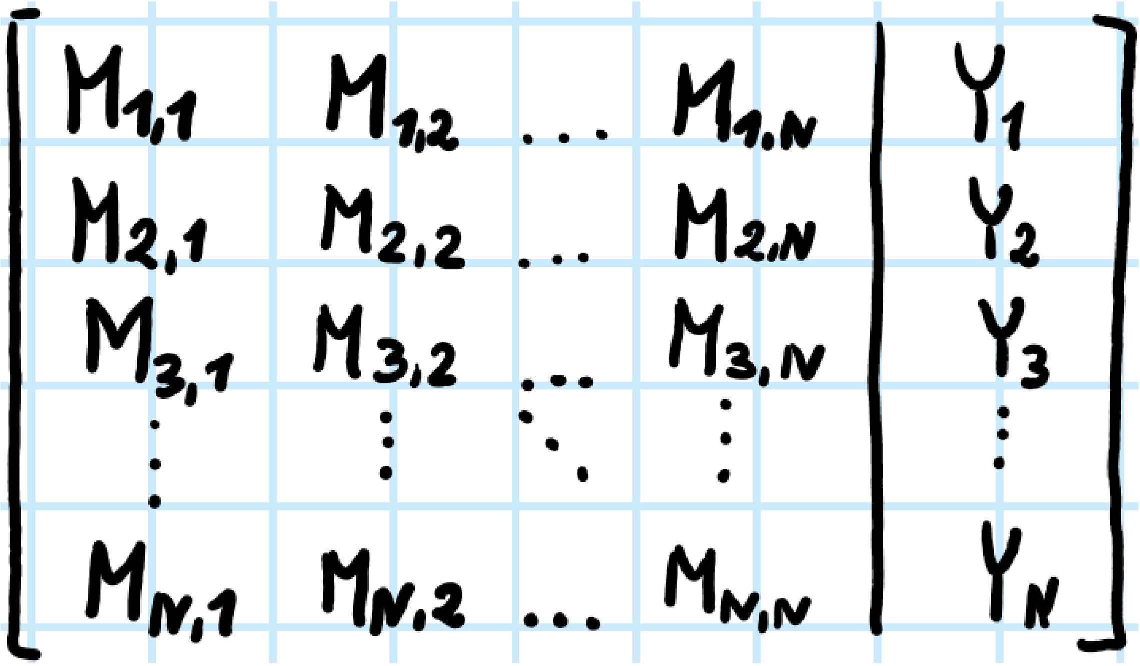
1. Dane:

Mamy daną macierz rozmiaru NxN (gdzie N∈N) postaci:



Rysunek 1. Macierz zadania

gdzie:

$$(\forall i, j \in [1, N], i, j \in \mathbb{N}_{+}) : Mi, j - element\ macierzy$$

$$(\forall k \in \mathbb{N}_{+}, k \in [1, N]) : Yk - element\ wektora\ wynikowego$$

W rozwiązaniu zadania możemy potraktować Y_i jako $M_{i,N+1}$

2. Podstawowe niepodzielne zadania obliczeniowe:

Wyznaczamy następujące niepodzielne zadania obliczeniowe, za pomocą których rozwiążemy wyżej przedstawiony układ:

- $A_{i,k}$ - znalezienie mnożnika dla wiersza **i-tego** do odejmowania go od wiersza **k-tego** i przypisanie go do zmiennej mk,i:

$$m_{k,i} = \frac{M_{k,i}}{M_{i,i}}$$

Wzór 1. Niepodzielne zadanie obliczeniowe $A_{i,k}$

- $B_{i,j,k}$ - pomnożenie **j-tego** elementu wiersza **i-tego** przez mnożnik (posłuży do odejmowania od **k-tego** wiersza) i przypisanie do zmiennej $n_{k,i}$:

$$n_{k,i} = M_{i,j} \cdot m_{k,i}$$

Wzór 2. Niepodzielne zadanie obliczeniowe $B_{i,j,k}$

- $C_{i,j,k}$ - odjęcie **j-tego** elementu wiersza **i-tego** od wiersza **k-tego**:

$$M_{k,j} = M_{k,j}\ -\ n_{k,i}$$

Wzór 3. Niepodzielne zadanie obliczeniowe $C_{i,j,k}$

3. Alfabet w sensie teorii śladów na podstawie niepodzielnych zadań obliczeniowych:

Załóżmy, że w ogólnym przypadku zawsze będziemy używać wiersza i-tego (i∈[1,N-1]) do "wyprodukowania" zer w kolumnie **i-tej**. Zatem wiersz **i-ty** posłuży do "wyprodukowania" zer w kolumnie **i-tej** wierszy od i+1 do N.

Stąd wyznaczamy alfabet Σ:

$$\Sigma = \{A_{1,2}, B_{1,1,2}, C_{1,1,2}, B_{1,2,2}, \ldots, B_{1,N+1,2}, C_{1,N+1,2}, A_{1,3}, B_{1,1,3}, \ldots, \\ A_{1,N}, B_{1,1,N}, C_{1,1,N}, \ldots, B_{1,N+1,N}, C_{1,N+1,N}, A_{2,3}, \ldots, A_{N-1,N}, \\ B_{N-1,1,N}, \ldots, B_{N-1,N+1,N}, C_{N-1,N+1,N}\}$$

Powyższe zapisujemy w łatwiejszej do interpretacji postaci:

$$\Sigma = \Sigma_1 \cup \Sigma_2 \cup \Sigma_3$$

gdzie:

$$\Sigma_1 = \{A_{i,j} : i = 1, \ldots, N-1; j = i+1, \ldots, N\} \\ \Sigma_2 = \{B_{i,j,k} : i = 1, \ldots, N-1; j = i, \ldots, N+1; k = i+1, \ldots, N\} \\ \Sigma_3 = \{C_{i,j,k} : i = 1, \ldots, N-1; j = i, \ldots, N+1; k = i+1, \ldots, N\}$$

Wzór 4. Alfabet Σ

4. Relacja zależności D dla alfabetu opisującego algorytm eliminacji Gaussa:

Zapiszmy relację zależności w postaci ogólnej:

$$D = sym\{D_1 \cup D_2 \cup D_3 \cup D_4 \cup D_5 +\} \cup I_A$$

Wzór 5. Wzór ogólny relacji zależności D.

gdzie:

- "+" - relacje przechodnie nie są bezpośrednio uwzględnione w D
- $$D_1 = \{(A_{i,j}, B_{i,j,k}) : i = 1, \ldots, N-1; j = i+1, \ldots, N; k = i, \ldots, N+1\}$$

  Co jest równoważne następującej równoważności:

  A jest zależne od B ⇔ $i_A = i_B \land k_A = k_B$

- $$D_2 = \{(B_{i,j,k}, C_{i,j,k}) : i = 1, \ldots, N-1; j = i, \ldots, N+1; k = i+1, \ldots, N\} \\ D_3 = \{(C_{i-1,j,i}, B_{i,j,k}) : i = 2, \ldots, N-1; j = i+1, \ldots, N+1; k = i+1, \ldots, N\}$$

  D_3 wynika z faktu, że chcąc wyznaczyć $B_{x,y,z}$ potrzebujemy mieć wcześniej $M_{x,y}$ oraz $A_{x,z}$. $M_{x,y}$ otrzymamy z wykonania odpowiedniego zadania C. Parę ($A_{x,z}$, $B_{x,y,z}$) otrzymamy z relacji D_1. Z kolei niektóre zadania C mogą być w relacji D_4 z zadaniem $A_{x,z}$, więc takie zadania C wykluczamy, ponieważ relacja tych zadań C z $B_{x,y,z}$ będzie wynikała z przechodniości. Pozostałe pary (C, $B_{x,y,z}$) zostaną wliczone do relacji D_3.
  Relacje D_2 i D_3 można zapisać w postaci równoważności:

  B jest zależne od C ⇔ $(i_B = i_C \land j_B = j_C \land k_B = k_C) \lor (i_B = k_C \land j_B = j_C)$

- $$D_4 = \{(C_{i,j,j}, A_{j,k}), (C_{i,j,k}, A_{j,k}) : i = 1, \ldots, N-1; j = i+1, \ldots, N-1; k = j+1, \ldots, N\}$$

  D_4 wynika z faktu, że chcąc wyznaczyć $A_{i,j}$ musimy znać $M_{j,i}$ oraz $M_{i,i}$, które muszą pochodzić z poprzednich operacji (poprzedzających wyznaczenie $A_{i,j}$).

