Learning Social Etiquette: Human Trajectory Understanding in Crowded Space

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Motivation
- Better understanding how human navigate in crowded space
- Capturing their behavior or social etiquette.

Contributions
- New large-scale dataset that collects videos of various type of agents
- New characterization that describes the “social sensitivity”
- New trajectory forecasting method

Our Model

Modeling Social Sensitivity

\[ E_{\text{so}}(v; \alpha, \beta, \psi) = \int_{\mathbb{R}^2} \frac{1}{\pi \sigma_w^2} \left( \frac{d(v, x, y)}{\sigma_w} \right) e^{-\frac{d(v, x, y)^2}{\sigma_w^2}} \, dx 
\]

Where:
- \( d(v, x, y) \): the distance to the subject to be avoided.
- \( \sigma_w \): the radius of influence of other object.
- \( \beta \): control the peakness of the weighting function

Forecasting Multiple classes of target

\[ E_{\text{so}}(v; \alpha, \beta, \psi) = \sum_{i \neq j} \frac{1}{\pi \sigma_d^2} \left( \frac{d(v, x_i, y_j)}{\sigma_d} \right) e^{-\frac{d(v, x_i, y_j)^2}{\sigma_d^2}} \]

where \( \theta = \{h_{\alpha}(v), \alpha_i(v), \alpha_j(v), \alpha_k(v), \sigma_d(v), \sigma_w(v), \beta(v)\} \)

Forecasting results from the Multi class dataset

Experiments

Evaluation Methods - Forecasting:
- Mean average displacement on all trajectories
- Mean average displacement on collisions avoidance
- Final position average displacement

Forecasting results from the Pedestrians Only Dataset [1]

Multi-target tracking

Modified Multi-target Tracking (MTT) algorithm from Xiang et al. [39].

- Linear forecasting method
- Single-class social force [1]
- Our multi-class forecasting method

Conclusions
- New large-scale dataset publicly available
- Better understanding of a target behaviors
- Better prediction and tracking

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References