Quelltext pbem09.nlogo

```
globals
[
  gute
  boese
  schnitt
  g_schnitt
  b_schnitt
  g_alle
  b_alle
  ;; norm_stark Initiale Anfangsstärke -> per Slider
]

patches-own
[ stark   ;; staerke d. spieler
  opfer  ;; angegriffener
  nb_n  ;; nachbarn nord, ost, sued, west
  nb_o
  nb_s
  nb_w
  gewinn  ;; wird ggf. eingetragen
  verlust ;; wird ggf. eingetragen

  hilfe ;; true wenn um Hilfe gerufen wird, false sonst
  send ;; Patch, an das Hilfe gesendet werden soll
  legion ;; Staerke der Hilfstruppen

  like_n ;; 'likeness' der Nachbarn
  like_o
  like_s
  like_w

  helpoverlike
]

to setup
    ;; initialisieren/ loeschen
  ca
  cp
    ;; Nachbarn ermitteln und eintragen

  set schnitt 0
  set b_alle 0
  set g_alle 0
  set b_schnitt 0
  set g_schnitt 0
  ask patches
    [
      set stark (random 20 + norm_stark) ;; erst noch schnell Staerke
initialiseieren
      set like_n (random 40 + 50)
      set like_o (random 40 + 50)
      set like_s (random 40 + 50)
      set like_w (random 40 + 50)

      ifelse Kooperation
       [set helpoverlike (60 + (random 2) * 20)]
       [set helpoverlike 9999]
      ifelse pycor < screen-edge-y
       [set nb_n patch (pxcor) (pycor + 1)]
```

```
       [set nb_n patch (pxcor) ( - pycor)]
      ifelse (pxcor <  screen-edge-x)
       [set nb_o patch (pxcor + 1) (pycor)]
       [set nb_o patch (- pxcor) (pycor)]
      ifelse pycor > (- screen-edge-y)
       [set nb_s patch (pxcor) (pycor - 1)]
       [set nb_s patch (pxcor) ( - pycor)]
      ifelse pxcor >  (- screen-edge-x)
       [set nb_w patch (pxcor - 1) (pycor)]
       [set nb_w patch (- pxcor) (pycor)]
     ]
     ;; Prozedur zum Einfaerben
   farbe
end

to go
    ;; evtl. Werte aus der Vorrunde löschen

 ask patches [set hilfe 0]
 ask patches [set send 0]
 ask patches [set legion 0]
 ask patches [set verlust 0]
 ask patches [set opfer 0]
 ask patches [set gewinn 0]
    ;; Prozeduren
 search
 hilferuf
 send_hilf
 get_hilfe
 combat
 damage
 back_hilfe
 bewerte
 farbe
 plotten
 durchschnitt
 gut_schnitt
 bad_schnitt

end


to search
    ;; unter den Nachbarn schauen, wer unter den Schwächeren der Stärkste
ist
    ;; diesen als 'Opfer' eintragen
ask patches
 [
 if (value-from nb_n [stark] < stark)
  [if (value-from nb_n [stark] > 20)
   [if like_n < helpoverlike
     [set opfer nb_n]
   ]
  ]
 if (value-from nb_o [stark] < stark)
  [if (opfer = 0) or (value-from nb_o [stark] > value-from opfer [stark])
   [if (value-from nb_o [stark] > 20)
    [if like_o < helpoverlike
      [set opfer nb_o]
    ]
   ]
  ]
 if (value-from nb_s [stark] < stark)
```

```
  [if (opfer = 0) or (value-from nb_s [stark] > value-from opfer [stark])
   [if (value-from nb_s [stark] > 20)
    [if like_s < helpoverlike
      [set opfer nb_s]
    ]
   ]
  ]
 if (value-from nb_w [stark] < stark)
  [if (opfer = 0) or (value-from nb_w [stark] > value-from opfer [stark])
   [if (value-from nb_w [stark] > 20)
    [if like_w < helpoverlike
     [set opfer nb_w]
    ]
   ]
  ]
]
end

to hilferuf
    ;; nach Hilfe rufen
  ask patches [
   if value-from nb_n [opfer] = (patch pxcor pycor)
    [set hilfe (hilfe + 1)]
   if value-from nb_o [opfer] = (patch pxcor pycor)
    [set hilfe (hilfe + 1)]
   if value-from nb_s [opfer] = (patch pxcor pycor)
    [set hilfe (hilfe + 1)]
   if value-from nb_w [opfer] = (patch pxcor pycor)
    [set hilfe (hilfe + 1)]
   ]
end

to send_hilf
 ask patches [
  if ((value-from nb_n [hilfe] > 0) and (nb_n != opfer))
   [if like_n >= helpoverlike
     [set send nb_n
      set legion ((like_n - helpoverlike) * 100) / (100 - helpoverlike)
      ;; aktuelle likeness prozentual zu max.mögl. likeness
     ]
   ]
  if ((value-from nb_o [hilfe] > 0) and (nb_o != opfer))
   [if ((send = 0) or (value-from nb_o [hilfe] > value-from send [hilfe]))
    [if like_o >= helpoverlike
      [set send nb_o
       set legion ((like_o - helpoverlike) * 100) / (100 - helpoverlike)
      ]
    ]
   ]
  if ((value-from nb_s [hilfe] > 0) and (nb_s != opfer))
   [if ((send = 0) or (value-from nb_s [hilfe] > value-from send [hilfe]))
    [if like_s >= helpoverlike
      [set send nb_s
       set legion ((like_s - helpoverlike) * 100) / (100 - helpoverlike)
      ]
    ]
   ]
  if ((value-from nb_w [hilfe] > 0) and (nb_w != opfer))
   [if ((send = 0) or (value-from nb_w [hilfe] > value-from send [hilfe]))
    [if like_w >= helpoverlike
      [set send nb_w
       set legion ((like_w - helpoverlike) * 100) / (100 - helpoverlike)
      ]
```

```
    ]
   ]
  ifelse (send != 0) and (stark > legion)
   [set stark (stark - legion)]
   [set legion 0]
  ]
 end

to get_hilfe
    ;; Hilfetruppen empfangen
  ask patches [
   if value-from nb_n [send] = (patch pxcor pycor)
    [set stark (stark + value-from nb_n [legion])
     ]
   if value-from nb_o [send] = (patch pxcor pycor)
    [set stark (stark + value-from nb_o [legion])
