Traffic jams follow explosive pattern, says researcher (w/Video)

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Morris Flynn studies traffic jams as if they were chemical reactions.

(PhysOrg.com) -- Picture this next time you're stuck in traffic: Thousands of wildebeests loping across the Serengeti Plain when suddenly a few spooked animals turn the orderly migration into a sea of locked horns, U-turns, head-on collisions and trampled calves.

That's the gory image Morris Flynn carried into his research on why people create traffic jams for no good reason. Flynn, a University of Alberta mechanical-engineering professor, saw something in common between a frightened herd of animals and hundreds, sometimes thousands, of drivers caught in phantom traffic jams.

These traffic jams are caused when drivers slow down, seemingly without reason, which causes a stop-and-go chain-reaction. And like everyone who drives on a freeway, Flynn knows phantom gridlock when he sees it.

"All it takes is one person to tap their brakes and for the driver right behind to overreact and slow way down," said Flynn.

Flynn's theoretical research isn't concerned with the psychology or skills of individual drivers. In fact, it doesn't have anything to do with people at all. He and his team, from the Massachusetts Institute of Technology, created mathematical formulas to calculate the severity of phantom traffic jams for highways with various speed limits and traffic volumes. Their research was published online this week in *Physical Reviews E*, published by the American Physical Society.

"We treat traffic as a chemically reacting gas," he said. In the research team's eyes, traffic flow is a gas and the start of a traffic jam is explosion and that force ripples outwards, engulfing everything in its path. When math formulas are applied to Flynn's model he can tell how quickly a traffic jam starts and how severe it will become.

"Once a detonation wave starts, it keeps moving outwards.

"A traffic jam starts with two vehicles and keeps on growing."

Flynn admits his study is completely theoretical. "We don't get down to the nitty-gritty of putting down road detectors, but our mathematical models can be used by highway authorities to predict and guide drivers through phantom traffic jams."

Flynn sees a day when all vehicles are GPS equipped and highway authorities can assure individual drivers that all is well up ahead.

And when traffic bottlenecks inevitably happen, drivers can be told to adjust their speeds so no one has to come to a complete stop.

Flynn grew up in Edmonton but even after a few years of graduate work in the United States he remembered the phantom traffic-tie ups in his hometown.

"I'd get into them driving westbound on the Whitemud as you come down the hill to the Quesnel Bridge. Sometimes the cars were backed up all the way to Terwilliger Drive."

So how does Flynn deal with the inevitable inconvenience of an un-needed traffic ties up? "I splurged and bought myself a really nice bicycle."

Provided by University of Alberta (news : web)