  Powyższy zapis relacji D4 można zapisać również jako:

  C jest zależne od A ⇔ $i_A = j_C \land (k_A = k_C \lor i_A = k_C)$

- $$D_5 = \{(C_{i-1,j,k}, C_{i,j,k}) : i = 2, \ldots, N-1; j = k, \ldots, N+1; k = i+1, \ldots, N\}$$

  Relacja D_5 wynika stąd, że chcąc wyznaczyć $C_{i,j,k}$ (wykonać odejmowanie w $M_{k,j}$) możemy potrzebować aktualnego $M_{k,j}$ (przed wykonaniem odejmowania). Zatem możemy potrzebować $C_{i-1,j,k}$. Natomiast niektóre takie pary mogą wynikać z przechodniości ($C_{i-1,j,k}$ -> $A_{j,k}$ -> $B_{j,x,k}$ -> $C_{j,x,k}$), więc żeby wyeliminować takie pary ustawiamy dolne ograniczenie na "j" równe k, dzięki czemu zostaną same pary zadań C, które nie wynikają z przechodniości (bo nie istnieją takie $A_{j,k}$ gdzie j >= k).

  Powyższy zapis relacji D5 można zapisać również jako (z pominięciem relacji zadania C z samym sobą):

C_1 jest zależne od $C_2 \Leftrightarrow j_{C_1} = j_{C_2} \wedge k_{C_1} = k_{C_2} \wedge i_{C_1}-1 = i_{C_2}$

- I_A - uwzględnia relacje zadania z samym sobą

5. Algorytm eliminacji Gaussa w postaci ciągu symboli (zadań obliczeniowych):

Przeprowadzając algorytm eliminacji Gaussa zerujemy elementy pod przekątną kolumna po kolumnie przesuwając się po przekątnej. Dla każdego elementu na przekątnej zerujemy wszystkie elementy w danej kolumnie poprzez odejmowanie wiersza, w którym dany element się znajduje od wiersza, w którym znajduje się analizowany element na przekątnej. Wyznaczenie ciągu zadań obliczeniowych może więc przebiegać następująco (algorytm wyznaczania ciągu):

```
dla wierszy i = 1, ..., N-1: // kolejność "i" ma znaczenie
    dla wierszy k = i+1, ..., N: // kolejność "k" nie ma znaczenia wzgl. "i", ale ma znaczenie dla "j"
        Wyznacz Ai,k
        dla kolumn j = i, ..., N+1: //kolejność "j" nie ma znaczenia
            Wyznacz Bi,j,k
            Wyznacz Ci,j,k
```

Algorytm wyznaczania ciągu zadań obliczeniowych.

Z powyższego algorytmu otrzymamy ciąg zadań obliczeniowych. Warto również zauważyć, że zadania $A_{i,k}$ mogą wykonywać się równolegle (w dowolnej kolejności) względem k. Tak samo para zadań $B_{i,j,k}$ i $C_{i,j,k}$ może wykonywać się równolegle względem j.

6. Graf zależności Diekerta:

Wierzchołkami grafu Diekerta będą wszystkie elementy z alfabetu. Natomiast, żeby wyznaczyć zbiór krawędzi, zauważamy, że krawędziami skierowanymi będą następujące pary operacji bezpośrednio zależnych (bez uwzględniania przechodniości):

$$E = E_1 \cup E_2 \cup E_3 \cup E_4 \cup E_5$$

Wzór 6. Zbiór krawędzi skierowanych grafu Diekerta

gdzie:

$$\begin{gathered}
E_1 = \{(A,B) : i_A = i_B \ \wedge \ \ k_A = k_B\} \\
E_2 = \{(B,C) : i_B = i_C \ \wedge \ \ j_B = j_C \ \wedge \ \ k_B = k_C\} \\
E_3 = \{(C,B) : i_B = k_C \ \wedge \ \ j_B = j_C \ \wedge \ \ i_C = i_B - 1 \ \wedge \ \ j_C \neq i_B\} \\
E_4 = \{(C,A) : i_A = j_C \ \wedge \ \ (k_A = k_C \vee i_A = k_C) \wedge i_C = i_A - 1\} \\
E_5 = \{(C_1,C_2) : j_{C_1} = j_{C_2} \ \wedge \ \ k_{C_1} = k_{C_2} \ \wedge \ \ i_{C_1} = i_{C_2} - 1 \wedge i_{C_1} \neq i_{C_2}\}
\end{gathered}$$

7. Postać normalna Foaty:

Postać normalną Foaty można przedstawić w następujący sposób:

$$FNF = [F_{A_1}]^\frown[F_{B_1}]^\frown[F_{C_1}]^\frown[F_{A_2}]^\frown[F_{B_2}]^\frown[F_{C_2}]^\frown\ldots^\frown[F_{A_{N-1}}]^\frown[F_{B_{N-1}}]^\frown[F_{C_{N-1}}]$$

Wzór 7. Postać normalna Foaty

gdzie:

$$\begin{gathered}
F_{A_k} = \{A_{k,l} : l = k+1,\ldots,N\} \\
F_{B_k} = \{B_{k,m,l} : m = 1,2,\ldots,N; l = k+1,\ldots,N\} \\
F_{C_k} = \{C_{k,m,l} : m = 1,2,\ldots,N; l = k+1,\ldots,N\}
\end{gathered}$$

8. Część implementacyjna - przedstawienie wyników:

- **N=2**
  - Alfabet

$$A = \{A_{1,2}; B_{1,1,2}; C_{1,1,2}; B_{1,2,2}; C_{1,2,2}; B_{1,3,2}; C_{1,3,2}\}$$

  - Relacja zależności

$$D = \{(A_{1,2}, A_{1,2}); (A_{1,2}, B_{1,1,2}); (A_{1,2}, C_{1,1,2});$$
$$(A_{1,2}, B_{1,2,2}); (A_{1,2}, B_{1,3,2}); (B_{1,1,2}, A_{1,2}); (B_{1,1,2}, B_{1,1,2});$$
$$(B_{1,1,2}, C_{1,1,2}); (C_{1,1,2}, A_{1,2}); (C_{1,1,2}, B_{1,1,2}); (C_{1,1,2}, C_{1,1,2});$$
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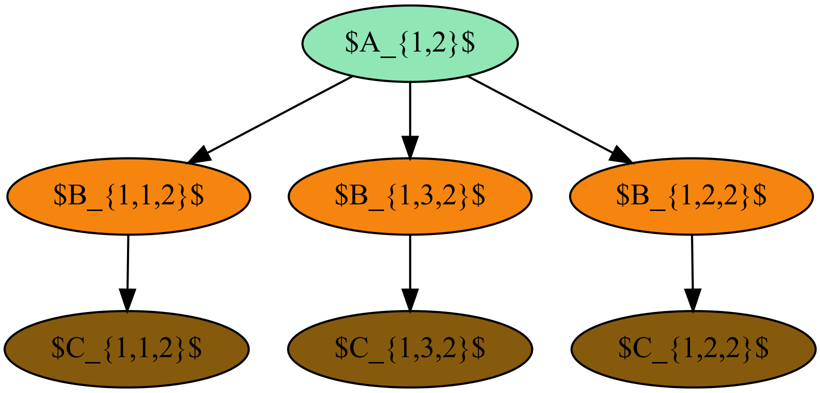
$$(B_{1,3,2}, B_{1,3,2}); (B_{1,3,2}, C_{1,3,2}); (C_{1,3,2}, B_{1,3,2}); (C_{1,3,2}, C_{1,3,2}); +\}$$

- Postać Normalna Foaty

$$FNF = \{[A_{1,2}][B_{1,1,2}; B_{1,2,2}; B_{1,3,2}][C_{1,1,2}; C_{1,2,2}; C_{1,3,2}]\}$$

- Graf Diekerta



- **N=3**
  - Alfabet

$$A = \{A_{1,2}; B_{1,1,2}; C_{1,1,2}; B_{1,2,2}; C_{1,2,2}; B_{1,3,2}; C_{1,3,2};$$
$$B_{1,4,2}; C_{1,4,2}; A_{1,3}; B_{1,1,3}; C_{1,1,3}; B_{1,2,3}; C_{1,2,3};$$
$$B_{1,3,3}; C_{1,3,3}; B_{1,4,3}; C_{1,4,3}; A_{2,3}; B_{2,2,3}; C_{2,2,3}; B_{2,3,3}; C_{2,3,3}; B_{2,4,3}; C_{2,4,3}; \}$$

