

CHAPTER 4

ANALYSIS AND DESIGN

4.1 Research Procedure

4.1.1 Collecting Data

Data collection is obtained from history of flight report in angkasa pura. The data collected is from year 2018 – 2020. First step we must converted from pdf to be csv file. After that we must import to my sql database.

**TOTAL PERGERAKAN LALU LINTAS ANGKUTAN UDARA
PT. PERSERO ANGKASA PURA I
BANDARA : ACHMAD YANI - 2018**

DOMESTIK BLN	PESAWAT				PENUMPANG				BAGASI (Kg)				KARGO (Kg)				POS (Kg)			
	DTG	BRK	LOK	JML	DTG	BRK	TRS	JML	DTG	BRK	TRS	JML	DTG	BRK	TRS	JML	DTG	BRK	TRS	JML
01	1.863	1.858	1.208	4.929	185.810	197.353	7	383.170	1.130.406	1.237.138	0	2.387.544	1.008.488	715.800	0	1.724.288	0	10.276	0	10.276
02	1.601	1.597	1.834	5.032	178.384	175.933	0	354.317	1.018.851	1.009.963	0	2.028.814	889.307	703.982	0	1.593.379	0	9.296	0	9.296
03	1.813	1.810	1.722	5.345	203.327	198.285	0	401.612	1.129.221	1.114.175	0	2.243.396	1.048.125	918.210	0	1.966.335	0	10.972	0	10.972
04	1.861	1.859	3.234	6.954	208.837	205.759	1.457	416.053	1.155.313	1.161.354	0	2.316.667	1.101.959	903.546	0	2.005.505	0	10.163	0	10.163
05	1.780	1.775	2.796	6.351	198.243	180.250	0	378.483	1.116.385	981.894	0	2.098.279	1.209.284	925.932	0	2.135.216	0	14.645	0	14.645
06	1.966	1.967	0	3.933	230.172	212.456	0	442.628	1.675.730	1.529.615	0	3.205.345	844.496	642.953	0	1.487.449	0	7.791	0	7.791
Sub Total	10.884	10.866	10.794	32.544	1.204.773	1.170.036	1.464	2.376.273	7.225.006	7.034.139	0	14.260.045	6.101.749	4.810.423	0	10.912.172	0	63.143	0	63.143
07	1.981	1.980	0	3.961	235.917	282.677	3.912	492.506	1.417.155	1.726.658	0	3.143.813	1.046.149	854.987	0	1.901.136	0	10.369	0	10.369
08	1.939	1.939	0	3.888	222.844	219.813	3.330	445.987	1.242.964	1.338.004	0	2.580.968	1.073.813	857.221	0	1.931.034	0	8.784	0	8.784
09	1.862	1.860	0	3.722	205.301	209.064	4.248	418.613	1.107.472	1.275.988	0	2.383.460	1.021.039	811.501	0	1.832.540	0	10.713	0	10.713
10	1.909	1.908	0	3.817	213.819	210.794	2.881	427.494	1.123.363	1.211.706	0	2.335.069	1.154.371	880.467	0	2.034.838	0	12.867	0	12.867
11	1.802	1.803	0	3.615	198.094	192.851	2.366	393.311	1.125.833	1.175.239	0	2.301.072	1.016.906	773.024	0	1.789.930	0	11.175	0	11.175
12	1.777	1.777	0	3.554	198.470	191.073	1.885	391.428	1.221.765	1.268.346	0	2.490.111	968.589	741.695	0	1.710.284	0	8.947	0	8.947
Sub Total	11.270	11.267	20	22.557	1.274.445	1.276.272	18.622	2.589.339	7.238.552	7.995.941	0	15.234.493	6.280.867	4.918.895	0	11.199.762	0	62.855	0	62.855
TOTAL	22.154	22.133	10.814	55.101	2.479.218	2.446.308	20.086	4.945.612	14.464.458	15.030.080	0	29.494.538	12.382.616	9.729.318	0	22.111.934	0	125.998	0	125.998

Figure 4.1 : Flight Data

Figure 4.1 the image above is an example of an image of the flight data that has been obtained. The data consists of many transactions in which it does not only contain departure data. The data obtained from PT. Angkasa Pura. In this project, the data that will be used for forecasting is passenger departure data.

4.1.2 Double Exponential Smoothing

The Double exponential smoothing method is the most widely used method to determine the trend equation for the second smoothing data through a smoothing process. This forecasting system captures patterns from past data and then uses it to project future data.

$$s'_0 = x_0$$

$$s''_0 = x_0$$

$$s'_t = \alpha x_t + (1 - \alpha)s'_{t-1}$$

$$s''_t = \alpha s'_t + (1 - \alpha)s''_{t-1}$$

$$F_{t+m} = a_t + mb_t$$

Figure 4.2 : Double Exponential Smoothing Formula

Figure 4.2 The picture above is the formula for double exponential smoothing. This formula is the formula used to make predictions on this project. in the formula it can be seen that there are 5 calculation processes to get forecasting results.

