

Yes, Candidates, There Is a Fuzzy Math

By Bart Kosko

They've been at it for weeks: the presidential candidates accusing each other of using "fuzzy math." George W. Bush first threw this dirty snowball in the debates, attacking Al Gore's analysis of the Bush budget plans. Mr. Gore threw it right back and kept throwing it. He even got audiences at campaign stops to shout "fuzzy math!" when he asked them to describe Mr. Bush's budget projections. Both candidates plainly use the term as the ultimate logical putdown.

What neither seems to realize is that there really is such a thing as

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fuzzy math, and we use it every day.

Fuzzy math and fuzzy logic are fields of mathematics and engineering, like chaos math or probability theory. Scientists hold international conferences on fuzzy math and pub-

A choice of insults shows a lack of scientific literacy.

lish in journals of fuzzy math. Scholars write textbooks and monographs on getting computers to reason with it. Two of the largest fuzzy research centers are in Governor Bush's own state, at Texas A&M University and the University of Texas at El Paso. And in Vice President Gore's home state of

Tennessee, General Motors puts fuzzy math to use in new Saturns.

The math of fuzzy math is not, itself, fuzzy. It is as black and white as the columns of budget numbers that we all want computers and accountants to add up correctly — and that each candidate suggests the other side wants to obfuscate. What fuzzy math does is let us — and our computers — reason with shades of gray. It is a branch of machine intelligence that captures human expertise in software or computer chips.

A good example of a fuzzy concept is cool air — it has a clear meaning, but it is not black or white. Fuzzy logic builds rules out of such fuzzy terms and then embeds those rules in a computer. One rule might be "If the air is cool, then set the motor speed to slow." Another might be "If the air is warm, then set the motor speed to high." Fuzzy math lets an expert program a computer in English, but helps the computer interpret "cool" according to a number of interacting vari-

ables — just as a human being does.

Both candidates say that their top priority is education. Both say they favor increased training in science and mathematics. Both rely on advanced technology to solve social problems that range from cleaning up oil spills to fighting information warfare at home and abroad. Yet both reflect the sorry state of scientific literacy in this country.

The rest of the world rightly laughs at the all-powerful Americans who still base their unit of length on the bottoms of men's feet. More tellingly, a famous 1989 study at Oxford and Northern Illinois Universities found only half of American adults knowing that the Earth orbited the sun and took a year to do it. Bush and Gore supporters may not be so naive as that, but if Americans were, as a rule, more sophisticated about what's going on in science, candidates who threw out the "fuzzy math" charge would find the laugh was on them.