Crowd size estimate based on line-density integration and computerized count of images

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Abstract:

Protest movements, sometimes promote concentrations of people, in technical terms, the so-called crowds. Since the size of the crowd (SC) tends to be used as the measure of the strength of the protest movement, heated debates arise around the truth of the SC reported by the different agencies (organizers, government, newspapers, etc.). In words of Watson and Yip (2011) "There is a large amount of variability in crowd estimates [SC] for two reasons: it is difficult to do, and there are strong motivations for getting it wrong!" (p. 104). For example, in the Separatist Movement demonstrations of 11 Sept 2015 in Barcelona, the organizers claimed 2 million people while other agencies provided a SC estimates around 1/2 million people. Such huge disparities among SC estimates evidence the presence of "political" (non-statistical!) bias in some, or maybe all, of the SC estimates.

In a static crowd, the basics for computing SC is the area method formula SC = A x D, where A is the area occupied by the crowd and D is a mean density estimate (people per square meter). In the case of a line-stretched crowd (LC), when the concentration takes place along an avenue of a city, then the area formula is A = L x W, where L is the length of the concentration, and W is the mean width along the concentration. In an LC, the parameter of length L tends to be widely agreed, but the parameters W of the width and D of density typically remains in dispute.

In this talk, we describe a SC estimate for a static LC. We present a method that makes use of the usually undisputed length parameter L but has the advantage of circumventing the controversial parameters of width W and density D. The key data for the new method are computerized counts of aerial images taken along the main axis of the crowd. The SC estimate is then produced by integrating the line density estimated from the automatic counts of images. Since integration is mathematical, and the counting of the images is computerized, non-statistical (i.e., political) bias is avoided by this CS estimate. The method is illustrated in the crowd analysis of the Catalan Separatist Movement demonstrations which took place on Sept 11, 2015 and Sept 11, 2016.