By examining a special case of mobile robot navigation Li and Wang present the concepts of fuzzy rule driven behavior for navigation entailing minimum complexity. They designed a fuzzy rule based control scheme which enabled a robot to navigate convex and concave corners of 90 degree angles by following the wall. The robot used three laser range sensors to do this. Two sensors were on the left flank of the robot facing left, and the third was on the front of the robot facing forward. Since the geometry of the course is understood before measurements are made, the authors are able to relate each range sensor reading to fuzzy set memberships Near, Mid, and Far.

The rules used to determine the steering angle fuzzy set memberships are then simply relate the various combinations of the laser range fuzzy membership sets to a sensible steering behavior, given the understood environment. The only environmental context which had to be deduced was whether the corner were concave or convex. This was determined with a simple threshold on the front range sensor, for mutually exclusive behavior selection. If front sensor is Far and front-side sensor is Far, then Turn Left (around the corner). If front sensor is Near and either side sensor is Near, then Turn Right (within the corner). The asymmetry of the robots’ range sensors further simplify the codification of wall-following behavior in and around 90 degree corners into such fuzzy rules; the wall is only ever to the left of the robot. A simulation was run in which the robot successfully navigated around a polygon featuring such convex and concave corners.

Presumably limited by a conference paper page limit, they lack details on the exact fuzzy operators used for membership determination. However, Li and Wang provide a brief and simple introduction to implementing navigational robot behavior with a few fuzzy measurements. The reader who is familiar with fuzzy logic theory can imagine that some combination of fuzzy set operators or membership set geometric parameters could be used to tune behavior until the desired wall following functionality is achieved.