Modelling Trip Distribution Using the Gravity Model and Fratar's Method

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ABSTRACT

Trip Distribution is a difficult and significant model in the urban transportation planning process. This paper creates and assesses a satisfactory model of the trip distribution stage for the Nasiriyah city by using two models, Gravity and Fratar methods. A large sample was used for developing the model. The research methodology depends on discussing the theoretical fundamentals of the various methods for estimating the trips distribution and examining the suitability of these fundamentals for the conditions of the selected study area. Two different models had been used, namely; Frater and Gravity model. These models were calibrated using real data. The study tests the accuracy of the models, including overall statistical assessments of the predicted movements. Finally, the study recommended to use Fratar Method. These results had been confirmed to the literature that, if the area is a homogenous growth, the best model is the growth factor (Fratar's method) and if the area is experiencing rapid changes. The gravity model will produce satisfactory results because it takes into account the competition in different land uses.

1. INTRODUCTION

Because of substantial growth in recent years, and continued future growth, the City of Al-Nasiriyah is confronted with various difficulties of arranging and dealing with its development system and transport framework especially inside the central business district (CBD). The city has development plans for the future, these plans will create major transport demands that will affect the current transport infrastructures and systems, also the transport demands will affect the current transport frameworks, especially the street organize inside the downtown area. Hence, the point of this examination is building up a transport model for the Nasiriyah region.

The transport model will help the city in setting up the future of transport request and test the effect of land use development, significant turns of events and street organize alternatives. The model of the investigation territory involves the urban zone is a trip distribution. It is a model of movement between zones - trips or links. Trip distribution models are designed to generate the best possible forecasts of destination choices based on traffic generation and attraction information for each travel area and genetic travel cost between each pair of zone [1-4].

The trip distribution model helps to control the changing in land uses. For instance, if a shopping centre is being arranged, so can make adjusted for the current trip generation model to fit the designed site (e.g., adding 500 retail occupations to the zone in which the shopping centre will exist). At that point, the model of trip generation is re-run with the new anticipated information, where the outing distribution model is applied to the anticipated beginnings and goals information. The outcome would be a model of likely outings to the new

shopping center. The principle of trip distribution forecasting represents by estimating the relations or linkages for trip attractions among traffic zones [5].

For depicting the distribution of trips between zones, the literature depends on a matrix as a form. The matrix is a table that consists of two-dimension. The cells within the table represent the volumes of traffic that affected of generation zone to attraction zone and denoted by (T_{i-j}). (T_{i-j}) a symbol represents the trips that generate at zone i and ended at zone j. O-D network is comprised of lines and sections that speak to the root and goal zones individually. In this way, the O-D grid is required for the directional traffic task [6]. Three significant steps in an O-D matrix table, firstly, the traffic volume, secondly, the O-D matrix, and finally, the total trip of production and attraction. Those are represented essential datum of transportation systems planning and operations [7].

A mixture of purposes depends on a datum in the O-D matrix such as new road designs and existing road improvements (widening or adding more lanes) due to rising transportation demand services and facilities. It is additionally basic in examining the effects of the execution of traffic activity situations to current traffic circumstance, social, and natural divisions. The situations may include the course change, street enclosure because of street works or maintenances, the emergence of crises because of cataclysmic event, for example, seismic tremor, a tsunami wave, forest fire and significant flood. The traffic administrators can predict the circumstances prone to happen and henceforth inform the street clients with enough time preceding the changes. Hence, O-D networks are the fundamental wellspring of data for some reasons and should be readied rigorously [6]. Throughout the years, modellers have utilized a few unique definitions of trip

distribution. The first was the Fratar or Growth model. This technique was presented by Fratar (1955). This structure extrapolated a base year trip table to the future dependent on development however doesn't consider the changing in spatial availability because of expanded gracefully or changes in movement designs and congestion [1]. In any case, the Fratar method is used routinely for anticipating through excursions in an urban zone and now and then in any event, for external - internal trips [8].

