

Powlekanie szkieletu

1 Lipiec 2004 – 7 Sierpień 2004

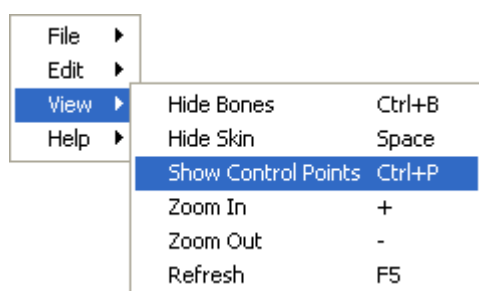
Wstęp

Niniejsza praca dotyczy programu pokazowego będącego prostym zastosowaniem wielowagowego powlekania szkieletu. Jest to semestralna praca zaliczeniowa z przedmiotu „Geometria komputerowa” wykładanego w semestrze letnim 2004 na Uniwersytecie Śląskim przez dra Przemysława Koprowskiego. (Był to najużyteczniejszy wykład i ćwiczenia na które autor tego artykułu miał okazję uczęszczać!)

W skład grupy, która wybrała tytułowe „powlekanie szkieletu” na temat pracy zaliczeniowej wchodziło również: Rafał Bielecki, Anna Kowal oraz Katarzyna Wojtek, jednakże fakt, iż prace toczyły się w okresie wakacyjnym, zaś członkowie zespołu mają ograniczony dostęp do Internetu i mieszkają w dość odległych od siebie miastach, grupa zdecydowała, że każdy zajmie się problemem „na własną rękę”, a do oceny przedstawiona zostanie najlepsza wersja programu. Tłumaczy to dlaczego lista autorów jest jednoosobowa.

1. Interfejs programu

Wszystkie opcje programu dostępne są dla użytkownika poprzez menu kontekstowe (zob. rys. 1). Przy czym



Rysunek 1. Menu kontekstowe programu.

większość ujętych tam opcji ma swoje skróty klawiszowe.

Ponieważ obsługa programu wydaje się być nieskomplikowana, a wręcz intuicyjna, to nie będziemy jej tutaj niepotrzebnie opisywać.

2. Format pliku ‘.skl’

Pliki ‘.skl’ są w rzeczywistości zwykłymi plikami tekstowymi. Zawartość pliku ‘.skl’ jest ignorowana, do momentu napotkania jednego ze znaków ‘|’, ‘@’ lub ‘#’, które definiują odpowiednio: kość, fragment skóry (płat powierzchni Béziera), albo wagi z jakimi dany punkt kontrolny jest zależny od wybranej kości. Składnia komend ‘|’, ‘@’, ‘#’ jest następująca:

| *jointnum*, *length*, *a_x*, *a_y*, *a_z*;

jointnum — liczba „powrotnych” stawów,

length — długość definiowanej kości,

a_x — stopniowa miara kąta obrotu definiowanej kości wokół osi OX (we współrzędnych kości nadrzędnej),

a_y, *a_z* — podobnie jw.

@*x₀₀*, *y₀₀*, *z₀₀*, *x₀₁*, *y₀₁*, *z₀₁*, ..., *x₃₃*, *y₃₃*, *z₃₃*;

x_{ij}, *y_{ij}*, *z_{ij}* — współrzędne punktu kontrolnego $P_{ij}^{(1)}$ definiowanego płata powierzchni Béziera (dla $i, j = 0, \dots, 3$).

#*patch_id*, *i*, *j*, *bone_id*, *w₀₀*, ..., *w₃₂*;

patch_id — identyfikator płata powierzchni Béziera (zależny od kolejności komend @, przy tym pierwszy definiowany płat ma numer 0),

i, *j* — identyfikator punktu P_{ij} wskazanego płata powierzchni Béziera,

bone_id — identyfikator kości (zależy od kolejności komend |, przy czym pierwsza definiowana kość ma numer 0),

