

**Abstract** – Crowd motion analysis covers the detection, tracking, recognition, and behavior interpretation of a target group according to persistent surveillance video data. This project is dedicated to developing and employing a generic crowd motion analysis framework, which is based on an analog-heat-transfer model and thus denoted as CMA-AHT for simplicity, to measure and identify the anomalous pedestrians from persistent surveillance video data. Based on the hypothesis of ergodicity, the CMA-AHT framework is formulated according to the statistical analysis about the historical records of crowd's behavior, geographic information system, and crowd motion dynamics. The derivation of the CMA-AHT framework and the innovative methods involved in the framework's implementation will be discussed in detail. Using the sample video data collected by Central Florida University as a benchmark data, CMA-AHT is validated through measuring and identifying anomalous personnel or group in the video.

**Key Words** – crowd motion analysis, heat-transfer, partial differential equations, geographic information, statistics, video processing.