CHAPTER VII

CONCLUSIONS

This research considers the problem of incomplete time-series prediction by imputing large missing rain data, which has two steps: similarity measure and Expectation Maximization (EM). The experimental results confirm that our approach is feasible for this prediction. The results are: 1) for cluster time series, an example of raingauge location of gauge no. 071 and 081, not only the neighboring gauge but also the topography having altitude in feet are 2400 and 2850, respectively are considered, and 2) interpretation of zero value with “no rain” in the process of determination of “missing” or “no rain” condition, a result of the determination as the percentage of “no rain” condition being predicted as negative False is approximately the percentage of 4-8 and the percentage of “missing” condition being predicted as no False, and 3) imputing missing data by comparison the proposed missing data estimation (SM) with the other techniques: expectation maximization (EM) and neural network (NN), measuring correlation of the proposed missing data estimation is better than the other techniques and 4) the lower and upper bounds of effective radar reflectivity threshold is set to 24 and 30 dBZ for gauge no. 071 and 081 which having high correlation coefficient for filling-in the missing of gauge data. One application of determination of “missing” or “no rain” condition prior to data imputation is to classify rainfall type which results in reducing $Z_e - R$ conversion error in radar rainfall estimates and rainfall accumulation. Our research is to develop and to improve the accuracy of the prediction by first determining whether the zero data values are of "missing" or "no rain" condition prior to data imputation and then by imputing the missing data, using two methods, namely, similarity measure and Expectation Maximization (EM) subsequently. These two methods help 1) to correct the problem by classifying the similar patterns of the radar reflectivity and the ground rainfall, and 2) to solve the collocation and synchronization for selecting all relevant data and 3) to achieve the optimum accuracy level of estimating rain intensity from radar reflectivity corresponding to spatial and temporal variability of rainfall intensity. These methods open the door to the great opportunity to achieve even greater progress in the area of rain prediction in the country like Thailand, where agriculture and fishery are the major professions of the royal kingdom. With this advanced innovation, it is expected that many more researches will be replicated for more and more accuracy in rain prediction. It is also hoped that this contribution will give us researchers the awareness on the importance on experimentations of highly sparse data in this field of study.

The problems studied as well as the results proposed in this dissertation are still in the infancy state. Yet, there are other interesting further studies that are listed as follows:

1. In practical application, the situation of predicting rainfall related to seasonal changes should be considered.
2. Analysis of incomplete climate data should be applied for hydrological model.
3. Since the Expectation Maximization (EM) algorithm is a useful tool in statistical estimation problems, iterative algorithm such as Numerical method, Simulated Annealing algorithm can also be used.