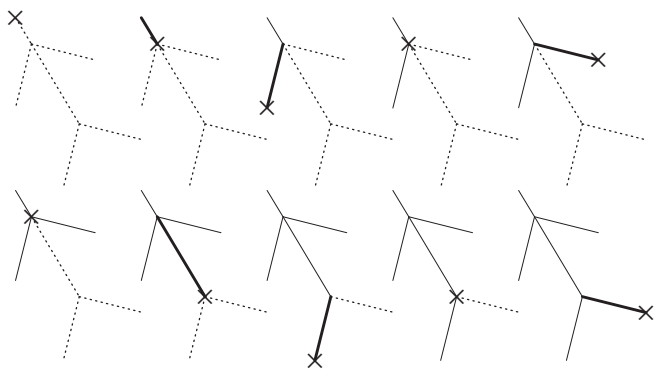
w_{ij} — waga ($i = 0, \dots, 3$; $j = 0, 1, 2$; zob. [WP]).

Znaki ‘,’ oraz ‘;’ separujące argumenty mogą być zastąpione innymi znakami, z wyłączeniem znaku kropki dziesiętnej i innych znaków mogących występować w reprezentacji liczby rzeczywistej. Wszystkie komendy mogą być podane w kilku wierszach, przy czym znak końca linii (podobnie jak spacja czy tabulacja) nie jest traktowany jak separator. Można też umieścić wszystkie komendy w jednej linii.

3. Rysowanie szkieletu

Najkrócej rzecz ujmując, rysowanie szkieletu polega na „nieodrywaniu ołówka od papieru”. Rysunek 2 przedstawia kolejne fazy rysowania, nieco pochylonego, szkieletu ‘first-step.skl’ (zob. zał. s. 26).

⁽¹⁾ P_{ij} jest oznaczeniem punktu kontrolnego i nie ma charakteru propagandowego...



Rysunek 2. Kolejne etapy rysowania (pochylonego) szkieletu 'first-step.sk1'.

Zauważmy, że przyjęty tutaj sposób opisu szkieletu pozwala na narysowanie dowolnej liczby kości wychodzących z pojedynczego stawu. Jednakże maksymalna „głębokość” stawów, jest ograniczona. W wersji OpenGL Release 3.7 (November 22, 1998) głębokość ta wynosi 32 poziomy, jednak nic nie stoi na przeszkodzie zwiększenia tej liczby przez „ręczną” obsługę kolejki FIFO.

Dodajmy jeszcze (z dumą), że wszystkie przykładowe szkielety powstały w trybie off-line.

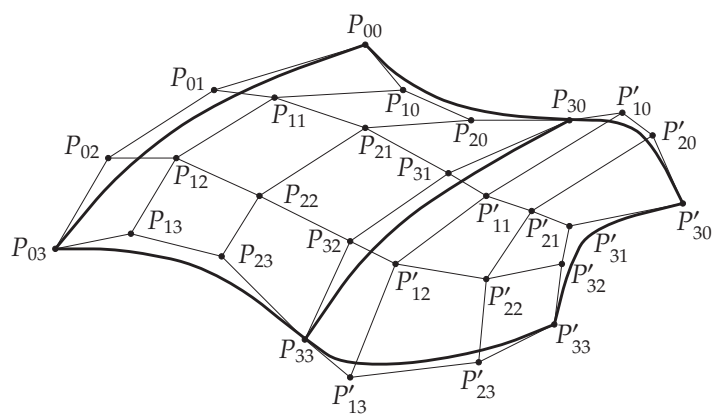
4. Modelowanie skóry

Skóra powiązana ze szkieletem może być opisana np. za pomocą płatów powierzchni Béziera, jak ma to miejsce w niniejszym przypadku. Pojedynczy płatek jest jednoznacznie wyznaczony przez współrzędne x, y i z swoich szesnastu punktów kontrolnych P_{ij} ($i, j = 0, \dots, 3$), jednakże uzyskanie bardziej skomplikowanych kształtów wymaga łączenia kilku płatków. Niestety zwykłe połączenie punktów kontrolnych wybranej krawędzi jednego płata z punktami kontrolnymi krawędzi innego płata gwarantuje jedynie ciągłość klasy C^0 na styku tworzonej powierzchni. Aby uzyskać ciągłość klasy C^1 trzeba tak dobrać współrzędne punktów kontrolnych, by odpowiednie trójki punktów były współliniowe (zob. rys. 3).

