Protecting Sports and Other Celebrities Against Stalking at Ad-Hoc Events

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***Abstract*—This paper was originally submitted to Xinova as a response to a Request for Invention (RFI) on new event monitoring methods. In this paper, a method to protect sports and other celebrities against stalking at ad hoc events is proposed.**

The highest profile celebrities usually receive some form of state funded security (eg the Secret Service in the US). The approach described here is a method to help protect the next tier of celebrities—those requiring significantly more protection than the average person but not receiving government sponsored security. In more detail, a record is made of which fans are appearing at both the celebrity's private and public events. An algorithm is provided for determining when particular people are appearing in the vicinity of these events to a degree greater than would be expected just via statistical noise. Those persons may then be of greater interest to law enforcement.

I. Problems

Although security in general is a problem that needs to be addressed a large temporary events, it can sometimes especially be a problem for celebrities. For example, back in the 1990's sports stars such as Nancy Kerrigan (figure skating) and Monica Seles (tennis) were targeted for attacks near where they were performing. More recently Indian volleyball player Arunima Sinha was attacked by thieves on a train in 2011, and one of the targets of the November 2015 Paris terrorists was a friendly soccer match between France and Germany at which the French president and foreign minister were in attendance. Although the highest ranking public officials will generally qualify for state funded security such as the US Secret Service, there is a need for security for public figures who may be sufficiently well known to be targets but do not qualify for the highest level of state security.

II. Summary of the Invention

A celebrity wishing to be covered at the level of security provided by this technology will be provided with an app with which they communicate with the security company providing security. At any given time a celebrity can indicate that they are at a public appearance, a private appearance, or that they wish complete privacy (even from the security company). Cameras—which could be fixed cameras or from drones—then determine who is in attendance at those events. When a particular person appears at such events too frequently, an alert is raised with the security company.

III. How is This Invention Made and Used

A celebrity is provided with an app with which they communicate with the security company providing security for ad hoc events. At any time they can indicate that they are in one of three modes. If in "public" mode they are performing at some kind of actual event—an athletic event, a press conference, etc—at which fans would be expected to be present. The presence, therefore, of fans at such an event is not in and of itself problematic. However the appearance of a fan at such an event in combination with their appearance at a more private event might be problematic. Second, there is "private" mode which would be when the celebrity is somewhere where fans are not invited—for example, training in private, in a private hotel room, in a dressing room where fans would not be expected nearby, in the Olympic Village, etc. Finally there is "completely private" mode where the celebrity does not want to share their details even with the security company—this could be a situation where they are involved in a dating relationship with someone new and they wish to keep it private. Using "completely private" mode will involve a tradeoff—they lose the security benefits of the app but are completely assured of privacy during sensitive moments.

IV. More Detailed Explanation

Security cameras—which may be at fixed locations or via drones—then compile a list of all people who are in the celebrity's vicinity during their appearances. This may be done via biometrics rather than a direct identification of the people involved. Suppose the person makes m total appearances of which n appearances (with $0 < n \leq m$) are private appearances. Denote these appearances by $A_1, A_2, \dots, A_m$ where A_i for $i \leq n$ is private and A_i for $i > n$ is public. Denote the people found at each of these appearances by $P_1, P_2, \dots, P_m$. In determining these sets of people, people with a known reason to be at these events—employees of the venue, other celebrities, security personnel themselves, etc—will be excluded. Next an algorithm is provided for determining when particular individuals may be showing up at events more than expected. The algorithm is as follows:

Step 1:

Excluded Sets $\leftarrow \emptyset$.

Step 2:

Candidate Maximal Subsets is set to the set of all subsets Q of $P = \{P_1, P_2, \dots, P_m\}$ with several properties: Q has at least two elements with at least one element P_i with $i \leq n$. The intersection of the set of elements of Q is non empty. For every proper superset Q_0 of Q which remains a subset of P, either Q_0 is an excluded set or the intersection of the elements of Q_0 is empty.

Step 3:

For each **candidate maximal subset** Q an analysis is performed to determine whether the number of elements in the intersection of the elements of Q is greater than what one would expect statistically. This can be determined by replacing the private appearances with similar private events at which the celebrity was not present and determining the size of the intersection. If the size of the intersection is similar when the private appearances are replaced by similar private events at which the celebrity is not present, then it is assumed that the appearance of people at all the events in Q is simply statistical noise and not cause for concern. Q is then moved to the set of **excluded sets** and removed from the set of candidate maximal subsets.

Step 4:

If anything was added to the set of excluded steps in Step 3, then go back to Step 2. Otherwise DONE.

If nothing remains in the set of candidate maximal subsets when the algorithm is done, then the algorithm has not identified any particularly problematic individuals who may be stalking the celebrity. However, if at least one element remains in the set of candidate maximal subsets, then all persons who are in the intersection of the elements of Q, where Q is any remaining candidate maximal subset, will be identified as possible stalkers of the celebrity in question. These are individuals who appeared at at least two events where the celebrity was present—at least one of which was a private event not intended for fans—and whose appearance could not be explained as mere statistical noise.

This algorithm will need to be performed repeatedly as new data becomes available as the celebrity makes additional public and private appearances.

V. Conclusion

As summarization, the proposed method is a mechanism for determining when particular people are appearing at particular celebrities' events more frequently that statistically expected. For someone to be flagged as potentially problematic they would need to be seen at least once at a "private" event (since otherwise they may simply be a legitimate fan) and at least once at a "public" event (since the objective is to protect people when they make their public appearances). If someone does appear in these combinations of situations, it is determined then whether this is happening more frequently that could be explained just via statistical noise. If so, it may warrant further attention.

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