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Short Term Load Forecasting Algorithm for Lunar New Year's Day

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Abstract – Short term load forecasts complexly affected by socioeconomic factors and weather variables have non-linear characteristics. Thus far, researchers have improved load forecast technologies through diverse techniques such as artificial neural networks, fuzzy theories, and statistical methods in order to enhance the accuracy of load forecasts. Short term load forecast errors for special days are relatively much higher than that of weekdays. The errors are mainly caused by the irregularity of social activities and insufficient similar past data required for constructing load forecast models. In this study, the load characteristics of Lunar New Year's Day holidays well known for the highest error occurrence holiday period are analyzed to propose a load forecast technique for Lunar New Year's Day holidays. To solve the insufficient input data problem, the similarity of the load patterns of past Lunar New Year's Day holidays having similar patterns was judged by Euclid distance. Lunar New Year's Day holidays periods for 2011-2012 were forecasted by the proposed method which shows that the proposed algorithm yields better results than the comprehensive analysis method or the knowledge-based method.

Keywords: Short-term load forecasting, Lunar new year's day, Load characteristics, Load patterns

1. Introduction

Accurate short term load forecast is essential for the operation of electric power systems. After experiencing the increased load uncertainty following unusual temperature phenomena and the circulatory blackouts of South Korea on September 15, 2011, attention to long and short term load forecasts has been high. In particular, larger load forecast errors occur for special days and days before and after special days because past data are insufficient and uncertainty is higher for these days unlike normal days. Accurate and reliable load forecasts for special days and days before and after special days are attracting great attention for the stable power system operation. To improve the accuracy of load forecasts for special days, a method to forecast special days' loads by applying fuzzy least square regression analysis algorithms was presented [1] and a study on the forecasting of short term loads using neural networks and fuzzy forecast techniques [2] and a study on the forecasting of loads on special days using Neural & Fuzzy networks [3] were conducted. In addition, other studies have been conducted for accurate special day load forecasting through diverse techniques such as Support Vector Machine based cities' special day loads forecasting methods [4] and special day loads forecasting techniques using Quick Propagation Neural Networks [5].

Among special days, Lunar New Year's Day and the Korean Thanksgiving Day are determined by the lunar calendar unlike general special days and thus it is difficult to reflect weather characteristics for these days. Industry operating rates, leisure activities and the number of the travelling public vary according to these holidays' characteristics and load characteristics on days before and after these holidays are much different from those on average days of the week. Therefore, exclusive characteristics analyses for Lunar New Year's Day and the Korean Thanksgiving Day are necessary. This study analyzes the Lunar New Year's Day load pattern characteristics and presents a load forecast algorithm using fuzzy linear regression models considering the characteristics of the pattern.

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2. Lunar New Year's Day Holidays' Load Characteristics

Lunar New Year's Day is a representative festive day of Korea along with the Korean Thanksgiving Day and refers to January 1 on the lunar calendar. Since the expansion of Lunar New Year's Day holidays into three days in 1989, loads during the three Lunar New Year's Day holidays and days before and after the holidays have appeared quite irregular. Since Lunar New Year's Day is determined by the lunar calendar, it falls on different days of the week and dates every year. In previous studies, load patterns of Lunar New Year's Days were analyzed by day of the week in order to find load characteristics during Lunar New Year's Day holidays. According to the results, 24 hour load patterns before and after a Lunar New Year's Day were generally the same although there were some differences

