
Генерация полных предпочтений $n \times n$

In[]:=

```
Clear@gen
gen[m_] := Module[{distr, mlst = {}, wlst = {}, mProfile = <| |>, wProfile = <| |>},
  For[i = 1, i ≤ m, i++,
    AppendTo[mlst, "m" <> ToString[i]];
    AppendTo[wlst, "w" <> ToString[i]];
  For[i = 1, i ≤ m, i++,
    AppendTo[mProfile, mlst[[i]] → <| "Preferences" → RandomSample@wlst, "Quota" → 1|>];
    AppendTo[wProfile,
      wlst[[i]] → <| "Preferences" → RandomSample@mlst, "Quota" → 1|>];
  distr = SortBy[Transpose@{RandomSample@mlst, RandomSample@wlst}, First];
  {mProfile, wProfile, distr}]
```

Поиск блокирующих пар

In[]:=

```
Clear@checkMW
checkMW[mProfile_, wProfile_, distr_] :=
Module[{lstCheck, lstStep, m, pairs = {}, lstStep2, lstCheck2},
  For[i = 1, i ≤ Length@mProfile, i++,
    m = "m" <> ToString[i];
    lstStep = mProfile[m, "Preferences"];
    lstCheck =
      lstStep[[1 ;; (Position[lstStep, Cases[distr, {m, _}]][[1, 2]]][[1, 1]] - 1]];
    For[j = 1, j ≤ Length@lstCheck, j++,
      lstStep2 = wProfile[lstCheck[[j]], "Preferences"];
      lstCheck2 = lstStep2[[
        1 ;; Position[lstStep2, Cases[distr, {_, lstCheck[[j]]}][[1, 1]]][[1, 1]] - 1]];
      If[Intersection[{m}, lstCheck2] ≠ {}, AppendTo[pairs, {m, lstCheck[[j]]}]];
    If[pairs == {}, True, pairs]
  ]
```

Алгоритм Гейла-Шепли

```

In[ ]:= Clear@galeShapley
galeShapley[mProfile_, wProfile_, s_] :=
Module[{pairs = {}, main, to, mainS, toS, k = 0},
  If[s == "m",
    main = Keys[mProfile];
    to = Keys[wProfile];
    mainS = mProfile;
    toS = wProfile;
    main = Keys[wProfile];
    to = Keys[mProfile];
    mainS = wProfile;
    toS = mProfile];
  While[Length@pairs ≠ Length@main,
    k++;
    For[i = 1, i ≤ Length@main, i++,
      If[Intersection[Flatten[pairs], {main[[i]]}] == {},
        For[j = 1, j ≤ Length@main, j++,
          If[Intersection[
            toS[{mainS[main[[i]], "Preferences"]}[[j]], "Preferences"], {main[[i]]}] ≠ {},
            toS[{mainS[main[[i]], "Preferences"]}[[j]]] =
              <|"Preferences" → toS[{mainS[main[[i]], "Preferences"]}[[j]], "Preferences"][[
                1 ;; Position[toS[{mainS[main[[i]], "Preferences"]}[[
                  j]], "Preferences"], main[[i]]][1, 1]], "Quota" → 1|>;
            If[s == "m", pairs = DeleteCases[pairs, {_, (mainS[main[[i]],
              "Preferences")}[[j]]],
              pairs = DeleteCases[pairs, {_, (mainS[main[[i]], "Preferences")}[[j]]]];
            AppendTo[pairs, {main[[i]], (mainS[main[[i]], "Preferences")}[[j]]];
            j = Length@main + 1;
          ]]]];
  ];
  SortBy[pairs, First]

```

Test 1

```

In[ ]:= mProfile = <|
  "m1" → <|"Preferences" → {"w2", "w3", "w1"}, "Quota" → 1|>,
  "m2" → <|"Preferences" → {"w3", "w1", "w2"}, "Quota" → 1|>,
  "m3" → <|"Preferences" → {"w3", "w2", "w1"}, "Quota" → 1|>
  |>;

In[ ]:= wProfile = <|
  "w1" → <|"Preferences" → {"m3", "m1", "m2"}, "Quota" → 1|>,
  "w2" → <|"Preferences" → {"m2", "m3", "m1"}, "Quota" → 1|>,
  "w3" → <|"Preferences" → {"m1", "m2", "m3"}, "Quota" → 1|>
  |>;

In[ ]:= galeShapley[mProfile, wProfile, "m"]
Out[ ]:= {{m1, w3}, {m2, w1}, {m3, w2}}

```

```

In[ ]:= checkMW[mProfile, wProfile, {"m1", "w3"}, {"m2", "w1"}, {"m3", "w2"}]
Out[ ]:= True

In[ ]:= galeShapley[mProfile, wProfile, "w"]
Out[ ]:= {{w1, m3}, {w2, m2}, {w3, m1}}

In[ ]:= checkMW[mProfile, wProfile,
  SortBy[{#[[2]], #[[1]]} & /@ {"w1", "m3"}, {"w2", "m2"}, {"w3", "m1"}], 1]]
Out[ ]:= True