  - Relacja zależności

$$D = \{(A_{1,2}, A_{1,2}); (A_{1,2}, B_{1,1,2}); (A_{1,2}, C_{1,1,2});$$
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$$(B_{1,2,2}, C_{1,2,2}); (C_{1,2,2}, B_{1,2,2}); (C_{1,2,2}, C_{1,2,2}); (C_{1,2,2}, A_{2,3}); (C_{1,2,2}, B_{2,2,3}); (B_{1,3,2}, A_{1,2}); (B_{1,3,2}, B_{1,3,2});$$
$$(B_{1,3,2}, C_{1,3,2}); (C_{1,3,2}, B_{1,3,2}); (C_{1,3,2}, C_{1,3,2}); (C_{1,3,2}, B_{2,3,3}); (B_{1,4,2}, A_{1,2}); (B_{1,4,2}, B_{1,4,2}); (B_{1,4,2}, C_{1,4,2});$$
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$$(B_{1,1,3}, C_{1,1,3}); (C_{1,1,3}, A_{1,3}); (C_{1,1,3}, B_{1,1,3}); (C_{1,1,3}, C_{1,1,3}); (B_{1,2,3}, A_{1,3}); (B_{1,2,3}, B_{1,2,3}); (B_{1,2,3}, C_{1,2,3});$$
$$(C_{1,2,3}, B_{1,2,3}); (C_{1,2,3}, C_{1,2,3}); (C_{1,2,3}, A_{2,3}); (C_{1,2,3}, C_{2,2,3}); (B_{1,3,3}, A_{1,3}); (B_{1,3,3}, B_{1,3,3}); (B_{1,3,3}, C_{1,3,3});$$
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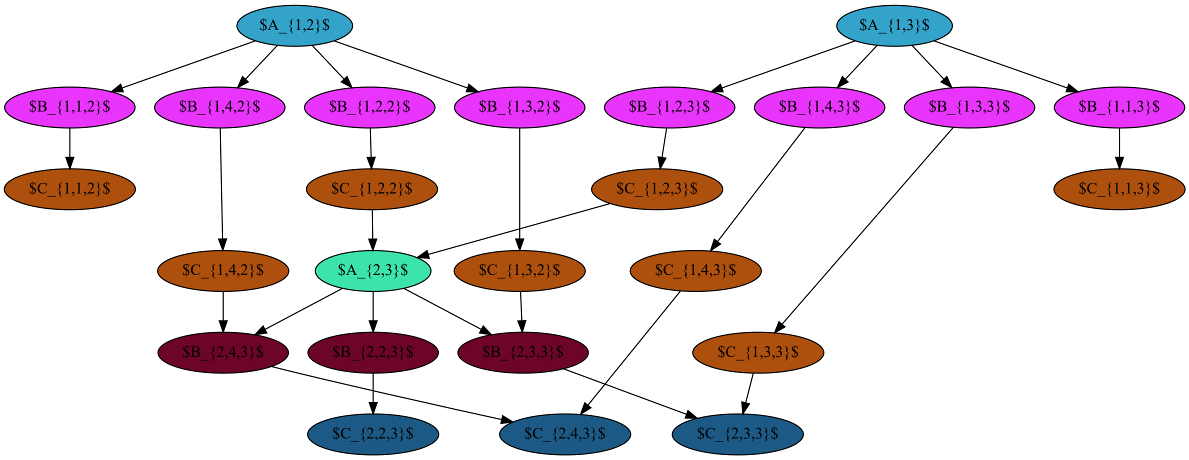
$$(A_{2,3}, B_{2,4,3}); (B_{2,2,3}, C_{1,2,2}); (B_{2,2,3}, A_{2,3});$$
$$(B_{2,2,3}, B_{2,2,3}); (B_{2,2,3}, C_{2,2,3}); (C_{2,2,3}, C_{1,2,3}); (C_{2,2,3}, A_{2,3}); (C_{2,2,3}, B_{2,2,3}); (C_{2,2,3}, C_{2,2,3}); (B_{2,3,3}, C_{1,3,2});$$
$$(B_{2,3,3}, A_{2,3}); (B_{2,3,3}, B_{2,3,3}); (B_{2,3,3}, C_{2,3,3}); (C_{2,3,3}, C_{1,3,3}); (C_{2,3,3}, B_{2,3,3}); (C_{2,3,3}, C_{2,3,3}); (B_{2,4,3}, C_{1,4,2});$$
$$(B_{2,4,3}, A_{2,3}); (B_{2,4,3}, B_{2,4,3}); (B_{2,4,3}, C_{2,4,3}); (C_{2,4,3}, C_{1,4,3}); (C_{2,4,3}, B_{2,4,3}); (C_{2,4,3}, C_{2,4,3}); +\}$$

  - Postać Normalna Foaty

$$FNF = \{[A_{1,2}; A_{1,3};][B_{1,1,2}; B_{1,2,2}; B_{1,3,2}; B_{1,4,2}; B_{1,1,3}; B_{1,2,3}; B_{1,3,3}; B_{1,4,3};]$$
$$[C_{1,1,2}; C_{1,2,2}; C_{1,3,2}; C_{1,4,2}; C_{1,1,3}; C_{1,2,3}; C_{1,3,3}; C_{1,4,3};][A_{2,3};][B_{2,2,3}; B_{2,3,3}; B_{2,4,3};][C_{2,2,3}; C_{2,3,3}; C_{2,4,3};]\}$$

  - Graf Diekerta



- **N=4**
  - Alfabet

$$A = \{A_{1,2}; B_{1,1,2}; C_{1,1,2}; B_{1,2,2}; C_{1,2,2}; B_{1,3,2}; C_{1,3,2}; B_{1,4,2}; C_{1,4,2}; B_{1,5,2}; C_{1,5,2}; A_{1,3}; B_{1,1,3}; C_{1,1,3}; B_{1,2,3}; C_{1,2,3}; B_{1,3,3}; C_{1,3,3}; B_{1,4,3}; C_{1,4,3}; B_{1,5,3}; C_{1,5,3}; A_{1,4}; B_{1,1,4}; C_{1,1,4}; B_{1,2,4}; C_{1,2,4}; B_{1,3,4}; C_{1,3,4}; B_{1,4,4}; C_{1,4,4}; B_{1,5,4}; C_{1,5,4}; A_{2,3}; B_{2,2,3}; C_{2,2,3}; B_{2,3,3}; C_{2,3,3}; B_{2,4,3}; C_{2,4,3}; B_{2,5,3}; C_{2,5,3}; A_{2,4}; B_{2,2,4}; C_{2,2,4}; B_{2,3,4}; C_{2,3,4}; B_{2,4,4}; C_{2,4,4}; B_{2,5,4}; C_{2,5,4}; A_{3,4}; B_{3,3,4}; C_{3,3,4}; B_{3,4,4}; C_{3,4,4}; B_{3,5,4}; C_{3,5,4}; \}$$

