Tracking of Thunderstorms through Weather Radar and Lightning Location Data

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Thunderstorms cause damage and economic losses throughout the world. As a local and rapidly changing phenomenon, forecasting of individual thunderstorms is difficult. For instance, conventional numerical weather prediction models are inefficient in this task. Therefore, doing spatially accurate short term prediction, i.e. *nowcasting*, of thunderstorms is important in the current weather forecasting.

Storms can be identified efficiently through spatially and temporally accurate remote sensing instruments, such as weather radar. Therefore, these data sources are frequently applied to the nowcasting of thunderstorms. For a human observer, following the movement and development of individual storms from weather radar images is usually not a difficult task. This, however, is not the case if the task is given to a computer.

A popular computer vision based approach to the nowcasting of thunderstorms is *object tracking*. The aim of the object tracking based nowcasting is to capture the trajectory of a storm, which can be applied to estimate velocity of the storm and consequently its movement.

In addition to the storm motion, the tracking approach is able to capture other essential parameters of individual thunderstorms. As an example, we may automatically estimate how much lightning a storm is producing or how intense it is with respect to different radar parameters. This is an important advantage over other computer vision based nowcasting techniques, which usually estimate the movement of the whole image pattern but are unable to analyze individual storms.

In here, a clustering-based object tracking method, which employs spatially and temporally accurate weather radar and lightning location data, is proposed for the nowcasting and monitoring of thunderstorms [1,2]. Since both weather radar and lightning data contain occasional errors, the fusion of these information types consolidates the tracking.

The method can be applied to several practical problems. Primarily, the automatic storm tracking and extrapolation facilitates human made monitoring and prediction of storms. Secondly, by means of the tracking method we can estimate life cycle phases of a storm and deduce if the storm is dissipating or intensifying. Furthermore, the method can be applied to the acquisition of extensive data sets, which can be utilized in the statistical analysis of thunderstorms.

References

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