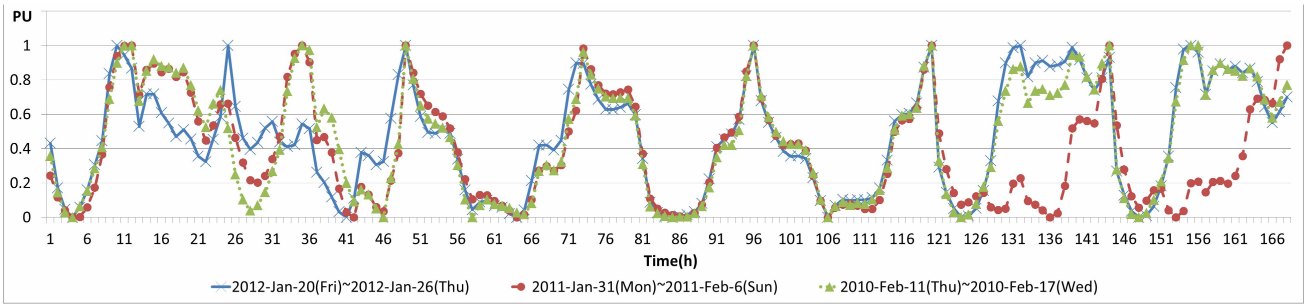

Fig. 1. Normalized load demand comparison graph

depending on the use of room heating loads according to temperatures [6]. It can be seen that low loads were shown in the afternoon which is general activity time and loads rapidly increased from late afternoon to nighttime because of low temperatures. In this study, in order to find the characteristics of the Lunar New Year's Day holiday periods and select fuzzy input data for fuzzy linear regression analysis methods, loads for seven days from D-3 to D+3 of Lunar New Year's Days were analyzed. Fig. 1 shows load graphs for seven days including Lunar New Year's Day holidays from 2010 to 2012.

Among Lunar New Year's Day holiday periods from 2010 to 2012, Lunar New Year's Days (D) and D±1 days have almost the same patterns. However, D±3 and D±2 days show different characteristics depending on days of the week although they are affected by holidays. If the characteristics of D±3 and D±2 days are not appropriately reflected on load forecasts for Lunar New Year's Day holidays, it will act as a major load forecast error factor. D-3 days show the characteristics of general loads regardless of whether they are weekdays or weekends.

Based on the foregoing analysis results, data selection methods of the load forecast algorithm will be presented in the next section.

3. Lunar New Year's Day holidays' Load Forecast Algorithm

The characteristics of Lunar New Year's Day holidays' load profiles show non-linearity and uncertainty. Fuzzy linear regression analysis models are applied to short term load forecasts for these special days [7].

The fuzzy linear regression model is expressed as the following.

$$Y_i = A_0 \oplus (A_1 \otimes X_i) \tag{1}$$

where, Y_i, X_i, A_0, and A_1 are fuzzy number and $\oplus$ is fuzzy number addition and $\otimes$ is fuzzy number multiplication.

In the model of fuzzy linear regression (1), A_0 (denoted by (a_0, α_0)) and A_1 (denoted by (a_1, α_1)) are a symmetric triangular fuzzy number where a_i is the center of A_i and α_i is the spread of A_i. The center and the spread of the symmetric triangular fuzzy numbers, X_i and Y_i, are (x_i, γ_i) and (y_i, e_i) where x_i and y_i are the average, and γ_i and e_i are the standard deviation. Throughout this paper, for simplicity, it is assumed that coefficients and variables are symmetric fuzzy numbers. $A_0:(a_0, \alpha_0)$ and $A_1:(a_1, \alpha_1)$ are estimated using given $X_i:(x_i, \gamma_i)$ and $Y_i:(y_i, e_i)$. As the result of fuzzy linear regression analysis for fuzzy input-output data using shape preserving operations [8], an LP based method can find the fuzzy linear regression model solving the following mixed LP problem [7]:

$$\begin{aligned} \mathit{Minimize} \qquad & J(a, \alpha) \\ = \ & Max(\alpha_0, |a_1|\gamma_1, \alpha_1|x_1|) \\ + \ & Max(\alpha_0, |a_1|\gamma_2, \alpha_1|x_2|) \\ & \vdots \\ + \ & Max(\alpha_0, |a_1|\gamma_i, \alpha_1|x_i|) \end{aligned} \tag{2}$$

subject to

$$\begin{aligned} |y_1 - (a_0 + a_1 x_1)| &\le \frac{1}{2} Max(\alpha_0, |a_1|\gamma_1, \alpha_1|x_1|) - \frac{1}{2} e_1, \\ |y_2 - (a_0 + a_1 x_2)| &\le \frac{1}{2} Max(\alpha_0, |a_1|\gamma_2, \alpha_1|x_2|) - \frac{1}{2} e_2, \\ &\vdots \\ |y_i - (a_0 + a_1 x_i)| &\le \frac{1}{2} Max(\alpha_0, |a_1|\gamma_i, \alpha_1|x_i|) - \frac{1}{2} e_i, \\ a_0, \alpha_1 &\ge 0. \end{aligned}$$

In this paper, the input data consist of the daily peak loads of the past three years and i of (2) is 3. Table 1 provides samples of the symmetric triangular fuzzy numbers, X_i and Y_i.

