

Research No.2 “The MEX Flow Analysis”

Mission

Fig. 1 shows the network of the Metropolitan Expressway (MEX) in Tokyo. The network consists of 20 centroids (double circle), 6 nodes (single circle) and 28×2 links. Link number is expressed in *Italic*.

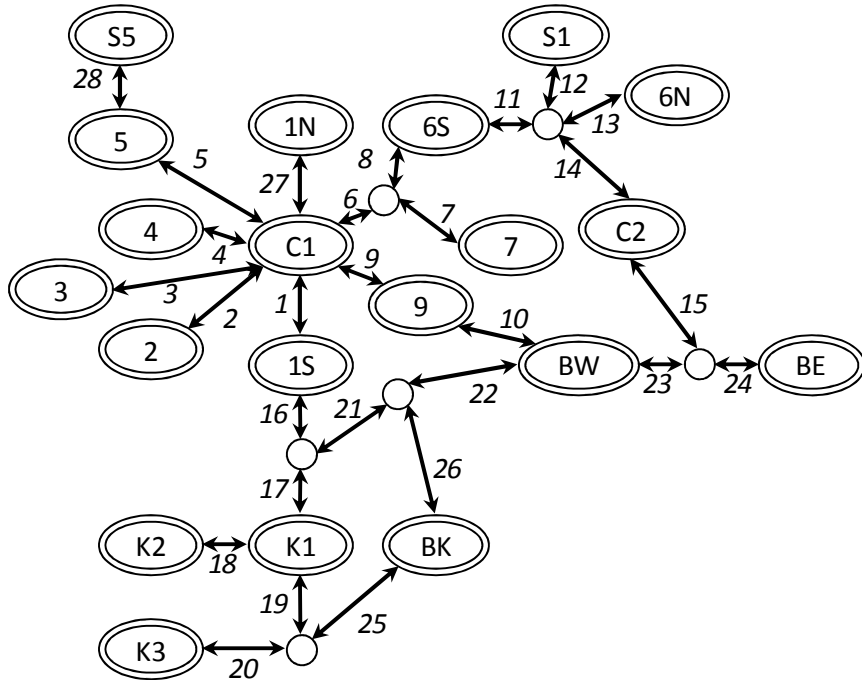


Fig.1 The MEX network

OD table is given in Table 1.

Table 1 OD table of the MEX

		D																			
		C1	1N	1S	2	3	4	5	6S	7	9	BW	BE	C2	6N	S1	K1	K2	K3	BK	S5
O	C1	870	2,998	4,268	7,472	21,617	22,970	13,055	612	6,866	308	3,262	6,658	1,697	4,910	2,186	4,580	2,332	3,311	746	1,478
	1N	3,641	1,776	4,410	4,802	5,842	2,171	140	25	65	0	664	152	24	72	36	2,365	1,126	945	418	6
	1S	3,313	2,393	2,071	55	794	2,470	5,386	350	1,000	121	551	2,471	639	2,150	1,193	2,783	2,202	1,755	826	440
	2	7,787	2,879	50	0	1,107	2,639	6,154	971	2,012	238	887	2,469	949	2,064	1,110	168	93	176	105	549
	3	12,314	2,456	984	540	15,327	769	7,620	1,257	4,181	871	3,558	6,230	1,627	6,425	3,822	229	86	106	211	962
	4	11,141	597	2,246	1,746	742	33,301	3,400	1,836	6,467	1,230	4,249	6,546	1,442	4,052	1,425	969	188	498	435	310
	5	6,526	18	3,914	3,417	6,723	2,987	30,059	860	4,209	1,322	3,385	3,047	235	568	181	1,506	549	755	460	3,709
	6S	198	7	394	643	1,366	1,520	1,357	149	4,344	9	595	1,818	823	9,910	6,123	291	194	254	103	103
	7	3,523	0	662	1,871	5,399	7,404	5,135	925	18,830	99	299	16	18	148	246	450	326	167	145	299
	9	90	8	218	331	959	1,520	1,575	102	253	12	1,767	3,000	162	941	796	638	339	720	336	110
	BW	1,879	442	1,258	641	3,374	3,696	3,425	824	680	1,755	13,750	16,030	3,732	7,580	7,454	2,052	1,718	5,534	3,710	379
	BE	4,787	173	2,757	1,502	5,714	6,353	4,240	1,279	125	4,053	15,771	3,954	2,160	3,747	8,849	2,501	1,730	4,226	2,131	239
	C2	753	14	770	664	1,603	981	280	402	70	202	3,786	2,250	457	6,167	10,121	850	499	869	689	16
	6N	3,509	17	1,948	2,020	6,128	2,756	614	6,720	68	630	6,479	3,850	5,026	5,496	1,437	1,255	841	2,343	1,702	4
	S1	1,999	5	1,498	1,133	3,305	790	103	5,083	218	765	6,852	9,225	8,981	1,340	10,541	1,250	604	1,899	1,460	0
	K1	3,076	1,635	3,275	131	254	920	2,116	500	698	499	1,910	2,281	743	1,764	1,387	13,474	15,461	16,249	3,329	202
	K2	1,770	710	2,893	89	66	252	957	120	291	250	1,653	1,407	538	910	598	15,513	0	5,078	2,060	88
	K3	1,972	689	1,719	247	202	350	1,164	381	381	749	5,337	4,996	800	2,937	1,731	15,660	6,005	25,692	9,155	101
	BK	607	189	892	74	176	333	532	159	249	362	4,351	2,176	561	1,625	1,229	3,206	1,872	8,859	7,546	46
	S5	867	0	316	406	873	330	3,308	88	148	105	280	125	19	0	10	129	65	78	43	8,655

Link performance function is expressed by the BPR type function.

$$t_a(x_a) = t_{0a} \left\{ 1 + \alpha \left(\frac{x_a}{C_a} \right)^\beta \right\}$$

Parameters of the link performance function for links are given in Table 2.

Table 2 Parameters of the link performance function

Link	t_{0a}	C_a	α	β
1	8.0	55,000	0.45	2.5
2	4.6	55,000	0.45	2.5
3	9.6	60,000	0.45	2.5
4	9.9	55,000	0.45	2.5
5	10.4	55,000	0.45	2.5
6	0.7	55,000	0.45	2.5
7	6.7	55,000	0.45	2.5
8	4.0	55,000	0.45	2.5
9	2.2	55,000	0.45	2.5
10	2.2	55,000	0.45	2.5
11	3.8	55,000	0.45	2.5
12	8.1	60,000	0.3	2.5
13	6.8	60,000	0.3	2.5
14	4.4	60,000	0.45	2.5
15	4.4	60,000	0.3	2.5
16	3.2	55,000	0.45	2.5
17	10.4	55,000	0.45	2.5
18	1.8	55,000	0.45	2.5
19	5.4	55,000	0.45	2.5
20	5.7	60,000	0.3	2.5
21	1.3	30,000	0.45	2.5
22	6.0	100,000	0.3	2.5
23	2.2	100,000	0.3	2.5
24	7.5	100,000	0.3	2.5
25	6.7	75000	0.3	2.5
26	9.5	75000	0.3	2.5
27	3.2	55000	0.45	2.5
28	8.0	55000	0.3	2.5

- (1) Formulate the UE network flow by optimization problem.
- (2) Solve this optimization problem.
- (3) Discuss the result from various aspects (e.g. comparison between the result and actual flow).