4.1. Modelowanie ramienia 'arm1.sk1' i 'arm2.sk1'

Chronologicznie pierwszym modelem „wyposażonym w skórę” był plik 'arm1.sk1' ⁽²⁾. Powstał on z jednego płata powierzchni Béziera stworzonego „w ciemno”, a następnie powielonego ośmiokrotnie i odpowiednio przesuniętego (zob. rys. 4(a)). Dalsze prace nad modelem ramienia polegały na „wyklupaniu” powstałych wgnieceń, tzn. na nadaniu modelowi ciągłości klasy C^1 (zob. rys. 4(b) i (c)). Tak powstał twór przypominający raczej małą puszkę piwa niż ramię. Został on więc

⁽²⁾ Kolejność powstania wszystkich przykładowych plików '.sk1' jest zgodna z kolejnością ich występowania w menu 'File' programu.



Rysunek 3. Dwa płaty Béziera połączone w sposób gwarantujący ciągłość klasy C^1 . Równości $P_{3j} = P'_{0j}$ dla $j = 0, \dots, 3$ gwarantują ciągłość klasy C^0 , zaś współliniowość punktów P_{2j}, P_{3j} i P'_{1j} dla $j = 0, \dots, 3$ zapewnia ciągłość klasy C^1 .

wydłużony ⁽³⁾ (zob. rys. 4(d)), a następnie przesunięty do punktu (0,0,0). Ponieważ modelowanie odbywało się względem globalnego układu współrzędnych, to konieczne było oznaczenie, które z punktów kontrolnych należą do jakiej kości (por. rys. 4(e)).

Pierwsze kroki są zwykle najtrudniejsze, tak też było w tym przypadku. Opis rysunku 5 stanowi jednak nie tylko wyraz radości autora, ale obrazuje też fiasko idei zastosowania dodatkowej małej kości zamiast zwykłego stawu, co jak przewidywał autor miało zniwelować efekt wklęsnięcia, widoczny właśnie na rysunku 5(b).

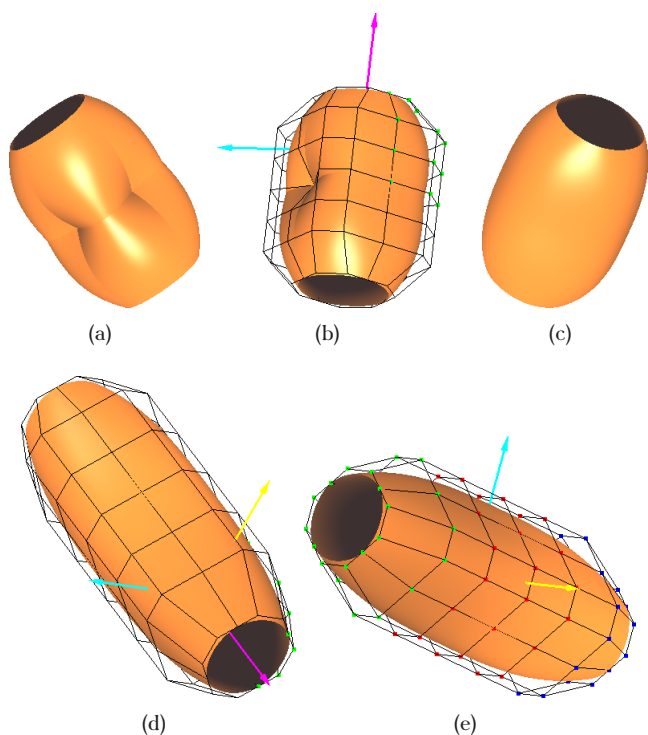
Model 'arm1.sk1' jest w rzeczywistości przykładem powlekania sztywnego, dlatego okazał się on nie odporny na efekt kolapsacji skóry wskutek skręcenia stawu wokół osi kości (zob. rys. 6).