  - Relacja zależności

$$\begin{gathered}
D = \{(A_{1,2}, A_{1,2}); (A_{1,2}, B_{1,1,2}); (A_{1,2}, C_{1,1,2}); (A_{1,2}, B_{1,2,2}); (A_{1,2}, B_{1,3,2}); \\
(A_{1,2}, B_{1,4,2}); (A_{1,2}, B_{1,5,2}); (B_{1,1,2}, A_{1,2}); (B_{1,1,2}, B_{1,1,2}); (B_{1,1,2}, C_{1,1,2}); \\
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(C_{1,2,2}, A_{2,4}); (C_{1,2,2}, B_{2,2,4}); (B_{1,3,2}, A_{1,2}); (B_{1,3,2}, B_{1,3,2}); (B_{1,3,2}, C_{1,3,2}); \\
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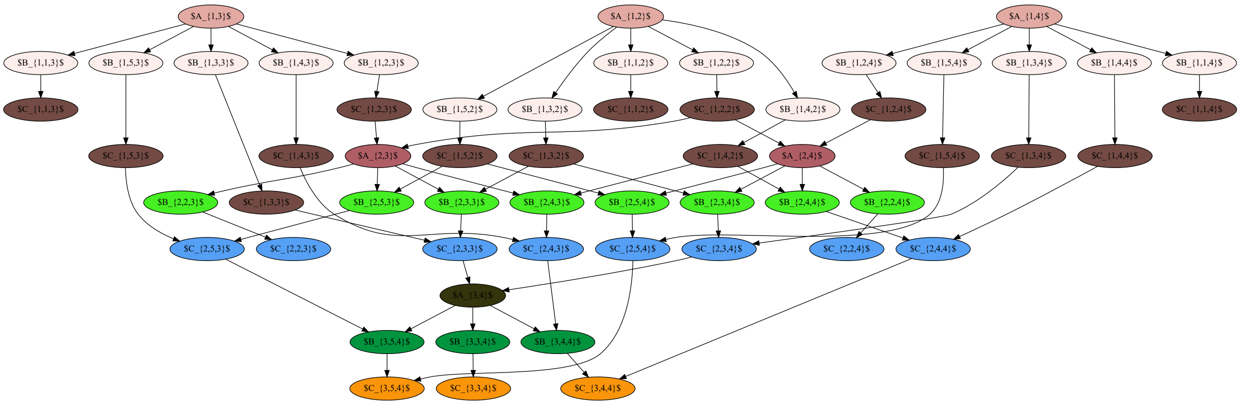
(A_{1,3}, C_{1,1,3}); (A_{1,3}, B_{1,2,3}); (A_{1,3}, B_{1,3,3}); (A_{1,3}, B_{1,4,3}); (A_{1,3}, B_{1,5,3}); (B_{1,1,3}, A_{1,3}); (B_{1,1,3}, B_{1,1,3}); \\
(B_{1,1,3}, C_{1,1,3}); (C_{1,1,3}, A_{1,3}); (C_{1,1,3}, B_{1,1,3}); (C_{1,1,3}, C_{1,1,3}) \\
(B_{1,2,3}, A_{1,3}); (B_{1,2,3}, B_{1,2,3}); (B_{1,2,3}, C_{1,2,3}); (C_{1,2,3}, B_{1,2,3}); (C_{1,2,3}, C_{1,2,3}) \\
(C_{1,2,3}, A_{2,3}); (C_{1,2,3}, C_{2,2,3}); (B_{1,3,3}, A_{1,3}); (B_{1,3,3}, B_{1,3,3}); (B_{1,3,3}, C_{1,3,3}) \\
(C_{1,3,3}, B_{1,3,3}); (C_{1,3,3}, C_{1,3,3}); (C_{1,3,3}, C_{2,3,3}); (C_{1,3,3}, A_{3,4}); (C_{1,3,3}, B_{3,3,4}) \\
(B_{1,4,3}, A_{1,3}); (B_{1,4,3}, B_{1,4,3}); (B_{1,4,3}, C_{1,4,3}); (C_{1,4,3}, B_{1,4,3}); (C_{1,4,3}, C_{1,4,3}) \\
(C_{1,4,3}, C_{2,4,3}); (C_{1,4,3}, B_{3,4,4}); (B_{1,5,3}, A_{1,3}); (B_{1,5,3}, B_{1,5,3}); (B_{1,5,3}, C_{1,5,3}) \\
(C_{1,5,3}, B_{1,5,3}); (C_{1,5,3}, C_{1,5,3}); (C_{1,5,3}, C_{2,5,3}); (C_{1,5,3}, B_{3,5,4}); (A_{1,4}, A_{1,4}) \\
(A_{1,4}, B_{1,1,4}); (A_{1,4}, C_{1,1,4}); (A_{1,4}, B_{1,2,4}); (A_{1,4}, B_{1,3,4}); (A_{1,4}, B_{1,4,4}) \\
(A_{1,4}, B_{1,5,4}); (B_{1,1,4}, A_{1,4}); (B_{1,1,4}, B_{1,1,4}); (B_{1,1,4}, C_{1,1,4}); (C_{1,1,4}, A_{1,4}); (C_{1,1,4}, B_{1,1,4}) \\
(C_{1,1,4}, C_{1,1,4}); (B_{1,2,4}, A_{1,4}); (B_{1,2,4}, B_{1,2,4}); (B_{1,2,4}, C_{1,2,4}); (C_{1,2,4}, B_{1,2,4}) \\
(C_{1,2,4}, C_{1,2,4}); (C_{1,2,4}, A_{2,4}); (C_{1,2,4}, C_{2,2,4}); (B_{1,3,4}, A_{1,4}); (B_{1,3,4}, B_{1,3,4}) \\
(B_{1,3,4}, C_{1,3,4}); (C_{1,3,4}, B_{1,3,4}); (C_{1,3,4}, C_{1,3,4}); (C_{1,3,4}, C_{2,3,4}); (C_{1,3,4}, A_{3,4}) \\
(C_{1,3,4}, C_{3,3,4}); (B_{1,4,4}, A_{1,4}); (B_{1,4,4}, B_{1,4,4}); (B_{1,4,4}, C_{1,4,4}); (C_{1,4,4}, B_{1,4,4}) \\
(C_{1,4,4}, C_{1,4,4}); (C_{1,4,4}, C_{2,4,4}); (C_{1,4,4}, C_{3,4,4}); (B_{1,5,4}, A_{1,4}); (B_{1,5,4}, B_{1,5,4}) \\
(B_{1,5,4}, C_{1,5,4}); (C_{1,5,4}, B_{1,5,4}); (C_{1,5,4}, C_{1,5,4}); (C_{1,5,4}, C_{2,5,4}); (C_{1,5,4}, C_{3,5,4} \\
(A_{2,3}, C_{1,2,2}); (A_{2,3}, C_{1,2,3}); (A_{2,3}, A_{2,3}); (A_{2,3}, B_{2,2,3}); (A_{2,3}, C_{2,2,3}) \\
(A_{2,3}, B_{2,3,3}); (A_{2,3}, B_{2,4,3}); (A_{2,3}, B_{2,5,3}); (B_{2,2,3}, C_{1,2,2}); (B_{2,2,3}, A_{2,3}); (B_{2,2,3}, B_{2,2,3} \\
(B_{2,2,3}, C_{2,2,3}); (C_{2,2,3}, C_{1,2,3}); (C_{2,2,3}, A_{2,3}); (C_{2,2,3}, B_{2,2,3}) \\
(C_{2,2,3}, C_{2,2,3}); (B_{2,3,3}, C_{1,3,2}); (B_{2,3,3}, A_{2,3}); (B_{2,3,3}, B_{2,3,3}); (B_{2,3,3}, C_{2,3,3}) \\
(C_{2,3,3}, C_{1,3,3}); (C_{2,3,3}, B_{2,3,3}); (C_{2,3,3}, C_{2,3,3}); (C_{2,3,3}, A_{3,4}); (C_{2,3,3}, B_{3,3,4}) \\
(B_{2,4,3}, C_{1,4,2}); (B_{2,4,3}, A_{2,3}); (B_{2,4,3}, B_{2,4,3}); (B_{2,4,3}, C_{2,4,3}); (C_{2,4,3}, C_{1,4,3}) \\
(C_{2,4,3}, B_{2,4,3}); (C_{2,4,3}, C_{2,4,3}); (C_{2,4,3}, B_{3,4,4}); (B_{2,5,3}, C_{1,5,2}); (B_{2,5,3}, A_{2,3}) \\
(B_{2,5,3}, B_{2,5,3}); (B_{2,5,3}, C_{2,5,3}); (C_{2,5,3}, C_{1,5,3}); (C_{2,5,3}, B_{2,5,3}); (C_{2,5,3}, C_{2,5,3}) \\
(C_{2,5,3}, B_{3,5,4}); (A_{2,4}, C_{1,2,2}); (A_{2,4}, C_{1,2,4}); (A_{2,4}, A_{2,4}); (A_{2,4}, B_{2,2,4}); (A_{2,4}, C_{2,2,4} \\
(A_{2,4}, B_{2,3,4}); (A_{2,4}, B_{2,4,4}); (A_{2,4}, B_{2,5,4}); (B_{2,2,4}, C_{1,2,2}); (B_{2,2,4}, A_{2,4}) \\
(B_{2,2,4}, B_{2,2,4}); (B_{2,2,4}, C_{2,2,4}); (C_{2,2,4}, C_{1,2,4}); (C_{2,2,4}, A_{2,4}); (C_{2,2,4}, B_{2,2,4}) \\
(C_{2,2,4}, C_{2,2,4}); (B_{2,3,4}, C_{1,3,2}); (B_{2,3,4}, A_{2,4}); (B_{2,3,4}, B_{2,3,4}); (B_{2,3,4}, C_{2,3,4}) \\
(C_{2,3,4}, C_{1,3,4}); (C_{2,3,4}, B_{2,3,4}); (C_{2,3,4}, C_{2,3,4}); (C_{2,3,4}, A_{3,4}); (C_{2,3,4}, C_{3,3,4}) \\
(B_{2,4,4}, C_{1,4,2}); (B_{2,4,4}, A_{2,4}); (B_{2,4,4}, B_{2,4,4}); (B_{2,4,4}, C_{2,4,4}); (C_{2,4,4}, C_{1,4,4}) \\
(C_{2,4,4}, B_{2,4,4}); (C_{2,4,4}, C_{2,4,4}); (C_{2,4,4}, C_{3,4,4}); (B_{2,5,4}, C_{1,5,2}); (B_{2,5,4}, A_{2,4}) \\
(B_{2,5,4}, B_{2,5,4}); (B_{2,5,4}, C_{2,5,4}); (C_{2,5,4}, C_{1,5,4}); (C_{2,5,4}, B_{2,5,4}); (C_{2,5,4}, C_{2,5,4} \\
(C_{2,5,4}, C_{3,5,4}); (A_{3,4}, C_{1,3,3}); (A_{3,4}, C_{1,3,4}); (A_{3,4}, C_{2,3,3}); (A_{3,4}, C_{2,3,4}); (A_{3,4}, A_{3,4} \\
(A_{3,4}, B_{3,3,4}); (A_{3,4}, C_{3,3,4}); (A_{3,4}, B_{3,4,4}); (A_{3,4}, B_{3,5,4}); (B_{3,3,4}, C_{1,3,3}) \\
(B_{3,3,4}, C_{2,3,3}); (B_{3,3,4}, A_{3,4}); (B_{3,3,4}, B_{3,3,4}); (B_{3,3,4}, C_{3,3,4}); (C_{3,3,4}, C_{1,3,4}) \\
(C_{3,3,4}, C_{2,3,4}); (C_{3,3,4}, A_{3,4}); (C_{3,3,4}, B_{3,3,4}); (C_{3,3,4}, C_{3,3,4}); (B_{3,4,4}, C_{1,4,3}) \\
(B_{3,4,4}, C_{2,4,3}); (B_{3,4,4}, A_{3,4}); (B_{3,4,4}, B_{3,4,4}); (B_{3,4,4}, C_{3,4,4}); (C_{3,4,4}, C_{1,4,4}) \\
(C_{3,4,4}, C_{2,4,4}); (C_{3,4,4}, B_{3,4,4}); (C_{3,4,4}, C_{3,4,4}); (B_{3,5,4}, C_{1,5,3}); (B_{3,5,4}, C_{2,5,3}) \\
(B_{3,5,4}, A_{3,4}); (B_{3,5,4}, B_{3,5,4}); (B_{3,5,4}, C_{3,5,4}); (C_{3,5,4}, C_{1,5,4}); (C_{3,5,4}, C_{2,5,4}) \\
(C_{3,5,4}, B_{3,5,4}); (C_{3,5,4}, C_{3,5,4}); +\}
\end{gathered}$$