Table 1. Fuzzy input data

	X_i (x_i, γ_i)	Y_i (y_i, e_i)
1	(x_1, γ_1)	(y_1, e_1)
2	(x_2, γ_2)	(y_2, e_2)
3	(x_3, γ_3)	(y_3, e_3)

$X_i:(x_i,\gamma_i)$ is made up by the average and the standard deviation of the daily peak loads for the previous four days of the holiday. Let the daily peak loads for the previous four days of the holiday be m_1, m_2, m_3 and m_4. M is the biggest load among the four values of the daily peak loads and the normalized average of the daily peak loads for the previous four days of the holiday is defined as the followings [7]:

$$x_i = \frac{m_1+m_2+m_3+m_4}{4M} \tag{3}$$

And the standard deviation of the daily peak loads for the previous four days of holiday is defined as the followings:

$$e_i = \sqrt{\frac{\left(\frac{m_1}{M}-x_i\right)^2+\left(\frac{m_2}{M}-x_i\right)^2+\cdots+\left(\frac{m_4}{M}-x_i\right)^2}{4}} \tag{4}$$

$Y_i:(y_i,e_i)$ contains the information of the holiday which represents the average and the standard deviation of the daily peak loads on the holiday. If m_1, m_2, m_3 and m_4 are the daily peak loads for the previous four weekdays of the holiday, then m_5 can be represented by the daily peak load of the holiday as the followings:

$$y_i = \frac{m_5}{M} \tag{5}$$

The final formula to obtain the 24 hour loads on the forecast day using the maximum load, minimum load, and PU_t, the normalized value of the hourly load on the forecast day is as follows.

$$Y_{4,t} = \left(Y_{4,\max} - Y_{4,\min}\right) \times PU_t + Y_{4,\min} \tag{6}$$

where, $Y_{4,t}$ represents the hourly loads on the forecast day, $Y_{4,\max}$ represents the maximum load on the forecast day, $Y_{4,\min}$ represents the minimum load on the forecast day and PU_t is the normalized value of the hourly load on the forecast day.

Loads can be represented by orthogonal coordinates for time and actual electricity consumption. To compare data for different days of the week, electricity consumption during each hour can be measured to compare overall patterns for 24 hours and similarity can be judged based on the results. Electricity consumptions during two days of the week will be appeared as two points for the same time slot and these two points will have their own coordinates. If the distance between two points at the same time slot is short, the similarity between the two points can be said to be high. A general method to obtain the distance between two coordinates in an orthogonal coordinate system is Euclid distance. Euclid distance is distance between two points appearing in an orthogonal coordinate system and it is defined by the following formula [9].

$$\begin{aligned} d(p,q) &= \sqrt{(p_1\cdot q_1)^2+(p_2\cdot q_2)^2+\cdots+(p_n\cdot q_n)^2} \\ &= \sqrt{\sum_{i=1}^{n}(p_i\cdot q_i)^2} \end{aligned} \tag{7}$$

where, i represents hour, p and q represent the normalized load values of hour i of the two days of the week to be compared. Since load levels vary year by year, they are compared through normalized values. The Euclid distance through the above formula indicates the sum of distance for entire 24 hours; average distances per hour are used for general judgments. The final formula for judging similarity between load profiles is as follows.

$$S = \sqrt{\sum_{i=1}^{24}(p_i-q_i)^2 \div 24} \tag{8}$$

where, S becomes to have a value between 0 and 1 and lower values mean higher similarity. Fig. 2 shows patterns of three the same day of the week. Similarities S for P1, P2, and P3 are as shown in Table 2.

P1-P3 shows the lowest similarity which is lower than 0.1. P1-P2, and P2-P3 show the similarity between 0.42 and 0.36 respectively. The fact that they are not so similar pattern can be easily seen visually too. Using this technique, days with high similarities were analyzed through comparison between normalized patterns for periods from D-3 to D+3 of the Lunar New Year's Day and past patterns.