    ]
   if value-from nb_s [send] = (patch pxcor pycor)
    [set stark (stark + value-from nb_s [legion])
    ]
   if value-from nb_w [send] = (patch pxcor pycor)
    [set stark (stark + value-from nb_w [legion])
    ]
  ]
end

to combat
 ask patches [
    ;; wenn man ein Opfer hat, Gewinn auf +5 und 5 zu Staerke addieren
    ;; potentielle Angriffsgewinne auswerten
   if opfer != 0[
    if (value-from opfer [stark] < stark)
     [set gewinn 5
      set stark (stark + gewinn)
     ]
    if (value-from opfer [stark] > stark)
     [set gewinn -5
      set stark (stark + gewinn)
     ]
   ]
  ]
end

to damage
    ;; bei allen Nachbarn 'schauen', ob als 'Opfer' eingetragen
    ;; und den 'gewinn' wert (kann negativ sein) subtrahieren (-> eigener
gewinn moeglich)
  ask patches [
   if value-from nb_n [opfer] = (patch pxcor pycor)
    [set stark (stark - value-from nb_n [gewinn])
      set verlust (verlust - 5)
     ]
   if value-from nb_o [opfer] = (patch pxcor pycor)
    [set stark (stark - value-from nb_o [gewinn])
     set verlust (verlust - 5)
    ]
   if value-from nb_s [opfer] = (patch pxcor pycor)
    [set stark (stark - value-from nb_s [gewinn])
     set verlust (verlust - 5)
    ]
   if value-from nb_w [opfer] = (patch pxcor pycor)
    [set stark (stark - value-from nb_w [gewinn])
     set verlust (verlust - 5)
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    ]
   ]
end

to back_hilfe
   ;; Legionen zurückschicken
   ask patches [
   if value-from nb_n [send] = (patch pxcor pycor)
    [set stark (stark - value-from nb_n [legion])
     ]
   if value-from nb_o [send] = (patch pxcor pycor)
    [set stark (stark - value-from nb_o [legion])
    ]
   if value-from nb_s [send] = (patch pxcor pycor)
    [set stark (stark - value-from nb_s [legion])
    ]
   if value-from nb_w [send] = (patch pxcor pycor)
    [set stark (stark - value-from nb_w [legion])
    ]

   ;; Legionen zurückbekommen
   set stark (stark + legion)
  ]
end

to bewerte
  ask patches [
      ;; Hilfe-Empfaenger bekommt leichten Abzug
   if send = nb_n
    [set like_n (like_n - 2)
    ]
   if send = nb_o
    [set like_o (like_o - 2)
    ]
   if send = nb_s
    [set like_s (like_s - 2)
    ]
   if send = nb_w
    [set like_w (like_w - 2)
    ]

      ;; Angreifer bekommt starken Abzug
   if value-from nb_n [opfer] = (patch pxcor pycor)
    [set like_n (like_n - 5)
    ]
   if value-from nb_o [opfer] = (patch pxcor pycor)
    [set like_o (like_o - 5)
    ]
   if value-from nb_s [opfer] = (patch pxcor pycor)
    [set like_s (like_s - 5)
    ]
   if value-from nb_w [opfer] = (patch pxcor pycor)
    [set like_w (like_w - 5)
    ]

    ;; erhaltene Hilfe wird belohnt
   if value-from nb_n [send] = (patch pxcor pycor)
    [set like_n (like_n + 4)
    ]
   if value-from nb_o [send] = (patch pxcor pycor)
    [set like_o (like_o + 4)
    ]
   if value-from nb_s [send] = (patch pxcor pycor)
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```
    [set like_s (like_s + 4)
    ]
   if value-from nb_w [send] = (patch pxcor pycor)
    [set like_w (like_w + 4)
    ]

        ;; Neutralität wird leicht belohnt
   if (not (value-from nb_n [send] = (patch pxcor pycor)))
      and (not (value-from nb_n [opfer] = (patch pxcor pycor)))
      and (not (send = nb_n))
    [set like_n (like_n + 0.05)
    ]
   if (not (value-from nb_o [send] = (patch pxcor pycor)))
      and (not (value-from nb_o [opfer] = (patch pxcor pycor)))
      and (not (send = nb_o))
    [set like_o (like_o + 0.05)
    ]
   if (not (value-from nb_s [send] = (patch pxcor pycor)))
      and (not (value-from nb_s [opfer] = (patch pxcor pycor)))
      and (not (send = nb_s))
    [set like_s (like_s + 0.05)
    ]
   if (not (value-from nb_w [send] = (patch pxcor pycor)))
      and (not (value-from nb_w [opfer] = (patch pxcor pycor)))
      and (not (send = nb_w))
    [set like_w (like_w + 0.05)
    ]
  ]
 end

to farbe
         ;; färbt Patches nach Farbe ein
         ;; schwache dunkel -> schwarz
         ;; starke rot -> weiss
 ask patches [
  if (stark <= 50)
   [set pcolor 10]
  if ((stark <= 60) and (stark > 50))
   [set pcolor 11]
  if ((stark <= 70) and (stark > 60))
   [set pcolor 12]
  if ((stark <= 80) and (stark > 70))
   [set pcolor 13]
  if ((stark <= 90) and (stark > 80))
   [set pcolor 14]
  if ((stark <= 100) and (stark > 90))
   [set pcolor 15]
  if ((stark <= 110) and (stark > 100))
   [set pcolor 16]
  if ((stark <= 120) and (stark > 110))
   [set pcolor 17]
  if ((stark <= 130) and (stark > 120))
   [set pcolor 18]
  if ((stark <= 140) and (stark > 130))
   [set pcolor 19]
  if (stark <= 200) and (stark > 140)
   [set pcolor 92]
  if (stark <= 300) and (stark > 200)
   [set pcolor 94]
  if (stark <= 400) and (stark > 300)
   [set pcolor 96]
  if (stark > 400)
   [set pcolor 98]
```