The following model created was the gravity model. The gravity model is entropy expansion model is generally utilized for trip conveyance examination [9], and the mediating openings model. Assessment of a few model structures in the 1960s inferred that "the gravity model and interceding opportunity model demonstrated equivalent unwavering quality and utility in reproducing the 1948 and 1955 trip distribution for Washington, D.C." [6].

2. METHODOLOGY

The basic of adoption a model for trips distribution is taken into consideration reaching for a reasonable approximation to the observed trip "(Matches between trips that are modelled and observed) with a note, there are no special statistics for calculating observed distribution". While for predicted distribution, a simple model was used to approximate the actual empirical distribution.

To achieve this, the following detailed objectives have been set:
(1) Gathering important information depending on the form had been implemented in the case study of Nasiriyah city.
(2) Estimating trip production for each zone by adopting the average trip rate (trips/inhabitant/day) for the entire city by using a category analysis method. However, the trip attracted to each zone was essentially estimated through building trip attraction model using simple linear regression, which was adopted as an essential parameter.
(3) Develop an improved trip distribution model that can investigate its validity.
(4) The calculation for developing model done at zone number 1 then duplicated for all zones.
(5) Make a comparison between the observed and modelled distribution to see whether the model creates a sensible guess.

2.1 Nassiriyah strategic transport model

Nasiriyah city is the urban area, it is a homogenous growth and doesn't experience rapid changes in land uses. The number of population for the city of Nasiriyah was 523236 person depending on Insights registration results for 2017 [10]. The absolute number of household in Nasiriyah city is evaluated to be about 58013 households. The selected study area is distinct. Whereas the boundary of the study area represented by the imaginary line, is termed as the 'external cordon'. The area that largely determines the travel pattern within the external cordon line is subdivided into zones. These zones are variety in order to promote data collection for transport planning processes. The sub-division into zones further helps to connect the sources and destinations of travel geographically. Zones within the study area are referred to as internal zones while

those outside the study area are referred to as external zones [11]. In this study, 22 zones are the total number of Traffic Analysis Zones (TAZ). Figure 1 provides descriptions of these zones.
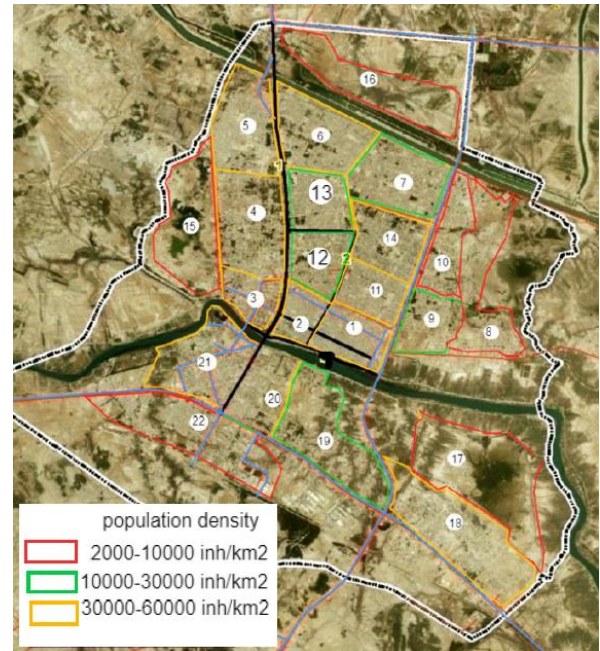

Figure 1. Nasiriyah city zones

3. MODEL DEVELOPMENT

Onset, two trip distribution matrices should be recognized. The first is observed distribution. This is the real number of outings that are observed for every starting point zone and every destination zone. The observed distribution is determined by essentially specifying the number of trips of every attraction cause. This is once in a while called a trips connection (or trips pair). The second is generally called the modeled distribution. In this case is used for approximately analytical distribution. Trips originating in each origin zone are situated in destination areas, usually based on being directly proportional to attractions and inversely proportional to costs (or impedance).

