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Population Protocols with Unordered Data

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Abstract: Population protocols form a well-established model of computation of passively mobile anonymous agents with constant-size memory. It is well known that population protocols compute Presburger-definable predicates, such as absolute majority and counting predicates. In this work, we initiate the study of population protocols operating over arbitrarily large data domains. More precisely, we introduce population protocols with unordered data as a formalism to reason about anonymous crowd computing over unordered sequences of data. We first show that it is possible to determine whether an unordered sequence from an infinite data domain has a datum with absolute majority. We then establish the expressive power of the immediate observation restriction of our model, namely where, in each interaction, an agent observes another agent who is unaware of the interaction.

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