Although the D±2 day of Lunar New Year's Day is not a holiday, this day shows load characteristics different from those of ordinary days due to the effects of Lunar New Year's Day holidays. Thus if load forecast methods for

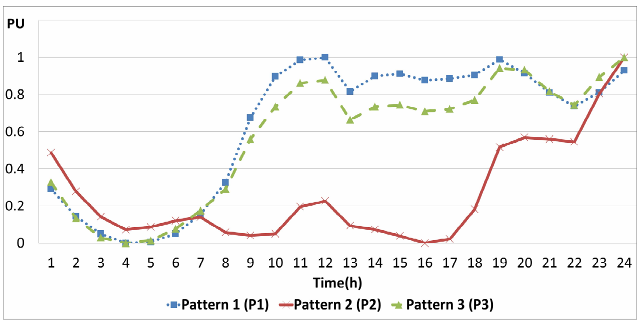

Fig. 2. Example graph for explanatory of similarity

Table 2. Similarity between patterns

Patterns for comparison	Similarity (S)
P1 – P2	0.4248
P1 – P3	0.0774
P2 – P3	0.3610

general ordinary days are used, larger errors may occur. In previous studies, when D±2 days were weekdays, three years in which the D±2 day of Lunar New Year's Day fell under weekdays were selected to estimate load patterns through normalized averages. However, when D±2 days were weekends, old past data had to be used to the same method because recent data were insufficient and thus larger errors occurred. In order to solve this problem, when the D-2 and the D+2 of the New Year's Day are the Sunday, the pattern is predicted with the data of 3 weeks on the previous Sunday. In this case, similar characteristics are exhibited on the same holiday, and the accuracy of normalized pattern prediction is improved and the problem of data shortage is solved.

3.1 Input data selection

Since Lunar New Year's Day holiday period shows a special light-load period and has unique patterns by day, forecast algorithms suitable for the patterns should be used. Load patterns during Lunar New Year's Day holiday periods are similar between years and loads on weekdays during the previous week of Lunar New Year's Day are reflected on maximum loads and minimum loads during Lunar New Year's Day holiday periods. Therefore, normalized patterns are made using patterns on past Lunar New Year's Days and maximum loads and minimum loads for loads during three weekdays immediately before the Lunar New Year's Day are reflected on the normalized patterns to complete 24 hour load forecasts for the Lunar New Year's Day.

To select fuzzy load forecast input data for Lunar New Year's Day holiday periods, the days of the week of past Lunar New Year's Day holiday periods were divided into seven cases and yearly Lunar New Year's Days were classified based on these cases.

Table 3. Classification of New Year's seasons by day-type

	D-3	D-2	D-1	D	D+1	D+2	D+3
Case1	Sat	Sun	Mon	Tue	Wed	Thu	Fri
Case2	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Case3	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Case4	Tue	Wed	Thu	Fri	Sat	Sun	Mon
Case5	Wed	Thu	Fri	Sat	Sun	Mon	Tue
Case6	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Case7	Fri	Sat	Sun	Mon	Tue	Wed	Thu

Table 4. Lunar New Year's Days sort by cases

	Upcoming Lunar New Year's Day	Previous Lunar New Year's Day	
Case1	2019	2002	2016
Case2	2025	2005	2001
Case3	2028	2011	2015
Case4	2018	1991	2014
Case5	2020	2003	2017
Case6	2023	2010	2013
Case7	2033	2012	2009

Past Lunar New Year's Day holidays by days of the week were examined as shown in Table 3. Then, upcoming Lunar New Year's Days were sorted in Table 4 according to the case in Table 3. As can be seen through these results too, data on Lunar New Year's Days which are the same days of the week are quite insufficient. Therefore, it can be seen that, to solve this problem, analyzing consistent characteristics of days of the week is important.

To solve this problem related with data insufficiency, data having similar load patterns to those of special days were studied through past data analyses.

Fig. 3 shows load patterns on the D-2 day of a Lunar New Year's Day and the Saturday immediately before a New Year's Day. It can be identified that the two days have similar patterns except for patterns during 02:00-12:00. In this case, Lunar New Year's Day and New Year's Day have a similar pattern because of both are Monday in a winter season, and there is a three-day holiday because D-2 was Saturday. The D-2 day of the 2012 Lunar New Year's Day and the D-2 day of the 2009 Lunar New Year's Day that are the same day of the week also showed similar patterns. Therefore, to forecast load patterns of the D-2 day on Saturday, the most recent the D-2 data of past New Year's Day and past Lunar New Year's Day when D-2 was Saturday is selected to estimate the normalized pattern for the forecast day in order to improve accuracy.