Model 'arm2.sk1' jest klonem 'arm1.sk1', w którym „ściśnięto” punkty kontrolne związane ze środkową kością odpowiadającą stawowi. Zabieg ten zmniejsza wklęsnięcie powstające przy zginaniu ramienia.

4.2. Modelowanie czajniczka 'teapot.sk1' i interaktywnego czajniczka 'interactive-teapot.sk1'

Oryginalny kształt czajniczka pochodzi ze źródeł biblioteki GLUT (zob. zał. s. 22) i chociaż nie jest on tam zapisany w formacie '.sk1', to konwersja jest tak prosta jak zabranie dziecku cukierka — wystarczy przed namalowaniem kolejnych płatków powierzchni Béziera zapisać współrzędne ich punktów kontrolnych do pliku '.sk1'. Oczywiście tak otrzymany czajniczek jest wyrażony we współrzędnych globalnych, co pozwala na łatwe uzyskanie nie interaktywnego czajniczka. Niestety w celu utworzenia interaktywnego czajniczka niezbędna jest dalsza żmudna „łatanina” (zob. rys. 7), uzyskany efekt jest jednak obłędny! (zob. rys. 8)

⁽³⁾ Dlatego, że okazał zbyt krótki, a nie dlatego, iż przypominał małą puszkę piwa...



Rysunek 4. Pierwsze kroki w modelowaniu ramienia `arm1.sk1`. (a) Ośiem płatów powierzchni Béziera połączonych w sposób gwarantujący ciągłość klasy C^0 . (b) Nadawanie modelowi ciągłości klasy C^1 . (c) Model mający już ciągłość klasy C^1 . (d) Model odpowiednio wydłużony. (e) Model z oznaczoną przynależnością poszczególnych punktów kontrolnych do odpowiednich kości szkieletu.

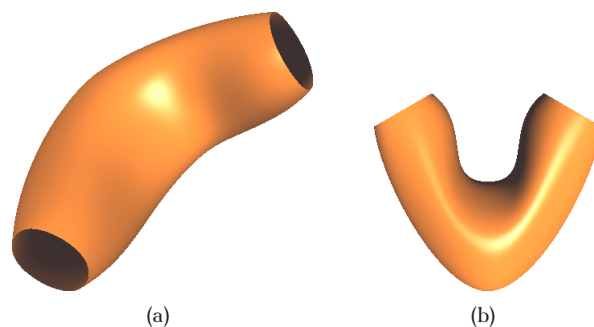
4.3. Modelowanie interaktywnego jajka ‘egg.sk1’

Idąc za ciosem⁽⁴⁾, utworzony został kolejny model — interaktywne jajko. Proces tworzenia tego modelu niewiele różni się od wcześniejszych. Najpierw wymodelowano cztery płaty powierzchni Béziera tworzące połowę skorupki. Rysunek 9(a) przedstawia skopiowaną drugą połowę jajka, a na rysunku 9(b) obie części są już odpowiednio pozycjonowane. Zabawy autora z jajkiem przedstawia rysunek 10. Rysunek 10(a) dowodzi, że interaktywnemu jajku, które w pozycji spoczynkowej przypomina raczej elipsoidę trójosiową obrotową, można nadać tradycyjny kształt jajka.

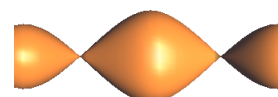
4.4. Modelowanie ramienia ‘arm3.sk1’, ‘arm4.sk1’ i ‘arm5.sk1’

Ostatnim modelem powleczone skórą, jaki zostanie tutaj przedstawiony jest kolejny model ramienia — ‘arm5.sk1’. Jest to jednocześnie jedyny model rzeczywiście wykorzystujący powleknięcie wielowagowe (zob. [WP]). (Wszystkie poprzednie miały skórę przyłączoną w sposób sztywny, który to sposób jest szczególnym przypadkiem powleknięcia wielowagowego.) Model

⁽⁴⁾ Za ciosem wymierzonym w czajniczek (zob. rys. 8(a)).



