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Dynamic Map Building for an Autonomous Mobile Robot

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Abstract

This paper presents an algorithm for autonomous map building and maintenance for a mobile robot. We believe that mobile robot navigation can be treated as a problem of tracking geometric features which occur naturally in the environment. We represent each feature in the map by a location estimate (the feature state vector) and two distinct measures of uncertainty: a covariance matrix to represent uncertainty in feature location, and a *credibility* measure to represent our belief in the validity of the feature. During each position update cycle, predicted measurements are generated for each geometric feature in the map and compared to actual sensor observations. Successful matches cause a feature's credibility to be increased. Unpredicted observations are used to initialize new geometric features, while unobserved predictions result in a geometric feature's credibility being decreased. We describe experimental results obtained with the algorithm that demonstrate successful map building using real sonar data.