Fig. 4 shows graphs for a D-2 day which is Sunday and three Sundays before the D-2 day. In this case, the fact that the D-2 day showed patterns similar to those of three Sundays before the D-2 day could be identified through data analyses. The effects of Sunday were dominant and thus the characteristics of Sunday appeared on the D-2 day with little effects of Lunar New Year's Day holidays.

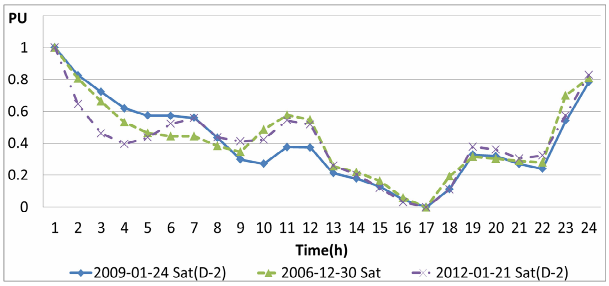

Fig. 3. Comparison between D-2(Sat) and other Saturday

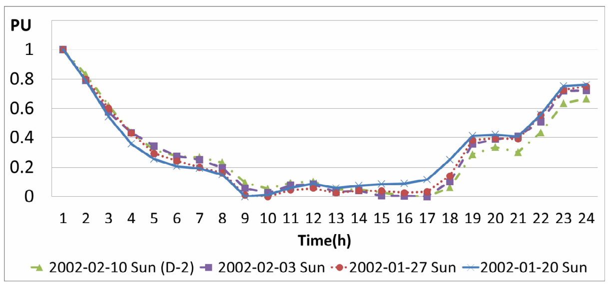

Fig. 4. Comparison between D-2(Sun) and former Sunday

Therefore, when the D-2 day is Sunday, patterns on three Sundays before the forecast day are used to obtain data on patterns in order to improve the accuracy of forecasts.

When the D+2 day is Saturday, load change rates on the D+2 day of Lunar New Year's Day in the forecast year and the same day of the week in the previous year are used to directly forecast loads on the D+2 day. A formula for load change rates on the D+2 day is as follows.

$$\Delta V_t^i = \frac{MW_t^{i(D+2)'} - MW_t^{iD'}}{MW_t^{iD'}} \tag{9}$$

where, ΔV_t^i represents the 24 hour load change rate on Lunar New Year's Day of the ith past year that has Lunar New Year's Day on the same day of the week and the D+2 day of Lunar New Year's Day, $MW_t^{i(D+2)'}$ represents the actual 24 hour loads on the D+2 day in the i^{th} year, and $MW_t^{iD'}$ represents the actual 24 hour loads on Lunar New Year's Day in the i^{th} year. Therefore, the final formula for forecasting the 24 hour loads on the D+2 day in cases where the D+2 day in the forecast year is Saturday is as follows.

$$Y_t^{D+2} = (\Delta V_t^i \times MW_t^D) + MW_t^D \tag{10}$$

Where, Y_t^{D+2} represents the forecasted load on the D+2 day in the forecast year, ΔV_t^i represents the 24 hour load change rate, and MW_t^D represents the actual load per hour on Lunar New Year's Day in the forecast year. The load forecast techniques for general weekdays and weekends for the D-3 day since the D-3 day does not show special patterns. The normalized load demand pattern for D+3 days is as follows. It can be seen that load patterns on D+3 days in 2010 and 2012 are quite similar. However, as shown in Fig. 5, it is shown that average patterns on D+3 days are not the same as those on other weekdays despite that the D+3 days are weekdays.

Since the average pattern of D+3 days is not the same as the patterns of other weekdays, we use the load pattern of D+2 days and the load pattern of weekdays of previous three years D+3 days to predict the load pattern of weekdays of D+3 days.

The load forecasting algorithm, the normalized pattern of the hourly load and selecting input data are summarized for the forecast day during Lunar New Year's Day holiday period.

