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In this work, we develop the multiple-source shortest path algorithms that use a given set of points (called a perimeter) as a source. This technique has a high application value in such problems as fire propagation modeling, epidemiology, demographics control, etc. Different algorithms were developed in order to suit possible demands of the user, such as implementation in parallel programming, minimization of the amount of iterations and memory, and use of the rate of spread (weights of the constituent edges) as a time dependent variable. The new methods were implemented in the Weather Research Forecasting (WRF) model coupled with the fire spread code SFIRE, where it solves the problem of the misbalance of fire and atmospheric state development, which happens when the model assimilates to the new data. This method was applied to a real fire case study. (Received September 16, 2014)