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  ]
end

to durchschnitt
 set schnitt 0
 ask patches
 [
   if (stark > 20)
   [set schnitt (schnitt + stark)]
 ]
 set schnitt (schnitt / count patches with [stark > 20])
end

to gut_schnitt
  set g_schnitt 0
  set g_alle 0
  ask patches
  [
   if ((stark > 20) and (helpoverlike = 60))
   [set g_schnitt (g_schnitt + stark)
    set g_alle (g_alle + stark)
   ]
 ]

 if (count patches with [(helpoverlike = 60)]) != 0
  [set g_schnitt (g_schnitt / count patches with [(stark > 20) and
(helpoverlike = 60)])]
end

to bad_schnitt
 set b_schnitt 0
 set b_alle 0
 ask patches
  [
   if ((stark > 20) and (helpoverlike > 60))
   [set b_schnitt (b_schnitt + stark)
    set b_alle (b_alle + stark)
   ]
 ]
 set b_schnitt (b_schnitt / count patches with [(stark > 20) and
(helpoverlike > 60)])
end


to plotten
 set-current-plot "Gut/ Böse, Anzahl"
  set-current-plot-pen "Gute"
   plot count patches with [(helpoverlike = 60) and (stark > 20)]
  set-current-plot-pen "Böse"
   plot count patches with [(helpoverlike > 60) and (stark > 20)]
 set-current-plot "Mittlere Stärken"
  set-current-plot-pen "Schnitt"
   plot schnitt
  set-current-plot-pen "Gut_Schnitt"
   plot g_schnitt
  set-current-plot-pen "Böse_Schnitt"
   plot b_schnitt
 set-current-plot "Stärke Gut/ Böse, akkumuliert"
    set-current-plot-pen "Gut_Alle"
     plot g_alle
    set-current-plot-pen "Böse_Alle"
     plot b_alle
end
```