post-COVID.

*Index Terms*—Information Visualization, Data Analytic, Big Data, COVID-19, Coronavirus Disease 2019.

## I. INTRODUCTION

In late 2019, there was the virus originally spreading from Wuhan, China, which was later called COVID-19 (Coronavirus Disease 2019), and quickly spreading globally. The spread of the virus causes many countries to impose either local lockdown or nationwide lock-down; however, the countries had to prevent the economic recession by using the social distancing policy for opening the economic activities instead of imposing the lock-down. The lock-down policy had effected many areas such as tourism or investments and the aviation industry. Many airlines had to re-schedule their flights or canceled.

In this research, we collected the data from FlightRadar24 [1] for flight traffic data for each airport and the COVID-19 infection data for each country. Both collected data were stored using a MySQL database system. The key question of our analysis is "*How active flight changed during the phrase of COVID-19*?

# II. METHODOLOGY

# A. Data collection

In this work, the flight data of 5636 airports worldwide were collected. FlightRadar24 provided data of all flights of a selected airport 36 hours before and 36 hours next scheduled flights. Since this project started in March 2020, in part of data collection, we used AeroDataBox [2] to view the list of flights for each airport from December 2019 to March 2020.

After that, we merged the flight data with FlightRadar24 to get the missing parameters of some flights. This method allowed us to collect the whole flight traffic data from late 2019 up to the present.

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To achieve the most up-to-date data, we created a Python script to execute every hour and sent a request to Fligh-tRadar24 for collecting the daily flight traffic data and stored it in the database. Then we need to process the data check to prevent the duplication of data and to update the flight data in our database. All of these processes allowed us to have flight traffic data and COVID-19 infection data fed to the database for the visualization system as found in *http//mit.bu.ac.th/visualization/*.

## B. Data summarization or big data handling

All the flight data fed from FlightRadar24 was very large that we tried to handle it by filtering them. We categorized and filtered them into a set of new data tables. With this method, we called it "data summarization" that the FlightData24 data was fed to a new table every day to ensure that the number of flights was updated. And for more latest data, we do this method for the past 7 days based on the execution date. This take a considerable amount of time in the background but an operation time for the flight data query is much faster.

## III. USE CASES FOR FLIGHT TRAFFIC ANALYSIS DURING COVID-19

#### A. Data analysis questions

The flights were separated into domestic flights and international flights. We separated our analysis into two parts.

- How many flights inside Thailand during the infection of COVID-19 ?
- How many flights outside Thailand had a destination to Thailand during the infection of COVID-19 ?

We used the collected data to generate a CSV file and then imported it into Microsoft PowerBI to visualize the data.

## B. Findings for domestic flight analysis

A graph shown in Fig 2 was the data between 22 January to 22 June, 2020. The date that had the maximum number of flights was on 13 March with 679 flights. The date that had the minimum number of flights was 18 April with six flights. However, there was a growth in the number of domestic flights increasing on the post-COVID-19. On 30 April, there were

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Fig. 1. Airport comparison between (a) Maximum arrival flights occurred on 27 January 2020 (b) Minimum arrival flights occurred on 19 April 2020





only 12 flights but on the next day, the number of flights was increasing to 87 flights. This was because the active airport was increasing from 10 airports to 25 airports at that time.

The domestic flights were also increasing again on 31 May. There were 80 flights and increased into 187 flights the next day. At that time, the number of airports remained the same but the flights of each airport were increasing. It showed that the situation of COVID-19 in Thailand was controllable enough for many airports in Thailand to be active.

Table I presents a number of daily domestic flight in three months of the post-COVID.

- April: 15 April to 30 April, 2020
- May: 1 May to 31 May, 2020
- June: 1 June to 18 June, 2020

where N represented the amount of days to be use for

TABLE I DAILY DOMESTIC FLIGHT ON POST-COVID

| Month                               | N  | Mean     | Std. Dev. | Median   | Max | Min |  |  |
|-------------------------------------|----|----------|-----------|----------|-----|-----|--|--|
| April                               | 16 | 11.8750  | 3.3331    | 12.5000  | 18  | 6   |  |  |
| May                                 | 31 | 76.3226  | 5.9913    | 75.0000  | 87  | 64  |  |  |
| June                                | 18 | 188.7222 | 10.2676   | 187.5000 | 211 | 175 |  |  |
| a Data hatriaan 15 April to 19 Juna |    |          |           |          |     |     |  |  |

<sup>a</sup>Data between 15 April to 18 June

calculating statistic data.

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## C. Findings for International Flight Analysis

A graph shown in Fig 3 is the data between 22 January to 15 June 2020. We chose the analysis key to be daily arrival flights. The line chart represented the daily arrival flights from 22



Fig. 3. Daily Arrival Flight and new COVID-19 case

January to 15 June. This graph also showed new daily COVID-19 cases as a bar chart. The daily arrival had its maximum point on 27 January with 525 arrival flights and its minimum point on 19 April with 8 arrival flights. On the other side, the daily new COVID-19 cases had its maximum point on 22 March with 188 new cases. Then, we put the date data into Python script to generate a CSV file and import it into Mapbox JL GS [3].

The number of airports that had a destination to Thailand on the date that had most arrival flight (27 January 2020) was 85 airports as shown in Fig 1 (a). Comparing to the date that had less arrival flight, it had only six airports as shown in Fig 1 (b). This visual information presented that Thailand did not let their guard down. Even the number of daily new COVID-19 cases was currently in control, the arrival flights of Thailand remained the same.

Table II showed the daily arrival flights that had a destination to Thailand from 3 April to 22 June 2020 when it was the post-COVID where N represented the number of days to be use for statistic calculation.

# **IV. CONCLUSIONS**

The analysis of arrival flights is able to provide the findings for a set of questions about flight behaviors during the spread

TABLE II DAILY ARRIVAL FLIGHT ON POST-COVID

| Ν  | Mean | Std. Dev. | Median | Max | Min |  |  |  |  |
|--|------|-----------|--------|-----|-----|--|--|--|--|
| 81   | 27   | 4.7635    | 27     | 36  | 8   |  |  |  |  |
| <sup>a</sup> Data between 3 April to 22 June, 2020 |      |           |        |     |     |  |  |  |  |

of COVID-19. This information is also useful for other areas such as investment or tourism that was affected by COVID-19.

We also provide a responsive visualization system for those whom were interested in COVID-19 to use these data for the visualization of flight traffic data. They may be used these data source to answer their hypotheses of the relationships between COVID-19 cases and arrival flights.

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