```

Test 2

```

In[ ]:= res = {<| "m1" → <| "Preferences" → {"w5", "w1", "w4", "w2", "w3"}, "Quota" → 1 |>,
  "m2" → <| "Preferences" → {"w1", "w5", "w3", "w4", "w2"}, "Quota" → 1 |>,
  "m3" → <| "Preferences" → {"w3", "w1", "w5", "w2", "w4"}, "Quota" → 1 |>,
  "m4" → <| "Preferences" → {"w5", "w2", "w4", "w3", "w1"}, "Quota" → 1 |>,
  "m5" → <| "Preferences" → {"w1", "w4", "w2", "w3", "w5"}, "Quota" → 1 |> |>,
  <| "w1" → <| "Preferences" → {"m1", "m4", "m2", "m3", "m5"}, "Quota" → 1 |>,
  "w2" → <| "Preferences" → {"m5", "m4", "m3", "m1", "m2"}, "Quota" → 1 |>,
  "w3" → <| "Preferences" → {"m2", "m4", "m3", "m1", "m5"}, "Quota" → 1 |>,
  "w4" → <| "Preferences" → {"m1", "m5", "m2", "m4", "m3"}, "Quota" → 1 |>,
  "w5" → <| "Preferences" → {"m2", "m1", "m3", "m5", "m4"}, "Quota" → 1 |> |>,
  {"m1", "w3"}, {"m2", "w5"}, {"m3", "w1"}, {"m4", "w4"}, {"m5", "w2"} |>};

In[ ]:= galeShapley[res[[1]], res[[2]], "m"]
Out[ ]:= {{m1, w5}, {m2, w1}, {m3, w3}, {m4, w2}, {m5, w4}}

In[ ]:= checkMW[res[[1]], res[[2]],
  {"m1", "w5"}, {"m2", "w1"}, {"m3", "w3"}, {"m4", "w2"}, {"m5", "w4"}]
Out[ ]:= True

In[ ]:= galeShapley[res[[1]], res[[2]], "w"]
Out[ ]:= {{w1, m1}, {w2, m4}, {w3, m3}, {w4, m5}, {w5, m2}}

In[ ]:= checkMW[res[[1]], res[[2]], SortBy[{#[[2]], #[[1]]} & /@
  {"w1", "m1"}, {"w2", "m4"}, {"w3", "m3"}, {"w4", "m5"}, {"w5", "m2"}], 1]]
Out[ ]:= True

```

```
In[ ]:= res2 = gen[5]
```

```
Out[ ]:= {<| m1 → <| Preferences → {w2, w1, w4, w3, w5}, Quota → 1 |>,
  m2 → <| Preferences → {w3, w4, w5, w2, w1}, Quota → 1 |>,
  m3 → <| Preferences → {w4, w5, w2, w3, w1}, Quota → 1 |>,
  m4 → <| Preferences → {w5, w1, w3, w2, w4}, Quota → 1 |>,
  m5 → <| Preferences → {w4, w5, w2, w3, w1}, Quota → 1 |> |>,
  <| w1 → <| Preferences → {m5, m2, m3, m4, m1}, Quota → 1 |>,
  w2 → <| Preferences → {m2, m5, m3, m4, m1}, Quota → 1 |>,
  w3 → <| Preferences → {m4, m5, m2, m3, m1}, Quota → 1 |>,
  w4 → <| Preferences → {m3, m4, m1, m2, m5}, Quota → 1 |>,
  w5 → <| Preferences → {m5, m4, m2, m1, m3}, Quota → 1 |> |>,
  {{m1, w2}, {m2, w4}, {m3, w1}, {m4, w3}, {m5, w5}}}
```

```
In[ ]:= galeShapley[res2[[1]], res2[[2]], "m"]
```

```
Out[ ]:= {{m1, w2}, {m2, w3}, {m3, w4}, {m4, w1}, {m5, w5}}
```

```
In[ ]:= checkMW[res2[[1]], res2[[2]],
  {"m1", "w2"}, {"m2", "w3"}, {"m3", "w4"}, {"m4", "w1"}, {"m5", "w5"}]
```

```
Out[ ]:= True
```

```
In[ ]:= galeShapley[res2[[1]], res2[[2]], "w"]
```

```
Out[ ]:= {{w1, m4}, {w2, m1}, {w3, m2}, {w4, m3}, {w5, m5}}
```

```
In[ ]:= checkMW[res2[[1]], res2[[2]], SortBy[{#[[2]], #[[1]]} & /@
  {"w1", "m4"}, {"w2", "m1"}, {"w3", "m2"}, {"w4", "m3"}, {"w5", "m5"}], 1]]
```

```
Out[ ]:= True
```