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Katılım bağlantısı için Zeliha Cansu Canbek (cansu.canbek@boun.edu.tr) ile iletişime geçebilirsiniz.

Title: Sequential Monte Carlo Localization Using Bluetooth Low-Energy Beacons

Abstract: We model the tracking of a Bluetooth Low-Energy (BLE) moving transceiver as a hidden Markov model, and filter the latent positions using sequential Monte Carlo. A novel aspect of our approach is the development of an observation model, specifically tailored for received signal strength indicator fingerprints: a histogram interpolation based on the optimal transport model of Wasserstein distance. The tracking results of the entire system are compared with alternative baseline estimation methods, such as nearest neighboring fingerprints and an artificial neural network. Our results show that highly accurate estimation from noisy data is practically feasible. Another novelty is a three layered hidden Markov model with joint state and parameter estimation. Assuming that a BLE transmitter does not provide any other motion related information, the transition density is designed to be a normal distribution whose noise covariance depends on a parameter, namely the diffusion factor, that is to be estimated alongside the positions. We first show an experimental proof of concept using synthetic data by comparing three parameter estimation approaches: static, decaying and adaptive diffusion factors. We then obtain the results on real data which show that online parameter sampling adapts to the observed data and yields lower error means and medians, but more importantly steady error distributions with respect to a large range of parameters. Thirdly, we introduce a novel technique and an associated dataset for evaluation of wireless indoor positioning algorithms. The technique makes use of an augmented reality based positioning system to annotate the signal data with high precision positions. Video streams captured by the cameras are subjected to a series of marker recognition, subset selection and filtering operations to yield highly precise pose estimations, hence, they can be used as the ground truth positions.

Biography: F. Serhan Daniş received his B.Sc. degree from Department of Computer Engineering of Galatasaray University in 2006 and his M.Sc. degree from Department of Systems and Control Engineering of Boğaziçi University in 2009. He is a Ph.D. candidate in Department of Computer Engineering at Boğaziçi University. He has been working as a research assistant at Galatasaray University since 2007. His research areas are Bluetooth Low-Energy Localization and Tracking, Sequential Monte Carlo Methods and Bayesian Statistics.