Adaptive Monte-Carlo Localization (AMCL) is a widely used localization algorithm in robotics, particularly in the ROS environment. It is based on the Monte-Carlo Localization (MCL) method, which uses a particle filter to estimate the robot's pose. AMCL adapts the number of particles based on the uncertainty of the robot's pose, making it more efficient in terms of computational resources. It uses laser scans and odometry data to update the particles' weights and resample them to maintain a consistent number of particles. AMCL is robust against noisy sensor data and can handle dynamic environments. It is also relatively simple to implement and tune.

Monte-Carlo Localization (MCL) is a probabilistic localization method that uses a particle filter to represent the robot's belief about its location. It is suitable for both static and dynamic environments. MCL works by maintaining a set of particles, each representing a possible location of the robot. The algorithm updates these particles based on motion models (odometry) and sensor models (e.g., LiDAR scans), and resamples them to focus on areas with higher probability. MCL is robust to sensor noise and can handle incomplete maps. However, it can be computationally intensive and requires careful tuning of parameters.

In the context of autonomous racing, as discussed in the thesis, MCL-based methods like PF2 were developed to improve robustness in adverse conditions compared to SLAM-based methods like Cartographer. PF2 was more robust in scenarios with poor sensor input, while Cartographer performed better in good conditions. However, specific details about "SynPF" are not available in the provided search results.

Since "SynPF" is not explicitly mentioned in the search results, it's challenging to provide detailed information about it. If you have more context or details about SynPF, it might be helpful to explore further.