Poker and Random Bunching

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In his Oct. 17 Campus Life column, Tech Editor Bill Andrews was “T’d Off” about the service of MBTA Bus #1 (the Harvard — Dudley route).

He couldn’t understand why he waits a long time (rain-soaked and all) only to see two #1 buses arriving together, the first one fully loaded and the second virtually empty. This being MIT, it may be time for a good theory or an underlying model of the phenomenon.

There are two possible explanations for this observable fact. The first is known as the “poker table” theory. It surmises that the drivers on Route 1 are a friendly bunch. They like each other’s company and prefer the thrills of Texas Hold ’Rm to leaving the station one at a time, driving alone along Massachusetts Avenue, collecting rain-soaked editors on time. The result is a convoy of two and three buses coming together to pick up and deliver hurried students to and from MIT.

The other theory is known as “random bunching” (aka “bus pairing”). It assumes that drivers leave the first station exactly on schedule — in, say, ten-minute intervals. But due to some random event — such as missing a green light or waiting for an old passenger who takes a long time to alight — one bus falls slightly behind schedule.

The chances are, then, that when it arrives a little late at the next station, the number of people waiting for the bus will be larger than average. The bus will therefore spend more time than average picking those passengers up, and fall further behind its schedule, finding an even larger number of passengers at the next station, and falling still further behind.

To add insult to injury, the bus behind it starts finding fewer and fewer people at the stations and gets further and further ahead of its schedule. Pretty soon the two buses start moving in a kind of convoy with the first bus full and the second one empty.

Observations suggest that random bunching is always at play, but the first theory is hard to rule out since poker games of drivers while on shift are difficult to observe without resorting to HP methods. Supporting evidence for the random bunching theory (aside from its scientific-sounding name) can be found by observing automatic systems that exhibit similar characteristics. For example, elevator systems tend to bunch just like buses – you can wait a long time for an elevator, then two or more will arrive together. This phenomenon is even stronger in Boston than in New York.

The random bunching explanation in the elevator case is similar to the buses. When polite people hold the elevator door for a latecomer, the elevator falls behind and there is a higher chance that it will get stopped at the next floor. Meanwhile, the other elevators in the group speed up and arrive, in many cases, simultaneously. The problem is less severe in New York, since Yankee fans are less inclined than genteel Red Sox fans to hold the door for latecomers.

The moral of the story is that holding the elevator door is actually anti-social behavior. The considerate driver who waits for a late passenger at a bus station is actually harming the system, while the driver of an early bus who waits at a station as you (already on board) urge him to leave is actually doing the right thing from a system point of view. The other lesson is that you've got to know when to hold them and when to fold them.

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