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A Measurement-Theoretic Analysis of Massaro's Fuzzy Logic Model of Perception

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This paper analyzes Massaro's Fuzzy Logic Model of Perception (FLMP) from a measurement-theoretic perspective. It is shown that in two-factor, two-category choice experiments, the choice probabilities do not uniquely determine the FLMP parameter values. It is demonstrated that two indirect scales of measurement are established by the choice probabilities, with uniaueness up to a single scale constant. Most of the properties that one might want to hold for fuzzy truth values are demonstrated to fail to hold under permissible rescalings. Finally, the choice rule in the FLMP is shown to be equivalent to a version of Rasch's item response theory model. The Rasch model expresses the probability that a test item is correctly answered as a function of a subject ability parameter and an item difficulty parameter. The Rasch model has been investigated extensively by psychometricians, so there exists a considerable body of statistical inference theory that is adaptable to the FLMP.