- Postać Normalna Foaty

$$\begin{gathered}
FNF = \{[A_{1,2}; A_{1,3}; A_{1,4};][B_{1,1,2}; B_{1,2,2}; B_{1,3,2}; B_{1,4,2}; B_{1,5,2}; B_{1,1,3}; B_{1,2,3}; \\
B_{1,3,3}; B_{1,4,3}; B_{1,5,3}; B_{1,1,4}; B_{1,2,4}; B_{1,3,4}; B_{1,4,4}; B_{1,5,4};][C_{1,1,2}; C_{1,2,2}; C_{1,3,2}; \\
C_{1,4,2}; C_{1,5,2}; C_{1,1,3}; C_{1,2,3}; C_{1,3,3}; C_{1,4,3}; C_{1,5,3}; C_{1,1,4}; C_{1,2,4}; C_{1,3,4}; \\
C_{1,4,4}; C_{1,5,4};][A_{2,3}; A_{2,4};][B_{2,2,3}; B_{2,3,3}; B_{2,4,3}; B_{2,5,3}; B_{2,2,4}; B_{2,3,4}; B_{2,4,4}; \\
B_{2,5,4};][C_{2,2,3}; C_{2,3,3}; C_{2,4,3}; C_{2,5,3}; C_{2,2,4}; C_{2,3,4}; C_{2,4,4}; C_{2,5,4};][A_{3,4};][B_{3,3,4}; B_{3,4,4}; B_{3,5,4};][C_{3,3,4}; C_{3,4,4}; C_{3,5,4};]\}
\end{gathered}$$

- Graf Diekerta



- **N=5**
  - Alfabet

$$A = \{A_{1,2}; B_{1,1,2}; C_{1,1,2}; B_{1,2,2}; C_{1,2,2}; B_{1,3,2}; C_{1,3,2}; B_{1,4,2}; C_{1,4,2}; B_{1,5,2}; C_{1,5,2}; B_{1,6,2}; C_{1,6,2}; A_{1,3}; B_{1,1,3}; C_{1,1,3}; B_{1,2,3}; C_{1,2,3}; B_{1,3,3}; C_{1,3,3}; B_{1,4,3}; C_{1,4,3}; B_{1,5,3}; C_{1,5,3}; B_{1,6,3}; C_{1,6,3}; A_{1,4}; B_{1,1,4}; C_{1,1,4}; B_{1,2,4}; C_{1,2,4}; B_{1,3,4}; C_{1,3,4}; B_{1,4,4}; C_{1,4,4}; B_{1,5,4}; C_{1,5,4}; B_{1,6,4}; C_{1,6,4}; A_{1,5}; B_{1,1,5}; C_{1,1,5}; B_{1,2,5}; C_{1,2,5}; B_{1,3,5}; C_{1,3,5}; B_{1,4,5}; C_{1,4,5}; B_{1,5,5}; C_{1,5,5}; B_{1,6,5}; C_{1,6,5}; A_{2,3}; B_{2,2,3}; C_{2,2,3}; B_{2,3,3}; C_{2,3,3}; B_{2,4,3}; C_{2,4,3}; B_{2,5,3}; C_{2,5,3}; B_{2,6,3}; C_{2,6,3}; A_{2,4}; B_{2,2,4}; C_{2,2,4}; B_{2,3,4}; C_{2,3,4}; B_{2,4,4}; C_{2,4,4}; B_{2,5,4}; C_{2,5,4}; B_{2,6,4}; C_{2,6,4}; A_{2,5}; B_{2,2,5}; C_{2,2,5}; B_{2,3,5}; C_{2,3,5}; B_{2,4,5}; C_{2,4,5}; B_{2,5,5}; C_{2,5,5}; B_{2,6,5}; C_{2,6,5}; A_{3,4}; B_{3,3,4}; C_{3,3,4}; B_{3,4,4}; C_{3,4,4}; B_{3,5,4}; C_{3,5,4}; B_{3,6,4}; C_{3,6,4}; A_{3,5}; B_{3,3,5}; C_{3,3,5}; B_{3,4,5}; C_{3,4,5}; B_{3,5,5}; C_{3,5,5}; B_{3,6,5}; C_{3,6,5}; A_{4,5}; B_{4,4,5}; C_{4,4,5}; B_{4,5,5}; C_{4,5,5}; B_{4,6,5}; C_{4,6,5}; \}$$

  - Relacja zależności

$$D = \{(A_{1,2}, A_{1,2}); (A_{1,2}, B_{1,1,2}); (A_{1,2}, C_{1,1,2}); (A_{1,2}, B_{1,2,2}); (A_{1,2}, B_{1,3,2}); (A_{1,2}, B_{1,4,2}); (A_{1,2}, B_{1,5,2}); (A_{1,2}, B_{1,6,2}); (B_{1,1,2}, A_{1,2}); (B_{1,1,2}, B_{1,1,2}); (B_{1,1,2}, C_{1,1,2}); (C_{1,1,2}, A_{1,2}); (C_{1,1,2}, B_{1,1,2}); (C_{1,1,2}, C_{1,1,2}); (B_{1,2,2}, A_{1,2}); (B_{1,2,2}, B_{1,2,2}); (B_{1,2,2}, C_{1,2,2}); (C_{1,2,2}, B_{1,2,2}); (C_{1,2,2}, C_{1,2,2}); (C_{1,2,2}, A_{2,3}); (C_{1,2,2}, B_{2,2,3}); (C_{1,2,2}, A_{2,4}); (C_{1,2,2}, B_{2,2,4}); (C_{1,2,2}, A_{2,5}); (C_{1,2,2}, B_{2,2,5}); (B_{1,3,2}, A_{1,2}); (B_{1,3,2}, B_{1,3,2}); (B_{1,3,2}, C_{1,3,2}); (C_{1,3,2}, B_{1,3,2}); (C_{1,3,2}, C_{1,3,2}); (C_{1,3,2}, B_{2,3,3}); (C_{1,3,2}, B_{2,3,4}); (C_{1,3,2}, B_{2,3,5}); (B_{1,4,2}, A_{1,2}); (B_{1,4,2}, B_{1,4,2}); (B_{1,4,2}, C_{1,4,2}); (C_{1,4,2}, B_{1,4,2}); (C_{1,4,2}, C_{1,4,2}); (C_{1,4,2}, B_{2,4,3}); (C_{1,4,2}, B_{2,4,4}); (C_{1,4,2}, B_{2,4,5}); (B_{1,5,2}, A_{1,2}); (B_{1,5,2}, B_{1,5,2}); (B_{1,5,2}, C_{1,5,2}); (C_{1,5,2}, B_{1,5,2}); (C_{1,5,2}, C_{1,5,2}); (C_{1,5,2}, B_{2,5,3}); (C_{1,5,2}, B_{2,5,4}); (C_{1,5,2}, B_{2,5,5}); (B_{1,6,2}, A_{1,2}); (B_{1,6,2}, B_{1,6,2}); (B_{1,6,2}, C_{1,6,2}); (C_{1,6,2}, B_{1,6,2}); (C_{1,6,2}, C_{1,6,2}); (C_{1,6,2}, B_{2,6,3}); (C_{1,6,2}, B_{2,6,4}); (C_{1,6,2}, B_{2,6,5}); (A_{1,3}, A_{1,3}); (A_{1,3}, B_{1,1,3}); (A_{1,3}, C_{1,1,3}); (A_{1,3}, B_{1,2,3}); (A_{1,3}, B_{1,3,3}); (A_{1,3}, B_{1,4,3}); (A_{1,3}, B_{1,5,3}); (A_{1,3}, B_{1,6,3}); (B_{1,1,3}, A_{1,3}); (B_{1,1,3}, B_{1,1,3}); (B_{1,1,3}, C_{1,1,3}); (C_{1,1,3}, A_{1,3}); (C_{1,1,3}, B_{1,1,3}); (C_{1,1,3}, C_{1,1,3}); (B_{1,2,3}, A_{1,3}); (B_{1,2,3}, B_{1,2,3}); (B_{1,2,3}, C_{1,2,3}); (C_{1,2,3}, B_{1,2,3}); (C_{1,2,3}, C_{1,2,3}); (C_{1,2,3}, A_{2,3}); (C_{1,2,3}, C_{2,2,3}); (B_{1,3,3}, A_{1,3}); (B_{1,3,3}, B_{1,3,3}); (B_{1,3,3}, C_{1,3,3}); (C_{1,3,3}, B_{1,3,3}); (C_{1,3,3}, C_{1,3,3}); (C_{1,3,3}, C_{2,3,3}); (C_{1,3,3}, A_{3,4}); (C_{1,3,3}, B_{3,3,4}); (C_{1,3,3}, A_{3,5}); (C_{1,3,3}, B_{3,3,5}); (B_{1,4,3}, A_{1,3}); (B_{1,4,3}, B_{1,4,3}); (B_{1,4,3}, C_{1,4,3}); (C_{1,4,3}, B_{1,4,3}); (C_{1,4,3}, C_{1,4,3}); (C_{1,4,3}, C_{2,4,3}); (C_{1,4,3}, B_{3,4,4}); (C_{1,4,3}, B_{3,4,5}); (B_{1,5,3}, A_{1,3}); (B_{1,5,3}, B_{1,5,3}); (B_{1,5,3}, C_{1,5,3}); (C_{1,5,3}, B_{1,5,3}); (C_{1,5,3}, C_{1,5,3}); (C_{1,5,3}, C_{2,5,3}); (C_{1,5,3}, B_{3,5,4}); (C_{1,5,3}, B_{3,5,5}); (B_{1,6,3}, A_{1,3}); (B_{1,6,3}, B_{1,6,3}); (B_{1,6,3}, C_{1,6,3}); (C_{1,6,3}, B_{1,6,3}); (C_{1,6,3}, C_{1,6,3}); (C_{1,6,3}, C_{2,6,3}); (C_{1,6,3}, B_{3,6,4}); (C_{1,6,3}, B_{3,6,5}); (A_{1,4}, A_{1,4}); (A_{1,4}, B_{1,1,4}); (A_{1,4}, C_{1,1,4}); (A_{1,4}, B_{1,2,4}); (A_{1,4}, B_{1,3,4}); (A_{1,4}, B_{1,4,4}); (A_{1,4}, B_{1,5,4}); (A_{1,4}, B_{1,6,4}); (B_{1,1,4}, A_{1,4}); (B_{1,1,4}, B_{1,1,4}); (B_{1,1,4}, C_{1,1,4}); (C_{1,1,4}, A_{1,4}); (C_{1,1,4}, B_{1,1,4}); (C_{1,1,4}, C_{1,1,4}); (B_{1,2,4}, A_{1,4}); (B_{1,2,4}, B_{1,2,4}); (B_{1,2,4}, C_{1,2,4}); (C_{1,2,4}, B_{1,2,4}); (C_{1,2,4}, C_{1,2,4}); (C_{1,2,4}, A_{2,4}); (C_{1,2,4},$$

