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# RPS (3-types) game with random matching

# N-population size, G-number of generations, mr-mutation rate
N=200;G=400;mr=0.02

#payoff matrix
PSR=t(array(c(2,1,3,3,2,1,1,3,2),dim=c(3,3)))

#arrays for type operations (3 types in RSP)
Lottery=array(0,dim=c(N,3))
Tot=array(0,dim=c(3))
P=array(0,dim=c(3))
AF=array(0,dim=c(3))

#population array: fitness, type, mutation r.v.
pop=array(0,dim=c(N,3))

#data array to record proportions of types
# 1-Paper, 2-Scissors, 3-Rock
data=array(0,dim=c(G,3))

# starting fitness (ensured to be always positive); greater value -- weaker selection
pop[1:N,1]=10

# starting population is uniformly random
pop[1:N,2]=as.integer(1+3*runif(N))

#cycle of generations
for (g in 1:G) {

#cycle of individuals in the population
for (x in 1:N) {
y=as.integer(1+N*runif(1))
#interaction -- note that both players obtains payoffs
pop[x,1]=pop[x,1]+PSR[pop[x,2],pop[y,2]]
pop[y,1]=pop[y,1]+PSR[pop[y,2],pop[x,2]]
}

#replicator dynamics (aggregate level proportions)
#average population fitness
AFP=sum(pop[1:N,1])/N
#average fitness of types
for (i in 1:3) {
Tot[i]=sum(pop[1:N,2]==i)
P[i]=data[g,i]=Tot[i]/N
if (Tot[i]>0) AF[i]=sum(pop[pop[1:N,2]==i,1])/Tot[i]
#discrete replicator dynamics
P[i]=P[i]*(AF[i]/AFP)
}

#individual types given aggregate level proportions (probabilities)
#stochastic replicator dynamics via transposed multinomial random number generation
Lottery=t(rmultinom(N, size = 1, prob=c(P[1],P[2],P[3])))
pop[1:N,2]=max.col(Lottery)

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#individual mutation random variables
pop[1:N,3]=runif(N)

#all mutans are of the same type code
#pop[pop[1:N,3]<mr,2]=as.integer(1+3*runif(1))

#cycle allows mutants of different types
for (i in 1:N) {
if (pop[i,3]<mr) pop[i,2]=as.integer(1+3*runif(1))
}

#reset starting fitness(es)
pop[1:N,1]=10
}

#plot
matplot(1:G,cbind(data[1:G,1],data[1:G,2],data[1:G,3]))

#code to save data

#NOTE! If you use Vista, make sure to run R as ADMINISTRATOR!
#NOTE! The file will be saved in your R folder!

#write.csv(data, file = "filename.csv")

done=1
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