Towards vision-based autonomous cross-country soaring flight for a small UAV glider

Autonomous soaring is a promising approach to augment the endurance of small UAVs. Most of the existing work on this field relies on accelerometers and/or GPS receivers to sense thermals in the proximity of the vehicle. However, thermal updrafts are often visually indicated by cumulus clouds that are well characterized by their sharp baselines. This paper focuses on a cloud mapping algorithm which estimates the 3D position of cumulus clouds. Using the meteorological fact of a uniform cloud base altitude a state-constrained sigma-point Kalman filter (SCSPKF) is developed. A method of using the resulting cloud map and its uncertainty in the path planning task to realize a soaring flight to a given wayoint is presented as a perspective of this work.