$C_{2,2,4}); (B_{1,3,4}, A_{1,4}); (B_{1,3,4}, B_{1,3,4}); (B_{1,3,4}, C_{1,3,4}); (C_{1,3,4}, B_{1,3,4}); (C_{1,3,4},$
$C_{1,3,4}); (C_{1,3,4}, C_{2,3,4}); (C_{1,3,4}, A_{3,4}); (C_{1,3,4}, C_{3,3,4}); (B_{1,4,4}, A_{1,4}); (B_{1,4,4},$
$B_{1,4,4}); (B_{1,4,4}, C_{1,4,4}); (C_{1,4,4}, B_{1,4,4}); (C_{1,4,4}, C_{1,4,4}); (C_{1,4,4}, C_{2,4,4}); (C_{1,4,4},$
$C_{3,4,4}); (C_{1,4,4}, A_{4,5}); (C_{1,4,4}, B_{4,4,5}); (B_{1,5,4}, A_{1,4}); (B_{1,5,4}, B_{1,5,4}); (B_{1,5,4},$
$C_{1,5,4}); (C_{1,5,4}, B_{1,5,4}); (C_{1,5,4}, C_{1,5,4}); (C_{1,5,4}, C_{2,5,4}); (C_{1,5,4}, C_{3,5,4}); (C_{1,5,4},$
$B_{4,5,5}); (B_{1,6,4}, A_{1,4}); (B_{1,6,4}, B_{1,6,4}); (B_{1,6,4}, C_{1,6,4}); (C_{1,6,4}, B_{1,6,4}); (C_{1,6,4},$
$C_{1,6,4}); (C_{1,6,4}, C_{2,6,4}); (C_{1,6,4}, C_{3,6,4}); (C_{1,6,4}, B_{4,6,5}); (A_{1,5}, A_{1,5}); (A_{1,5},$
$B_{1,1,5}); (A_{1,5}, C_{1,1,5}); (A_{1,5}, B_{1,2,5}); (A_{1,5}, B_{1,3,5}); (A_{1,5}, B_{1,4,5}); (A_{1,5}, B_{1,5,5});$
$(A_{1,5}, B_{1,6,5}); (B_{1,1,5}, A_{1,5}); (B_{1,1,5}, B_{1,1,5}); (B_{1,1,5}, C_{1,1,5}); (C_{1,1,5}, A_{1,5});$
$(C_{1,1,5}, B_{1,1,5}); (C_{1,1,5}, C_{1,1,5}); (B_{1,2,5}, A_{1,5}); (B_{1,2,5}, B_{1,2,5}); (B_{1,2,5}, C_{1,2,5})$
$; (C_{1,2,5}, B_{1,2,5}); (C_{1,2,5}, C_{1,2,5}); (C_{1,2,5}, A_{2,5}); (C_{1,2,5}, C_{2,2,5}); (B_{1,3,5}, A_{1,5});$
$(B_{1,3,5}, B_{1,3,5}); (B_{1,3,5}, C_{1,3,5}); (C_{1,3,5}, B_{1,3,5}); (C_{1,3,5}, C_{1,3,5}); (C_{1,3,5}, C_{2,3,5});$
$(C_{1,3,5}, A_{3,5}); (C_{1,3,5}, C_{3,3,5}); (B_{1,4,5}, A_{1,5}); (B_{1,4,5}, B_{1,4,5}); (B_{1,4,5}, C_{1,4,5});$
$(C_{1,4,5}, B_{1,4,5}); (C_{1,4,5}, C_{1,4,5}); (C_{1,4,5}, C_{2,4,5}); (C_{1,4,5}, C_{3,4,5}); (C_{1,4,5}, A_{4,5});$
$(C_{1,4,5}, C_{4,4,5}); (B_{1,5,5}, A_{1,5}); (B_{1,5,5}, B_{1,5,5}); (B_{1,5,5}, C_{1,5,5}); (C_{1,5,5}, B_{1,5,5});$
$(C_{1,5,5}, C_{1,5,5}); (C_{1,5,5}, C_{2,5,5}); (C_{1,5,5}, C_{3,5,5}); (C_{1,5,5}, C_{4,5,5}); (B_{1,6,5}, A_{1,5});$
$(B_{1,6,5}, B_{1,6,5}); (B_{1,6,5}, C_{1,6,5}); (C_{1,6,5}, B_{1,6,5}); (C_{1,6,5}, C_{1,6,5}); (C_{1,6,5}, C_{2,6,5});$
$(C_{1,6,5}, C_{3,6,5}); (C_{1,6,5}, C_{4,6,5}); (A_{2,3}, C_{1,2,2}); (A_{2,3}, C_{1,2,3}); (A_{2,3}, A_{2,3}); (A_{2,3},$
$B_{2,2,3}); (A_{2,3}, C_{2,2,3}); (A_{2,3}, B_{2,3,3}); (A_{2,3}, B_{2,4,3}); (A_{2,3}, B_{2,5,3}); (A_{2,3}, B_{2,6,3});$
$(B_{2,2,3}, C_{1,2,2}); (B_{2,2,3}, A_{2,3}); (B_{2,2,3}, B_{2,2,3}); (B_{2,2,3}, C_{2,2,3}); (C_{2,2,3}, C_{1,2,3});$
$(C_{2,2,3}, A_{2,3}); (C_{2,2,3}, B_{2,2,3}); (C_{2,2,3}, C_{2,2,3}); (B_{2,3,3}, C_{1,3,2}); (B_{2,3,3}, A_{2,3});$
$(B_{2,3,3}, B_{2,3,3}); (B_{2,3,3}, C_{2,3,3}); (C_{2,3,3}, C_{1,3,3}); (C_{2,3,3}, B_{2,3,3}); (C_{2,3,3}, C_{2,3,3});$
$(C_{2,3,3}, A_{3,4}); (C_{2,3,3}, B_{3,3,4}); (C_{2,3,3}, A_{3,5}); (C_{2,3,3}, B_{3,3,5}); (B_{2,4,3}, C_{1,4,2});$
$(B_{2,4,3}, A_{2,3}); (B_{2,4,3}, B_{2,4,3}); (B_{2,4,3}, C_{2,4,3}); (C_{2,4,3}, C_{1,4,3}); (C_{2,4,3}, B_{2,4,3});$
$(C_{2,4,3}, C_{2,4,3}); (C_{2,4,3}, B_{3,4,4}); (C_{2,4,3}, B_{3,4,5}); (B_{2,5,3}, C_{1,5,2}); (B_{2,5,3}, A_{2,3});$
$(B_{2,5,3}, B_{2,5,3}); (B_{2,5,3}, C_{2,5,3}); (C_{2,5,3}, C_{1,5,3}); (C_{2,5,3}, B_{2,5,3}); (C_{2,5,3}, C_{2,5,3});$
$(C_{2,5,3}, B_{3,5,4}); (C_{2,5,3}, B_{3,5,5}); (B_{2,6,3}, C_{1,6,2}); (B_{2,6,3}, A_{2,3}); (B_{2,6,3}, B_{2,6,3});$
$(B_{2,6,3}, C_{2,6,3}); (C_{2,6,3}, C_{1,6,3}); (C_{2,6,3}, B_{2,6,3}); (C_{2,6,3}, C_{2,6,3}); (C_{2,6,3}, B_{3,6,4});$
$(C_{2,6,3}, B_{3,6,5}); (A_{2,4}, C_{1,2,2}); (A_{2,4}, C_{1,2,4}); (A_{2,4}, A_{2,4}); (A_{2,4}, B_{2,2,4}); (A_{2,4},$
$C_{2,2,4}); (A_{2,4}, B_{2,3,4}); (A_{2,4}, B_{2,4,4}); (A_{2,4}, B_{2,5,4}); (A_{2,4}, B_{2,6,4}); (B_{2,2,4}, C_{1,2,2});$
$(B_{2,2,4}, A_{2,4}); (B_{2,2,4}, B_{2,2,4}); (B_{2,2,4}, C_{2,2,4}); (C_{2,2,4}, C_{1,2,4}); (C_{2,2,4}, A_{2,4});$
$(C_{2,2,4}, B_{2,2,4}); (C_{2,2,4}, C_{2,2,4}); (B_{2,3,4}, C_{1,3,2}); (B_{2,3,4}, A_{2,4}); (B_{2,3,4}, B_{2,3,4});$
$(B_{2,3,4}, C_{2,3,4}); (C_{2,3,4}, C_{1,3,4}); (C_{2,3,4}, B_{2,3,4}); (C_{2,3,4}, C_{2,3,4}); (C_{2,3,4}, A_{3,4});$
$(C_{2,3,4}, C_{3,3,4}); (B_{2,4,4}, C_{1,4,2}); (B_{2,4,4}, A_{2,4}); (B_{2,4,4}, B_{2,4,4}); (B_{2,4,4}, C_{2,4,4});$
$(C_{2,4,4}, C_{1,4,4}); (C_{2,4,4}, B_{2,4,4}); (C_{2,4,4}, C_{2,4,4}); (C_{2,4,4}, C_{3,4,4}); (C_{2,4,4}, A_{4,5});$
$(C_{2,4,4}, B_{4,4,5}); (B_{2,5,4}, C_{1,5,2}); (B_{2,5,4}, A_{2,4}); (B_{2,5,4}, B_{2,5,4}); (B_{2,5,4}, C_{2,5,4});$
$(C_{2,5,4}, C_{1,5,4}); (C_{2,5,4}, B_{2,5,4}); (C_{2,5,4}, C_{2,5,4}); (C_{2,5,4}, C_{3,5,4}); (C_{2,5,4}, B_{4,5,5});$
$(B_{2,6,4}, C_{1,6,2}); (B_{2,6,4}, A_{2,4}); (B_{2,6,4}, B_{2,6,4}); (B_{2,6,4}, C_{2,6,4}); (C_{2,6,4}, C_{1,6,4});$
$(C_{2,6,4}, B_{2,6,4}); (C_{2,6,4}, C_{2,6,4}); (C_{2,6,4}, C_{3,6,4}); (C_{2,6,4}, B_{4,6,5}); (A_{2,5}, C_{1,2,2});$
$(A_{2,5}, C_{1,2,5}); (A_{2,5}, A_{2,5}); (A_{2,5}, B_{2,2,5}); (A_{2,5}, C_{2,2,5}); (A_{2,5}, B_{2,3,5}); (A_{2,5},$
$B_{2,4,5}); (A_{2,5}, B_{2,5,5}); (A_{2,5}, B_{2,6,5}); (B_{2,2,5}, C_{1,2,2}); (B_{2,2,5}, A_{2,5}); (B_{2,2,5},$
$B_{2,2,5}); (B_{2,2,5}, C_{2,2,5}); (C_{2,2,5}, C_{1,2,5}); (C_{2,2,5}, A_{2,5}); (C_{2,2,5}, B_{2,2,5}); (C_{2,2,5}, C_{2,2,5});$
$(B_{2,3,5}, C_{1,3,2}); (B_{2,3,5}, A_{2,5}); (B_{2,3,5}, B_{2,3,5}); (B_{2,3,5}, C_{2,3,5}); (C_{2,3,5}, C_{1,3,5});$
$(C_{2,3,5}, B_{2,3,5}); (C_{2,3,5}, C_{2,3,5}); (C_{2,3,5}, A_{3,5}); (C_{2,3,5}, C_{3,3,5}); (B_{2,4,5}, C_{1,4,2});$
$(B_{2,4,5}, A_{2,5}); (B_{2,4,5}, B_{2,4,5}); (B_{2,4,5}, C_{2,4,5}); (C_{2,4,5}, C_{1,4,5}); (C_{2,4,5}, B_{2,4,5});$
$(C_{2,4,5}, C_{2,4,5}); (C_{2,4,5}, C_{3,4,5}); (C_{2,4,5}, A_{4,5}); (C_{2,4,5}, C_{4,4,5}); (B_{2,5,5}, C_{1,5,2});$
$(B_{2,5,5}, A_{2,5}); (B_{2,5,5}, B_{2,5,5}); (B_{2,5,5}, C_{2,5,5}); (C_{2,5,5}, C_{1,5,5}); (C_{2,5,5}, B_{2,5,5});$
$(C_{2,5,5}, C_{2,5,5}); (C_{2,5,5}, C_{3,5,5}); (C_{2,5,5}, C_{4,5,5}); (B_{2,6,5}, C_{1,6,2}); (B_{2,6,5}, A_{2,5});$
$(B_{2,6,5}, B_{2,6,5}); (B_{2,6,5}, C_{2,6,5}); (C_{2,6,5}, C_{1,6,5}); (C_{2,6,5}, B_{2,6,5}); (C_{2,6,5}, C_{2,6,5});$
$(C_{2,6,5}, C_{3,6,5}); (C_{2,6,5}, C_{4,6,5}); (A_{3,4}, C_{1,3,3}); (A_{3,4}, C_{1,3,4}); (A_{3,4}, C_{2,3,3}); (A_{3,4},$
$C_{2,3,4}); (A_{3,4}, A_{3,4}); (A_{3,4}, B_{3,3,4}); (A_{3,4}, C_{3,3,4}); (A_{3,4}, B_{3,4,4}); (A_{3,4}, B_{3,5,4});$
$(A_{3,4}, B_{3,6,4}); (B_{3,3,4}, C_{1,3,3}); (B_{3,3,4}, C_{2,3,3}); (B_{3,3,4}, A_{3,4}); (B_{3,3,4}, B_{3,3,4});$
$(B_{3,3,4}, C_{3,3,4}); (C_{3,3,4}, C_{1,3,4}); (C_{3,3,4}, C_{2,3,4}); (C_{3,3,4}, A_{3,4}); (C_{3,3,4}, B_{3,3,4});$
$(C_{3,3,4}, C_{3,3,4}); (B_{3,4,4}, C_{1,4,3}); (B_{3,4,4}, C_{2,4,3}); (B_{3,4,4}, A_{3,4}); (B_{3,4,4}, B_{3,4,4});$
$(B_{3,4,4}, C_{3,4,4}); (C_{3,4,4}, C_{1,4,4}); (C_{3,4,4}, C_{2,4,4}); (C_{3,4,4}, B_{3,4,4}); (C_{3,4,4}, C_{3,4,4});$
$(C_{3,4,4}, A_{4,5}); (C_{3,4,4}, B_{4,4,5}); (B_{3,5,4}, C_{1,5,3}); (B_{3,5,4}, C_{2,5,3}); (B_{3,5,4}, A_{3,4});$
$(B_{3,5,4}, B_{3,5,4}); (B_{3,5,4}, C_{3,5,4}); (C_{3,5,4}, C_{1,5,4}); (C_{3,5,4}, C_{2,5,4}); (C_{3,5,4}, B_{3,5,4});$
$(C_{3,5,4}, C_{3,5,4}); (C_{3,5,4}, B_{4,5,5}); (B_{3,6,4}, C_{1,6,3}); (B_{3,6,4}, C_{2,6,3}); (B_{3,6,4}, A_{3,4});$
$(B_{3,6,4}, B_{3,6,4}); (B_{3,6,4}, C_{3,6,4}); (C_{3,6,4}, C_{1,6,4}); (C_{3,6,4}, C_{2,6,4}); (C_{3,6,4}, B_{3,6,4});$
$(C_{3,6,4}, C_{3,6,4}); (C_{3,6,4}, B_{4,6,5}); (A_{3,5}, C_{1,3,3}); (A_{3,5}, C_{1,3,5}); (A_{3,5}, C_{2,3,3}); (A_{3,5},$
$C_{2,3,5}); (A_{3,5}, A_{3,5}); (A_{3,5}, B_{3,3,5}); (A_{3,5}, C_{3,3,5}); (A_{3,5}, B_{3,4,5}); (A_{3,5}, B_{3,5,5});$
$(A_{3,5}, B_{3,6,5}); (B_{3,3,5}, C_{1,3,3}); (B_{3,3,5}, C_{2,3,3}); (B_{3,3,5}, A_{3,5}); (B_{3,3,5}, B_{3,3,5});$
$(B_{3,3,5}, C_{3,3,5}); (C_{3,3,5}, C_{1,3,5}); (C_{3,3,5}, C_{2,3,5}); (C_{3,3,5}, A_{3,5}); (C_{3,3,5}, B_{3,3,5});$