Furthermore, two model have been used in metropolitan region to achieve the best result for an acceptable assessment. First, is the Gravity model. This model gets its name from the way that it is adroitly founded on Newton's Law of attractive energy, which express that power of fascination between two bodies is straightforwardly relative to the result of the majority of the two bodies and conversely corresponding to the square of the separation between them. Eq. (1) is utilized for the estimation of the Gravity model [4, 11]. The other model is a Fratar's method [9, 12] used Eq. (2).

$$T_{ij} = \alpha \ O_i \ D_j \ f(d_{ij}) \qquad (1)$$

where, T_{ij} is trips produced in Zone i and attracted to zone j, O_i, D_j is the total trip ends produced at i and attracted at j, $f(d_{ij})$ is the generalized function of distance between any pair of zones i and j and α is the proportionality factor " Unique form of this travel distance function" that will be used throughout this paper is given as follows:

$$f(dij)= C/ti\text{-}j^n$$

where:

C: Calibration factor for the friction factor, i = origin zone, j = destination zone, n = number of zone i = origin zone j = destination zone n = number of zone.

For the second model can be represented in the following functional form

$$Ti-j = Li-j \times \frac{Pi}{pi} \times \frac{Aj}{aj} \times \frac{\sum_{j=1}^{n} ti-j}{\sum_{j=1}^{n} \frac{Aj}{aj} \times ti-j} \qquad (2)$$

where, Ti-j is the summation of future trip production between i and j, ti-j is the current trip production, Pi is the summation of trip production prediction, pi is the current trip production from zone I, Aj is the summation of future trip attraction to zone j and aj is the current trip attraction to zone j.

3.1 The input of model

Develop a model of distribution needs many estimations. Firstly, estimate trip generation by Households. Secondly calculate the parameters which required in the model building for trip distribution stage by Gravity model such as (Ki, Lj, Impedance function, m and x). As well as estimation the summation of future trips production and attraction Fratar's method. Generally, the data source for all estimation above consists of details of the person travels survey conducted by home interview of Nasiriyah city for the year 2018. The statistical accepted sample size was the minimum sample size needed for conducting the household survey is [10]:

Sample Size = (1/70) * 58013 = 1214 households.

3.2 Calculating the variables of the model

Trip Generation by Households (H.H): The trips generated by households are classified as Home-Based (HB) and Non-Home-Based (NHB). Home-based trips have one end, either origin or destination, located at the home zone of the trip maker. If both ends of a trip are located in zones where the trip maker does not live, it is considered as a non-home-based trip [13]. For modelling, the study adopted the HB trips which had been categorized as four purposes which are: Home Based Work (HBW), Home Based education (HBE), Home Based Shopping (HBSH) and Home Based Other (HBO), which gave a satisfying data can adopt at model development. The Non-Home Based (NHB) had been excluded because the number of forms of their that obtained from Home Interview Survey (HIS) was too few and it cannot represent the individual movement. Thus, "Category Analysis" [9, 14] had been used to obtain trip rate by splitting the household at each traffic zone for categories according to the average person per household. Two curves had been developed. One, reveals the relation between the rate of household size and proportion of population. While, the other, reveals the relation between the rate of trips /trip purpose and household size as shown in Figure 2 and Figure 3 respectively. The rate of the household is extracted from dropping the value of H.H size for zone on a curves in Figure 2 to obtain the rate of H.H/ H.H size as illustrated in Figure 4