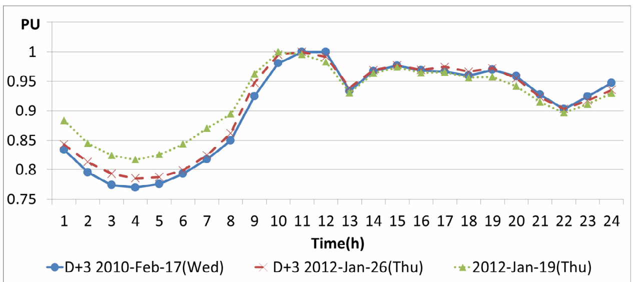

Fig. 5. Load demand patterns of D+3 in 2010 and 2012

The cases of the load forecasting for Lunar New Year's Day holidays

Fuzzy linear regression analysis models are applied to short term load forecasts for Lunar New Year's Day and D±1 days. The normalized patterns of the 24 hourly loads for Lunar New Year's Day holidays are made using the average of patterns on the past three years for Lunar New Year's Day holidays. Selecting input data for the forecasting algorithm are previous 3 year's actual loads for the forecast day, previous 3 year's actual loads for each previous week of the forecast day and actual loads of previous weekday of the forecast day. In these cases, day-type of the forecast day is not considered.

The cases of the load forecasting for the D±2 day of Lunar New Year's Day

Fuzzy linear regression analysis models are applied to short term load forecasts for the D±2 day on weekdays of Lunar New Year's Day. The normalized pattern of the 24 hourly loads for the D±2 day on weekdays of Lunar New Year's Day are made using loads of previous 3 year's D±2 days on weekday of a Lunar New Year's Day. Selecting input data for the forecasting algorithm are previous 3 year's actual loads for the D±2 day on weekdays, previous 3 year's actual loads for each previous week of the D±2 day on weekdays and actual loads of previous weekday of the forecast day.

For the D±2 day on Sunday, the normalized pattern of the 24 hourly loads are made using loads of recent previous 3 week's Sunday of the forecast day. Fuzzy linear regression model is applied to short term load forecasting for the D±2 day on Sunday. Selecting input data for the forecasting algorithm are actual loads of previous 3 week's Sunday for the D±2 day on Sunday, actual loads of previous 3 weekdays for the D±2 day on weekdays and actual loads of previous weekdays of the forecast day.

For the D-2 day on Saturday, fuzzy linear regression analysis models for Sunday is applied to short term load forecasts. For the D-2 day on Saturday, the normalized pattern of the 24 hourly loads are made using the recent pattern for the normalized pattern of the same day-type of the D-2 day or the normalized pattern of the previous Saturday loads of New Year's Day on Monday. Selecting input data for the forecasting algorithm are the same as ones for the D±2 day on Sunday. For the D+2 day on Saturday, load forecasting is performed using Eq. (10). The normalized pattern is not required because of using Eq. (10). Selecting input data for the forecasting algorithm are actual loads of Lunar New Year' Day and previous 2 or 3 year's the 24 hour load change rates between the same day-type Lunar New Year's Day and the D+2 day.

The cases of the load forecasting for the D±3 day of Lunar New Year's Day

General short term load forecasting models [11, 12] can be applied to short term load forecasts for the D-3 day of Lunar New Year's Day. Load characteristics of those days are normal on weekdays, Saturday and Sunday.

For the D+3 day on weekday and Sunday of Lunar New Years, peak load of the D+3 day can be forecasted using general short term load forecasting models. However, minimum load of the D+3 day on weekday and Sunday of Lunar New Years can be forecasted by taking average of minimum load of the D+2 day and forecasted minimum load of the D+4 day. For the D+3 day on weekday of Lunar New Year's Day, the normalized pattern of the 24 hourly loads is made using loads of previous 3 year's D+3 days on weekday of Lunar New Year's Day. Selecting input data for the forecasting algorithm are actual maximum loads of previous 3 weekdays of Lunar New Year' Day, minimum load of the D+2 day and forecasted minimum load of the D+4 day.

For the D+3 day on Sunday of Lunar New Year's Day, the normalized pattern of the 24 hourly loads is made using load pattern of the forecasted 24 hourly D+2 day of Lunar New Year's Day. Selecting input data for the forecasting algorithm are actual maximum loads of previous 3 weekdays and Sunday of Lunar New Year' Day, minimum load of the D+2 day and forecasted minimum load of the D+4 day. General short term load forecasting models for weekends [12] can be applied to short term load forecasts the D+3 on Saturday of Lunar New Year's Day.