$$(C_{3,3,5}, C_{3,3,5}); (B_{3,4,5}, C_{1,4,3}); (B_{3,4,5}, C_{2,4,3}); (B_{3,4,5}, A_{3,5}); (B_{3,4,5}, B_{3,4,5});$$
$$(B_{3,4,5}, C_{3,4,5}); (C_{3,4,5}, C_{1,4,5}); (C_{3,4,5}, C_{2,4,5}); (C_{3,4,5}, B_{3,4,5}); (C_{3,4,5}, C_{3,4,5});$$
$$(C_{3,4,5}, A_{4,5}); (C_{3,4,5}, C_{4,4,5}); (B_{3,5,5}, C_{1,5,3}); (B_{3,5,5}, C_{2,5,3}); (B_{3,5,5}, A_{3,5});$$
$$(B_{3,5,5}, B_{3,5,5}); (B_{3,5,5}, C_{3,5,5}); (C_{3,5,5}, C_{1,5,5}); (C_{3,5,5}, C_{2,5,5}); (C_{3,5,5}, B_{3,5,5});$$
$$(C_{3,5,5}, C_{3,5,5}); (C_{3,5,5}, C_{4,5,5}); (B_{3,6,5}, C_{1,6,3}); (B_{3,6,5}, C_{2,6,3}); (B_{3,6,5}, A_{3,5});$$
$$(B_{3,6,5}, B_{3,6,5}); (B_{3,6,5}, C_{3,6,5}); (C_{3,6,5}, C_{1,6,5}); (C_{3,6,5}, C_{2,6,5}); (C_{3,6,5}, B_{3,6,5});$$
$$(C_{3,6,5}, C_{3,6,5}); (C_{3,6,5}, C_{4,6,5}); (A_{4,5}, C_{1,4,4}); (A_{4,5}, C_{1,4,5}); (A_{4,5}, C_{2,4,4}); (A_{4,5},$$
$$C_{2,4,5}); (A_{4,5}, C_{3,4,4}); (A_{4,5}, C_{3,4,5}); (A_{4,5}, A_{4,5}); (A_{4,5}, B_{4,4,5}); (A_{4,5}, C_{4,4,5});$$
$$(A_{4,5}, B_{4,5,5}); (A_{4,5}, B_{4,6,5}); (B_{4,4,5}, C_{1,4,4}); (B_{4,4,5}, C_{2,4,4}); (B_{4,4,5}, C_{3,4,4});$$
$$(B_{4,4,5}, A_{4,5}); (B_{4,4,5}, B_{4,4,5}); (B_{4,4,5}, C_{4,4,5}); (C_{4,4,5}, C_{1,4,5}); (C_{4,4,5}, C_{2,4,5});$$
$$(C_{4,4,5}, C_{3,4,5}); (C_{4,4,5}, A_{4,5}); (C_{4,4,5}, B_{4,4,5}); (C_{4,4,5}, C_{4,4,5}); (B_{4,5,5}, C_{1,5,4});$$
$$(B_{4,5,5}, C_{2,5,4}); (B_{4,5,5}, C_{3,5,4}); (B_{4,5,5}, A_{4,5}); (B_{4,5,5}, B_{4,5,5}); (B_{4,5,5}, C_{4,5,5});$$
$$(C_{4,5,5}, C_{1,5,5}); (C_{4,5,5}, C_{2,5,5}); (C_{4,5,5}, C_{3,5,5}); (C_{4,5,5}, B_{4,5,5}); (C_{4,5,5}, C_{4,5,5});$$
$$(B_{4,6,5}, C_{1,6,4}); (B_{4,6,5}, C_{2,6,4}); (B_{4,6,5}, C_{3,6,4}); (B_{4,6,5}, A_{4,5}); (B_{4,6,5}, B_{4,6,5});$$
$$(B_{4,6,5}, C_{4,6,5}); (C_{4,6,5}, C_{1,6,5}); (C_{4,6,5}, C_{2,6,5}); (C_{4,6,5}, C_{3,6,5}); (C_{4,6,5}, B_{4,6,5}); (C_{4,6,5}, C_{4,6,5}); +\}$$

