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ref: H.J. Zimmermann *Fuzzy Sets, Decision Making, and Expert Systems.* Boston, MA: Kluwer 1987
ISBN 0-89838-149-5

premise: Fuzzy logic is based on the idea that elements may be partial members of a set. In conventional set theory, the membership of elements in a set is all or nothing — in or out — 0 or 1. In fuzzy set theory, the membership of elements in a set may be any value between 0 and 1.

Conventional logic is like digital circuitry used to build computers. Fuzzy logic is like analog circuitry used to build sound systems.

An element of a fuzzy set is like an undecided voter who is not behind the candidate 100%.

notn: $\tilde{\wedge} \equiv$ fuzzy AND
$\tilde{\vee} \equiv$ fuzzy OR

ex: 3 people are polled on their feelings about candidate A. They are asked to give an approval rating of over all performance.

person	% approval	=	membership in set $\tilde{A}$
1	25 %		.25
2	56		.56
3	38		.38

Fuzzy set $\tilde{A} = \{(\underset{\text{person}}{1}, \underset{\text{membership}}{.25}), (2, .56), (3, .38)\}$

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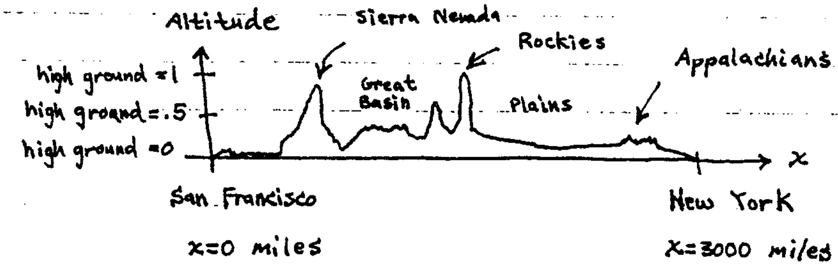
ex: A surveyor maps the altitude of points along a highway across the United States.



We can think of this plot as representing the membership of each point x in the fuzzy set $\tilde{A}$ = high ground.

$$\tilde{A} = \{ (x, \text{altitude at } x) : x \text{ between 0 and 3000 miles} \}$$

Again, we use ordered pairs to represent $\tilde{A}$, but in this example we have a continuous range of x values.

note: We must define "high ground" such that for every altitude we encounter for the x values under consideration we have a membership between 0 and 1. (The 0 and 1 are allowed values.)

comment: We use membership in fuzzy sets to describe how much of a given characteristic each element possesses. This gives us a way of being somewhat vague and qualitative in describing our knowledge about each element. Yet, we still have a mathematical framework for working with this fuzzy knowledge.