Sequentially, Figure 3 shows the relationship between the rate of trips/trip destination and the size of the household; the analysis will extrapolate the average trip rate according to trip purpose as Figure 5.
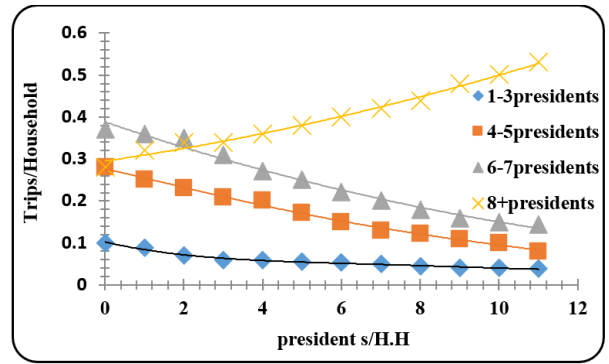
Figure 2. Relation between the rate of household size and proportion of a person
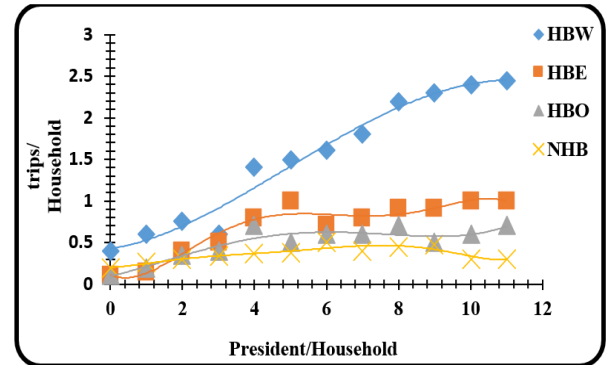

Figure 3. Relation between the rate of trips /trip purpose and household size
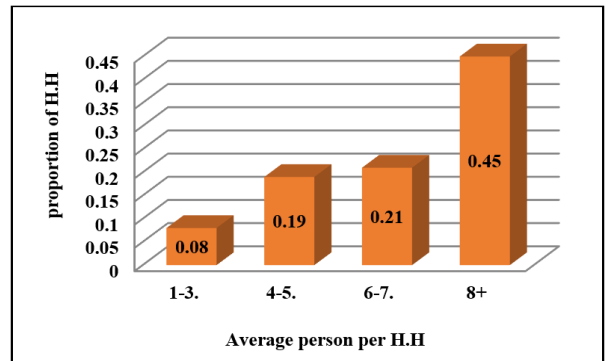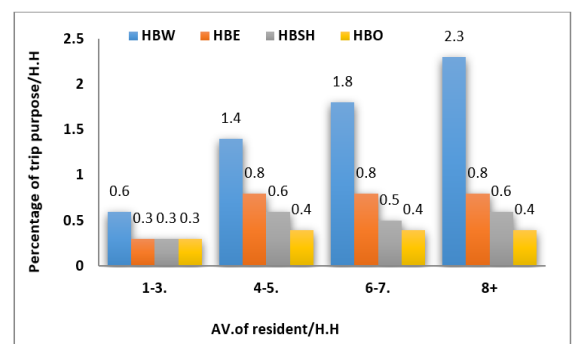

Figure 4. Rate of H.H/ H.H size

Figure 5. Average trip rate according to trip purpose

The trip production in any zone depending on H.H and average trip rate. For estimation rate of household trip production, it's multiplying the average household trip rate

according to the purpose for each household size by its percentage in Figure 3 then have been multiply by the total number of the household at each zone. Thus bellow the estimating of trip production for zone No.1.

Average   H.B.W

rate=0.6×0.08+1.4×0.19+1.8×0.21+2.3×0.45=1.7

Since the No. of (HBW) trip for zone 1 = 1.7× (No. of H.H for zone 1 = 948[10])=1.7×948 = 1612 trip

The same procedure has been applied for estimating all trips purpose for all city as shown in Table 1.