Table 4.1 Table Double Exponential Smoothing

TAHU N	BUL AN	JUMLAH PENUMPA NG	ST'	ST''	AT	BT	F	MAPE
2018	1	1858	1858	1858	1858	0	18 58	0
	2	1597	1858	1858	1858	0	18 58	0
	3	1810	1649. 2	1690. 96	1607.44	- 167	14 40	13
	4	1859	1777. 84	1760. 46	1795.216	70	18 65	5
	5	1775	1842. 77	1826. 31	1859.228 8	66 8	19 25	4

	6	1967	1788. 55	1796. 1	1781.002 88	-30	17 51	2
	7	1980	1931. 31	1904. 27	1958.352	108	20 67	7
	8	1939	1970. 26	1957. 06	1983.460 685	53	20 36	3
	9	1860	1945. 25	1947. 61	1942.890 194	-9	19 33	1
	10	1908	1877. 05	1891. 16	1862.937 65	-56	18 06	4
	11	1803	1901. 81	1899. 68	1903.939 452	9	19 12	1
	12	1777	1822. 76	1838. 15	1807.378 275	-62	17 46	4
2019	1	1550	1786. 15	1796. 55	1775.753 732	-42	17 34	3
	2	1347	1597. 23	1637. 09	1557.366 362	-	13 98	12
	3	1463	1397. 05	1445. 06	1349.036 395	-	11 57	17
	4	1371	1449. 81	1448. 86	1450.759 904	4	14 55	0
	5	1326	1386. 76	1399. 18	1374.342 506	-50	13 25	4
	6	1506	1338. 15	1350. 36	1325.946 606	-49	12 77	5
	7	1484	1472. 43	1448. 02	1496.844 942	98	15 95	8
	8	1514	1481. 69	1474. 95	1488.420 113	27	15 15	2
	9	1470	1507. 54	1501. 02	1514.054 247	26	15 40	2
	10	1543	1477. 51	1482. 21	1472.804 894	-19	14 54	2
	11	1502	1529. 9	1520. 36	1539.439 788	38	15 78	3

			1507.	1510.	1505.023		14	
	12	1545	58	14	719	-10	95	1
2020	1	1556	52	04	896	22	65	2
	2	1479	3	25	81	16	73	1
	3	1282	66	58	648	-44	39	4
	4	407	33	38	827	144	44	14
	5	53	590.4 66	744.4 49	436.4834 248	- 616	17 9	130
	6	231	160.4 93	277.2 85	43.70205 685	- 467	42 3	364
	7	414	216.8 99	228.9 76	204.8214 857	-48	15 7	28
	8	529	374.5 8	345.4 59	403.7005 12	116	52 0	39
	9	491	498.1 16	467.5 85	528.6473 454	122	65 1	31
	10	540	492.4 23	487.4 55	497.3909 177	20	51 7	5
	11	669	530.4 85	521.8 79	539.0904 733	34	57 4	8
	12	696	641.2 97	617.4 13	665.1805 526	96	76 1	19

Table 4.1 this table is a illustration a process from calculation of algorithm double exponential smoothing. the calculation process carried out from 2018 to 2020. The percentage of errors generated from the calculation process can be seen in the MAPE column. For the results themselves, double exponential smoothing shows a high percentage of error when there is a data spike.

4.2 Design

4.2.1 Flow Chart

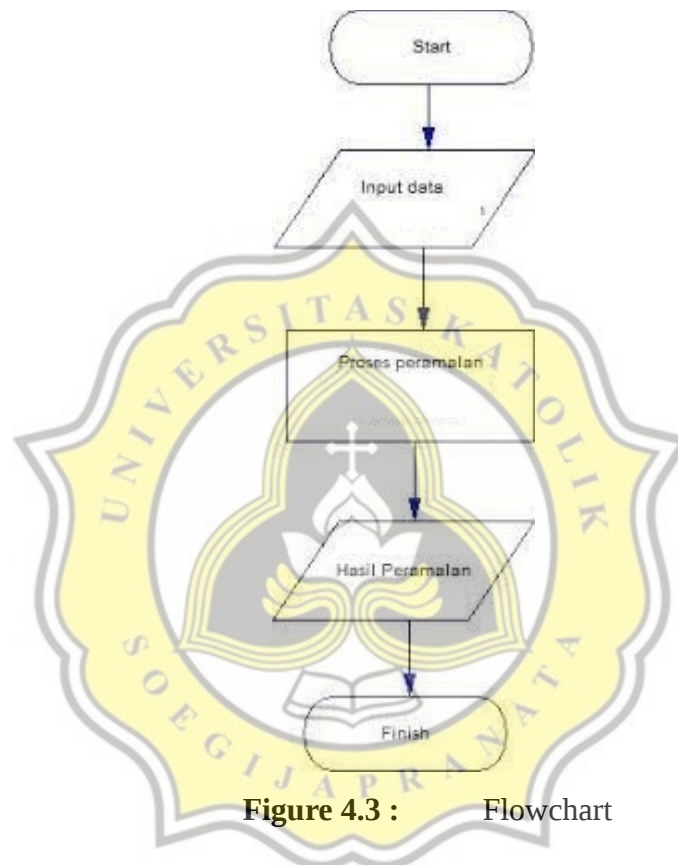


Figure 4.3 : Flowchart

Figure 4.3. First step to make prediction we must input the data into database. After that we can do calculating process using double exponential smoothing. The program will automatically calculate data using alpha 0.1-0.9. The result will be compared and show as a chart.