Title: Surveillance to detect emerging space-time clusters

Abstract: The interest is on monitoring incoming space-time events to detect an emergent space-time cluster as early as possible. Assume that point process events are continuously recorded in space and time. In a certain unknown moment, a small localized cluster of increased intensity starts to emerge. Its location is also unknown. The aim is to let an alarm to go off as soon as possible after its emergence, but avoiding that it goes off unnecessarily. The alarm system should also provide an estimate of the cluster location. In addition to that, the alarm system should take into account the purely spatial and the purely temporal heterogeneity, which are not specified by the user. A space-time surveillance system with these characteristics using a martingale approach to derive the surveillance system properties is proposed. The average run length for the situation when there are clusters present in the data is appropriately defined and the method is illustrated in practice. The algorithm is implemented in a freely available GIS system.