Table 1. Trips Production by purpose at all zones for the base year

Trip purpose	Zone No.																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	sum
HBW	1612	3752	3457	23823	34149	42037	86150	89378	95029	56050	47127	56061	93166	62281	19819	34196	48144	25199	75071	21143	33417	3752	95295
HBE	796	1581	576	513	759	1311	1632	1929	1470	1638	1242	1272	1389	1377	729	735	957	1125	237	939	858	951	23574
HBSH	588	273	237	576	474	744	519	552	1629	399	264	381	438	723	453	309	681	624	267	312	537	291	10884
HBO	408	243	237	279	309	603	261	231	327	156	186	318	513	399	252	189	339	534	135	309	321	291	6528
SUM	3404	3039	1479	2139	2373	3546	3711	4596	5439	3120	2643	3180	3654	3585	2514	2370	3120	3288	1029	2403	2679	2643	63735

Table 2. Rate of trip attraction/purpose

Trip purpose	HBW	HBED	HBO	NHB	SUM
Rate / total trips	42%	37.2%	14.8%	6%	100%

Table 3. Trip Attraction for 2020

Trip Attraction	Zone No																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Sum
Attraction	19412	8398	7046	3758	21479	5396	2359	2454	2930	1066	822	5396	4205	3513	11019	1846	1263	716	2096	2321	2995	4459	114949
HBW 42%	8153	3527	2959	1578	9021	2266	991	1031	1231	448	345	2266	1766	1475	4628	775	530	300	880	975	1258	1873	8153
HBED 37.2%	7221	3124	2621	1398	7990	2007	878	913	1090	397	306	2007	1564	1307	4099	687	470	266	780	863	1114	1659	42761
HBSH 14.8%	2873	1243	1043	556	3179	799	349	363	434	158	122	799	622	520	1631	273	187	106	310	344	443	660	17012
HBO 6%	1165	504	423	225	1289	324	142	147	176	64	49	324	252	211	661	111	76	43	126	139	180	268	6897

Otherwise, trip attraction, it is a typical practice to utilize total models as linear regression conditions [15] for trip attractions. The dependent variable for these total models is trip attraction. While, the independent variables and according to Figure 5, the trip work had been got the largest use, therefor the study adopted just the employment variable for the building attraction model which represent zonal total values. But it is recommended to expand the model attraction by adopting other variables (e.g. educational and recreation) for reaching more accuracy outcomes. Thus, the study reached for relation at Eq. (3) below:

$$Aj = 1.689Ej + 586 \qquad (3)$$

where, Aj is the trip attraction for zone j and Ej is the zonal employment j.

The correlation coefficient of the model achieved 80%, and the rate of trip per No. of trips purpose it's going to excreted results as shown in Table 2.

The rate above at Table 2 will be duplicated for all zones to obtain the trip attraction within the city for the base year. Table 3 reveals the estimation of a trip attraction of Nassiriyah city for the base year of 2020.

The number of the trips generated between all of the zones of origin i and all of the zones of destination j should be equal to the total end of trip generated in the zone of origin for any destination zone, similar declarations can be mad. These are recognized as the constraints on flow conservation are given as follows:

$$\sum_{j=1}^{n} Tij = Oi \qquad (4)$$

$$\sum_{i=1}^{n} Tij = Dj \qquad (5)$$

Based on Eq. (1) will be obtained:

$$\sum_{j=1}^{n} (Ki\, Lj\,.\, Oi.\, Dj\, f(dij)) = Oi \qquad (6)$$

$$\sum_{i=1}^{n} (Ki\, Lj\,.\, Oi.\, Dj\, f(dij)) = Dj \qquad (7)$$

By arranging the equations above obtained the following equations:

$$Lj\, Dj \sum_{j=1}^{n} (Ki\,.\, Oi\, f(dij)) = Dj \qquad (8)$$

$$Ki\, Oi \sum_{j=1}^{n} (Lj\,.\, Dj\, f(dij)) = Oi \qquad (9)$$

Finally, the study is reaching to two equations as bellow:

$$Ki = \frac{1}{\sum_{j=1}^{n}(Lj\,.Dj\, f(dij))} \qquad (10)$$

$$Lj = \frac{1}{\sum_{i=1}^{n}(Ki.\, Oi\, f(dij))} \qquad (11)$$

Another step, the impedance function takes different formulas of functions [13], so for investigate the study very

important step is calculating Impedance function. As the literature, the impedance function takes different formulas of functions [13], so for investigate the study distance had been using the following Equation as an impedance function. The impedance function takes different formulas of functions [13], so for investigate the study distance had been using the following Equation as an impedance function.