Rysunek 5. Testowanie modelu ramienia `arm1.sk1`: (a) To żyje! (b) Viktoria!



Rysunek 6. Nieco ubarwiona demonstracja efektu kolapsacji skóry (ang. *candy-warpper effect*) na przykładzie modelu ‘arm1.sk1’.

‘arm5.sk1’ oparty jest na jedynie dwóch pozycjach bazowych — ‘arm3.sk1’ i ‘arm4.sk1’ (zob. rys. 11). Przygotowania tego modelu opisuje dokładniej następny paragraf.

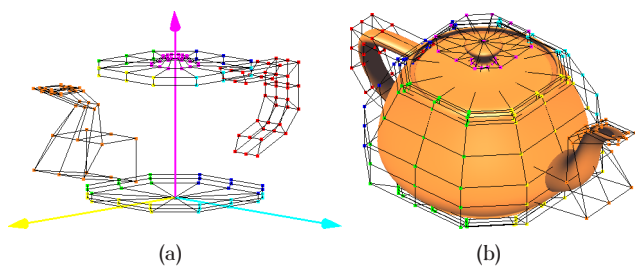
5. Problem wagi ciężkiej — wyznaczanie wag

Szczegóły dotyczące znaczenia wag, na których opiera się metoda powleknięcia wielowagowego można znaleźć w [WP], dlatego prześledzimy tutaj jedynie metodę zastosowaną do wyznaczenia wag dla konkretnego modelu ramienia (plik ‘arm5.sk1’) utworzonego z dwóch pozycji bazowych (pliki ‘arm3.sk1’ i ‘arm4.sk1’).

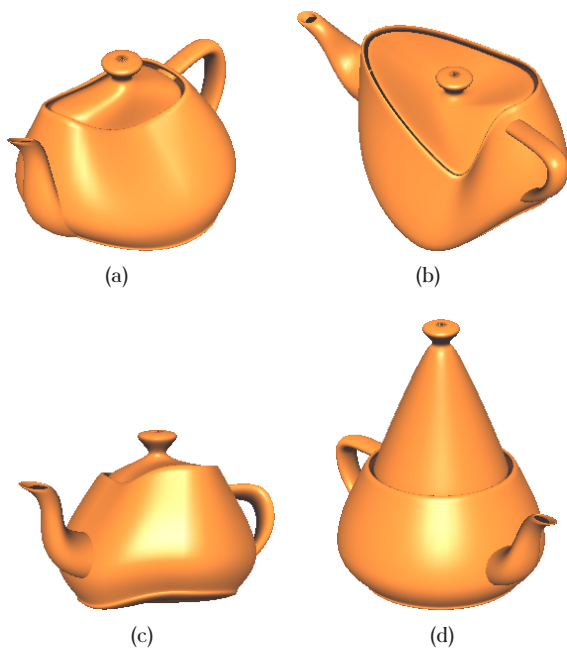
Na przykład dla wyznaczenia wag dla współrzędnej x jednego tylko punktu kontrolnego P_{00} związanego z zerowym płatem powierzchni Béziera modelowanego ramienia, należy znaleźć minimum sumy kwadratów przy ograniczeniu zadanym poniższym układem:

$$\left\{ \begin{array}{l} 0,4 = 0 \cdot w_{000000} - 0,125 \cdot w_{000010} + \\ + 0 \cdot w_{000020} + 0,05 \cdot w_{000030} + \\ + 0 \cdot w_{000100} - 0,125 \cdot w_{000110} + \\ + 0 \cdot w_{000120} + 0,525 \cdot w_{000130} + \\ + 0 \cdot w_{000200} - 0,0716971 \cdot w_{000210} - \\ - 0,155639 \cdot w_{000220} + 1,03604 \cdot w_{000230} \\ 0,621362 = 0 \cdot w_{000000} - 0,125 \cdot w_{000010} + \\ + 0 \cdot w_{000020} + 0,05 \cdot w_{000030} + \\ + 0 \cdot w_{000100} - 0,108253 \cdot w_{000110} + \\ + 0,095 \cdot w_{000120} + 0,468061 \cdot w_{000130} + \\ + 0 \cdot w_{000200} - 0,071697 \cdot w_{000210} + \\ + 0,155639 \cdot w_{000220} + 0,922158 \cdot w_{000230} \end{array} \right.$$

