Inferring interactions from position and orientation information in human groups

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Abstract

What is the nature of spatial and physical interactions in human groups? Several definitions coexist: from contamination opportunity [4] to managerial relationships [3] through traditional social contact, the spectrum of spatial relationships researchers seek to characterize is wide.

In this presentation, we discuss a methodology to assess physical human interactions. Instead of capturing directly "face-to-face" interactions using RFID [4] or Bluetooth [1] tags, we capture the individuals' positions and orientation.

Interactions are then inferred using a set of statistical models. The main advantage of this approach is to allow researchers to define which interaction they want to extract (provided it only involves the position and orientation of the subjects), instead of relying on an already defined interaction model whose genericity and whose fit to targeted interaction type is questionable.

This presentation describes our methodology to reconstruct such interactions. Our starting point is an axiomatic definition of what a physical interaction is: a visual contact (*i*) within a given range (*ii*) between multiple immobile actors (*iii*) of a certain minimum duration (*iv*). Each of the aforementioned axioms is associated with some parameters — minimum duration, range, visual contact angle . . . We experimentally test the impact of these parameters and of various interaction detection techniques.

Our experimental setup consists of a fine-grained localization system based on Ultra-wide-band signals. Similar in its principles to motion capture systems [2], it works however seamlessly in crowded environments. We present the results from two experiments, one involving 20 volunteers alternating between motion and controlled interactions, and one involving 50 volunteers interacting freely in a cocktail. Collected data allow to measure the actual angle and distance between "face-to-face" interaction participants, and to experimentally characterize Hall's personal reaction bubbles. Finally we discuss the impact of different interaction extraction policies on the resulting human interaction graphs.

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