$$f(dij) = (di - j)^m \times e^{-x \cdot dij} \qquad (12)$$

where:

di-j = distance between zone i and j, x, m = constant

The matrix of distance had been estimated depending on a plan of the Nassiriyah city on scale (1: 100000). At this stage, program used to distribute the trips on zones inside and at outside of the city, upon on Gravity Model and for calculating all variables which show in steps (a, b and c). While the constant (x, m) found by two stages, one supposes limit values for (m, x) as illustrate in bellow formula:

$$f(di - j) = di - j^{1.6} \times e^{-0.78 \, di-j} \qquad (13)$$

By substituting the value of (d) from the distance matrix to find the constant (Ki, Lj) so suppose K1=1 and using Eq. (11) will obtain a value of the parameter of Lj. Then entering this value in Equation 10 for reaches to a new value of Ki. Thus, the iterative process continues until the values of Ki Thus, the iterative process continues until the values of Ki, Lj converge of the next iterative process, thus obtaining the values of (Ki, Lj), at last going to calculate trip distribution matrix (Ti-j) and compare it with the observed trip matrix for a base year that's lead to estimate the ratio of error as follows:

$$R. Error = \Sigma i \Sigma j \, \frac{Ti - j. \, T\hat{\ } i - j}{Ti - j} \qquad (14)$$

where, $T\hat{\ } i - j$ is the calculating value and $Ti - j$ is the observed value.

At comparative the ratio of error in the formula above with the opposite values that lead to determining the need to change the constant value (m, x) at impedance function. The value of m and x at range (1.8-2.5) and (0.5-0.75) respectively, these steps represent the second stage in the correction. The dependability of model investigation at estimates the constant value in the model as (Ki, Lj, m, x) according to permitted data for the base year. When comparing with observation value, can select the model for future prediction.

At Stage 2, The study used Fratar's method for distributing the trips. It is one of Growth factored methods, the advantage of this method, its take all growth factors for different areas at distribution trips. The study used the Eq. (2) as mention earlier in section 3. The model involved many periods to reach for a matrix, which the different at its been convergence in value of trips that attracted to all zones at the base year with the value of trip attraction at the target year. The growth factor has been determining as greater than 1 and less than 1.2.

The outcomes of trip distribution models are usually calibrated by contrast between O-D trips observed verses O-D trips modelled so, the findings indicate that in most volume groups up to 4000 trips with the gravity model, the Fratar system forecasts compare best with the O-D assignments as illustrated in Figure 6.

Figure 6 shows a linear relationship. It is showing the slopes and R2 for each model. Thus, it shows that Frater's method

was accurate for the base year of the study area according to the value of the coefficient of determination was 0.977, it is representing a high value to explain the strength between the observed and modelled trips. While the Gravity model among the zones did not give accurate results here the coefficient of determination was 0.2012.
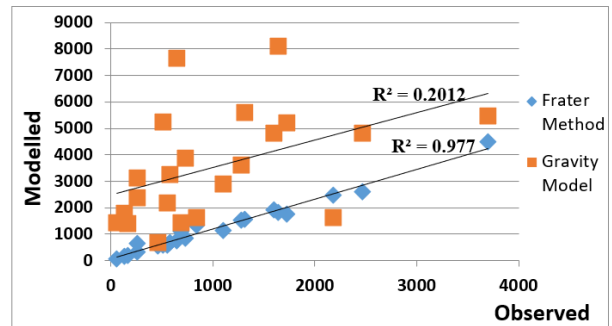