4. Case Study

To verify the proposed method and identify resultant improvement, loads from January 20 to 26 of 2012 and from January 31 to February 6 of 2011 were forecasted by the existing methods and the proposed method. The existing methods are the comprehensive analysis method and the knowledge-based method. The comprehensive analysis method performs load forecasts by using trend model and temperature sensitivity as follows:

$$F_D = B_D + [B_D \times (TF_D - T_D) \times T_{Bians}] \tag{11}$$

where, F_D : forecast value, B_D : base load calculated by trend model, TF_D : temperature forecast, T_D : weighted average temperature, T_{Bians} : temperature sensitivity.

The knowledge-based method is a sort of expert systems having the rule base database and the Fuzzy inference engine [10]. The comparison results are as shown in Table 5.

The average error rates of loads during Lunar New Year's Day holidays obtained through the comprehensive analysis method were shown to be relatively high at 10.2% in 2011 and 9.64% in 2012 while those obtained through the knowledge-based method were shown to be relatively lower at 7.59% in 2011 and 4.68% in 2012. The load forecast results during Lunar New Year's Day holidays obtained through the proposed method were improved by 5.01% on average for 2011 and 6% on average for 2012 when compared to those obtained through the comprehensive analysis method and by 2.4% on average for 2011 and 1.02% on average for 2012 when compared to those obtained through the knowledge-based method.

Therefore, it can be seen that the proposed method showed considerably higher accuracy than the comprehensive analysis method or the knowledge-based method. Since the phenomenon that forecast errors become larger when poor past data are used could be relieved through the proposed algorithm, it could be identified that the forecast results for Lunar New Year's Day holiday periods that had large errors were improved.

Table 5. Comparison between the existing methods and the proposed method

Date	Note	The comprehensive analysis method		The knowledge-based method		The proposed method	
		Max Error[%]	MAPE[%]	Max Error[%]	MAPE[%]	Max Error[%]	MAPE[%]
2011-01-31(Mon)	D-3	16.27	14.69	3.79	2.17	5.5	3.12
2011-02-01 (Tue)	D-2	14.60	11.44	10.46	5.86	7.13	3.42
2011-02-02 (Wed)	D-1	13.91	11.52	15.10	10.83	7.4	5.03
2011-02-03 (Thu)	D-Day	13.04	11.19	14.99	13.35	8.19	5.16
2011-02-04 (Fri)	D+1	13.67	11.09	10.67	8.39	8.83	7.04
2011-02-05 (Sat)	D+2	9.78	4.82	14.98	8.18	9.15	6.61
2011-02-06 (Sun)	D+3	15.57	6.64	11.91	4.37	8.81	5.93
2011 MAPE		13.83	10.20	11.70	7.59	7.86	5.19
2012-01-20 (Fri)	D-3	6.52	2.98	8.42	4.65	9.99	5.22
2012-01-21 (Sat)	D-2	12.92	5.13	7.11	2.92	5.52	2.54
2012-01-22 (Sun)	D-1	10.43	6.25	14.16	9.95	9.01	3.46
2012-01-23(Mon)	D-Day	11.75	9.85	3.42	1.64	6.07	3.01
2012-01-24(Tue)	D+1	13.68	11.68	2.22	0.91	7.47	4.39
2012-01-25(Wed)	D+2	23.03	16.78	15.78	8.75	7.78	4.85
2012-01-26 (Thu)	D+3	21.50	14.82	6.57	3.98	4.72	1.98
2012 MAPE		14.26	9.64	8.24	4.68	7.22	3.64

5. Conclusion

This paper presents a systematic short term load forecast technique for Lunar New Year's Day holiday period for which load forecast errors are large among special days. To solve the problem of insufficient past similar data to Lunar New Year's Day holidays, the similarities of load patterns during past Lunar New Year's Day holidays with similar patterns were judged by Euclid distance. The input data construction method for fuzzy linear regression models and application models for diverse types of days of the week of Lunar New Year's Days and days around the day was systematized and presented. The proposed Lunar New Year's Day load forecast technique greatly improved the accuracy of forecasts for 2011 and 2012 than the comprehensive analysis method and the knowledge-based method. Since Lunar New Year's Day holidays are greatly affected by the curtailment of industrial loads and general loads, systematic studies of forecast techniques considering operation rates of large customers are required.

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