HW 11.8

Saturday, October 24, 2020 1:23 PM

Passed Solution review

8. Consider the following social problem.[5] A pedestrian is hit by a car and lies injured on the road. There are n people in the vicinity of the accident. The injured pedestrian requires immediate medical attention, which will be forthcoming if at least one of the n people calls for help. Simultaneously and independently, each of the n bystanders decides whether or not to call for help (by dialing 911 on a cell phone or pay phone). Each bystander obtains v units of utility if someone (anyone) calls for help. Those who call for help pay a personal cost of c. That is, if person i calls for help, then he obtains the payoff $v - c$; if person i does not call but at least one other person calls, then person i gets v; finally, if none of the n people calls for help, then person i obtains zero. Assume $v > c$.

(a) Find the symmetric Nash equilibrium of this n-player normal-form game. (Hint: The equilibrium is in mixed strategies. In your analysis, let p be the probability that a person does not call for help.)

Call — not call but other does — no call

$V-C$ — V — 0

If symmetric, $p = 1-p$ so $(V-C) = (1-p^{n-1})\cdot V \rightarrow p = \frac{C}{V}\cdot\frac{1}{1-n}$

It's $p^{n-1} = c/v$ due to how probability works

$V - C = V(1-p^{n-1})$

$p^{n-1} = c/v$

$p = (c/v)^{(1/(n-1))}$

(b) Compute the probability that at least one person calls for help in equilibrium. (This is the probability that the injured pedestrian gets medical attention.) Note how this depends on n. Is this a perverse or intuitive result?

$1-p^n = 1-\frac{c}{v}\frac{n}{n-1} \rightarrow$

Forgot to do the whole problem?

$P(X>0) = 1 - P(0)^{(n/n-1)}$

$= 1-(c/v)^{(n/n-1)}$

$c/v < 1$ so as n grows, $P(X>0)$ decreases. This is perverse and intuitive. People will assume that someone else is calling in a large group. In smaller groups or individually it is apparent that you need to take charge

The limit is $P(X>0) \rightarrow 1-c/v$