Figure 6. Calibration of models

4. STATSTICAL ANALYSIS FOR EVALUATION TRIP DISTRBUTION MODELS

As mention in section 3. The outcomes of trip distribution models are usually calculated by the contrast between modelled O-D trips and observed ones. More precisely, this paper will analyze the effects of the calibrated models using three parameters, as follows [16]:

1- The root means square error percentage (RMSE percentage), a metric for the average of individual O-D pairs, can be determined as follows:

$$\%RMSE = \frac{RMSE}{t-} \times 100 \qquad (15)$$

where, $RMSE = \sqrt{\frac{\Sigma_{ij} \, tij - Tij}{X}}$, $t- = \frac{\Sigma_{ij}(tij)}{X}$, tij is observed trips between zone i and zone j, Tij is estimated trips between zone i and zone j and X is number of observed non-zero O-D pairs.

2- Percentage of mean absolute change per trip (%MADPT) that can be calculated as follow:

$$\%MADPT = \frac{\Sigma_{ij} \, |tij + Tij|}{\Sigma_{ij} \, tij} \times 100 \qquad (16)$$

3- Mean absolute change per cell (MADPC) that can be calculated as follows:

$$\%MADPC = \frac{\Sigma_{ij} \, |tij + Tij|}{n} \times 100 \qquad (17)$$

So, the three parameters above gave the result as a Table 4 bellow:

Table 4. Statically result of Fratar and Gravity mode

Model	Parameters		
	RMSE%	MADPT %	MADPC%
Gravity	276	69	155
Fratar	161	24	70

Table 5. Modelled trip matrix for the base year 2020

| Zone No	Destination 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	sum
1	846	134	134	150	22	20	76	57	547	113	143	466	39	20	47	18	33	320	655	31	326	480	4607
2	688	90	90	69	26	14	31	59	300	37	128	111	141	25	95	46	31	276	446	46	220	479	3458
3	1275	86	86	64	31	21	33	72	235	43	131	96	24	29	44	417	59	131	589	224	1506	443	5638
4	1600	131	131	74	55	39	34	56	1015	46	300	70	17	17	39	85	77	280	2248	2900	667	1004	10814
5	1729	128	128	173	29	24	31	46	317	33	187	224	9	11	20	207	20	373	726	243	1357	261	6200
6	1636	85	85	147	24	13	38	96	781	57	122	113	16	9	27	278	43	1470	1338	72	131	410	7077
7	2185	87	87	70	21	16	29	57	967	68	56	345	22	27	33	100	1431	78	1140	52	85	672	7610
8	261	86	86	44	26	9	20	17	130	122	60	134	21	20	20	497	564	68	740	40	39	98	3101
9	559	56	56	52	31	11	25	29	503	65	68	91	31	74	1654	143	59	113	744	20	329	512	5160
10	261	38	38	29	16	13	16	17	134	115	24	72	43	711	56	60	18	44	540	26	55	122	2405
Origin 11	131	64	64	48	26	11	18	35	116	116	29	121	367	43	30	135	26	59	261	24	40	74	1773
12	1307	147	147	117	12	17	27	59	837	141	81	1654	16	17	46	102	27	108	880	60	173	421	6306
13	649	116	116	85	27	22	34	53	1129	86	419	134	13	29	99	143	38	450	774	261	306	742	5656
14	3697	89	89	60	47	11	22	35	663	246	43	341	21	30	57	134	44	74	726	56	74	930	7474
15	2468	113	113	37	22	21	42	59	2731	122	73	61	9	8	31	46	20	146	531	30	555	551	7829
16	728	83	83	89	29	17	64	982	190	99	42	55	21	35	29	69	47	186	551	16	254	215	3873
17	576	40	40	26	25	29	507	46	134	147	103	100	14	24	30	74	31	42	711	46	172	325	3261
18	169	26	26	31	39	447	21	24	118	60	24	57	7	7	27	42	24	37	76	20	94	76	1420
19	456	43	43	57	2341	26	40	43	313	137	68	86	11	13	18	59	21	56	442	47	115	245	4661
20	55	17	17	885	14	13	13	30	94	27	24	42	8	7	4	5	8	56	57	39	21	39	1451
21	516	2152	2152	46	56	26	70	61	453	363	98	276	11	16	35	65	29	85	563	5	55	170	4044
22	1097	113	113	37	57	33	43	60	450	161	61	204	22	26	29	99	42	221	840	42	245	332	3463
sum	22862	38943	8942	3602	9478	2212	0419	6212	1302	3732	2252	4822	852	1166	2440	2794	2661	4642	1554	767	326	8545	107282
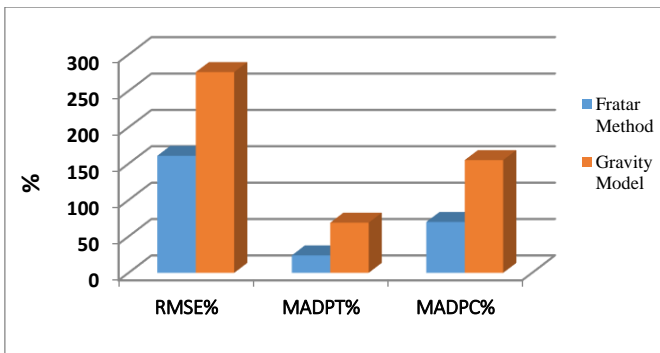
Figure 7. Statical result for Fratar and Gravity model