- Postać Normalna Foaty

$$\begin{gathered}
FNF = \{[A_{1,2}; A_{1,3}; A_{1,4}; A_{1,5};][B_{1,1,2}; B_{1,2,2}; B_{1,3,2}; \\
B_{1,4,2}; B_{1,5,2}; B_{1,6,2}; B_{1,1,3}; B_{1,2,3}; B_{1,3,3}; B_{1,4,3}; \\
B_{1,5,3}; B_{1,6,3}; B_{1,1,4}; B_{1,2,4}; B_{1,3,4}; B_{1,4,4}; B_{1,5,4}; \\
B_{1,6,4}; B_{1,1,5}; B_{1,2,5}; B_{1,3,5}; B_{1,4,5}; B_{1,5,5}; B_{1,6,5};] \\
[C_{1,1,2}; C_{1,2,2}; C_{1,3,2}; C_{1,4,2}; C_{1,5,2}; C_{1,6,2}; C_{1,1,3}; \\
C_{1,2,3}; C_{1,3,3}; C_{1,4,3}; C_{1,5,3}; C_{1,6,3}; C_{1,1,4}; C_{1,2,4}; \\
C_{1,3,4}; C_{1,4,4}; C_{1,5,4}; C_{1,6,4}; C_{1,1,5}; C_{1,2,5}; C_{1,3,5}; \\
C_{1,4,5}; C_{1,5,5}; C_{1,6,5};][A_{2,3}; A_{2,4}; A_{2,5};][B_{2,2,3}; \\
B_{2,3,3}; B_{2,4,3}; B_{2,5,3}; B_{2,6,3}; B_{2,2,4}; B_{2,3,4}; B_{2,4,4}; \\
B_{2,5,4}; B_{2,6,4}; B_{2,2,5}; B_{2,3,5}; B_{2,4,5}; B_{2,5,5}; B_{2,6,5};] \\
[C_{2,2,3}; C_{2,3,3}; C_{2,4,3}; C_{2,5,3}; C_{2,6,3}; C_{2,2,4}; C_{2,3,4}; \\
C_{2,4,4}; C_{2,5,4}; C_{2,6,4}; C_{2,2,5}; C_{2,3,5}; C_{2,4,5}; C_{2,5,5}; \\
C_{2,6,5};][A_{3,4}; A_{3,5};][B_{3,3,4}; B_{3,4,4}; B_{3,5,4}; B_{3,6,4}; \\
B_{3,3,5}; B_{3,4,5}; B_{3,5,5}; B_{3,6,5};][C_{3,3,4}; C_{3,4,4}; C_{3,5,4}; \\
C_{3,6,4}; C_{3,3,5}; C_{3,4,5}; C_{3,5,5}; C_{3,6,5};][A_{4,5};][B_{4,4,5}; \\
B_{4,5,5}; B_{4,6,5};][C_{4,4,5}; C_{4,5,5}; C_{4,6,5};]\}
\end{gathered}$$

- Graf Diekerta