Table 4 shows the values for the various model formulations of the above-mentioned error measures. The graphical presentation of these outcomes is shown in Figure 7. It can be noticed that the best trip distribution model is the Fratar, based on Table 4 and Figure 7. With a significant relative variance, the Fratar Approach showed the lowest values of the three error steps. The percent RMSE of gravity forms improved by Fratar by about 39 percent with respect to the percent MADPT value, the improvement was about 61 compared to the gravity model.

Accordingly, a trip distribution matrix was built based on the results of the Fratar method, as shown in Table 5.

5. RESULTS AND DISCUSSION

(1) First of all, the process of data collection and survey conducting for each zone needs a long time and cost with large stresses. Hence it must be planned before starting, as well as it's required an institution work. Data that obtained wasn't an accuracy but, it gave acceptable information.

(2) To outline the main point of modelling trip distribution, it is depending on building trip generation model which represent a firstly studying that had been conducted in all Nasiriyah city take on the household characteristics. The model of attraction that used in modelling had been represented by the relationship between the number of trips and number of employees (Ej) at the same zone represented by Eq. (3). The model is a simplified the purpose of study, as well as it gives a good result. But recommend to inter other variables for this equation such as educational and recreation. The model attraction can use for redistribution of employment on the zones of the city for secure balance between zones to reduce traffic volume on the Central Business District network (CBD).

(3) For the modelling trip distribution, Model of Fratar proved its possibility of using it in forecasting for Al Nasiriyah city, because this method is successfully used for a homogenous growth areas. As well as in updating the data of the survey of the origin and destination of trips that collected recently, although this method does not care for rapid growth patterns. The Fratar's method has been used, it gave satisfactory results.

(4) Gravity model did not investigate a real result because Nassiriyah city is a medium-sized so as the city is not experiencing rapid changes, as well as the distances between its sectors, do not constitute an obstacle for any trip.

(5) For the gravity model, the best calibrated friction factor functions are as follows:

$$f(di-j) = di-j^{1.6} \times e^{-0.78\,di-j}$$

(6) The developing Matrix of trip distribution can be adopted for enhancing transportation network.

Finally, the study recommended:

(1) Adopt future academic studies interested with trip distribution according to its purpose take into the model split and traffic assignment to suggest the alternative for a quote strategy of the transportation system.

(2) The issue of outing conveyance is non-direct nature therefore the study recommends to use Neural Networks (NN) is appropriate for tending to the non-direct issues.

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