(Łącznie należało rozwiązać $16 \cdot 4 \cdot 4 \cdot 3 = 768$ podobnych układów.) Oczywiście układ dwóch równań z dwu-



Rysunek 7. Przystosowanie kształtu czajniczka do wymogów formatu '.skl'. (a) „Łatanina” w trakcie. (b) „Łatanina” zakończona.

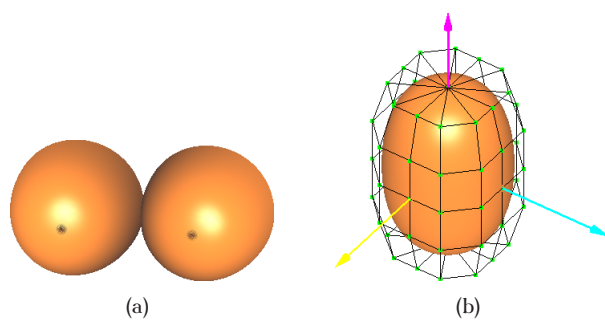


Rysunek 8. Testowanie interaktywnego czajniczka: (a) Czajniczek po spotkaniu z samochodem. (b) Brzydkie czajniczko. (c) Czajniczek Alicji w Krainie Czarów. (d) Imprezowy czajniczek.

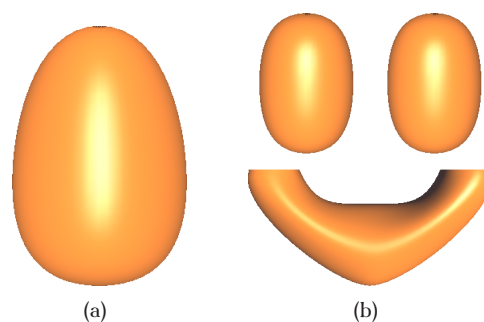
nastoma niewiadomymi może mieć nieskończenie wiele rozwiązań. To dużo⁽⁵⁾.

Wyjaśnijmy w tym miejscu znaczenie indeksów występujących w szukanych wagach w_{pijbl} . p oznacza identyfikator płata powierzchni Béziera; i, j identyfikują punkt kontrolny na płacie wyznaczonym przez p ; b jest identyfikatorem kości; i w końcu k, l określają numer jednej z dwunastu wag związanych z danym punktem kontrolnym i daną kością ($k = 0, \dots, 3$; $l = 0, 1, 2$). Teraz wiadać, że cichaczem ustaliliśmy powiązanie punktu z trzema kośćmi (z jedną „główną” i z dwiema sąsiednimi). Z uwagi na małą złożoność naszego modelu możemy założyć, że w powyższym układzie równań wszystkie wagi dotyczące tej samej kości będą równe. To redukuje liczbę niewiadomych do trzech. Odchodząc teraz od konkretnych

⁽⁵⁾ Tak więc mimo występowania dwunastu zmiennych zadanie okazuje się być nietuzinkowe...



Rysunek 9. Modelowanie interaktywnego jajka. (a) Nieestetyczny jest to jedynie model jajka we wczesnej fazie preparacji. (b) Odpowiednio(?) ułożone fragmenty skorupki modelowanego jajka.



Rysunek 10. Testowanie interaktywnego jajka. (a) Przystöjne jajko. (b) Wyraz zadowolenia autora, z faktu iż posiada interaktywne jajko...

danych i oznaczając odpowiednie wagi przez x, y i z sprowadzamy wyjściowy problem do zadania minimalizacji $x^2 + y^2 + z^2$ przy ograniczeniu zadanym poniższym układem:

$$\begin{cases} a_0^x x + a_0^y y + a_0^z z = b_0 \\ a_1^x x + a_1^y y + a_1^z z = b_1 \end{cases} \quad (1)$$

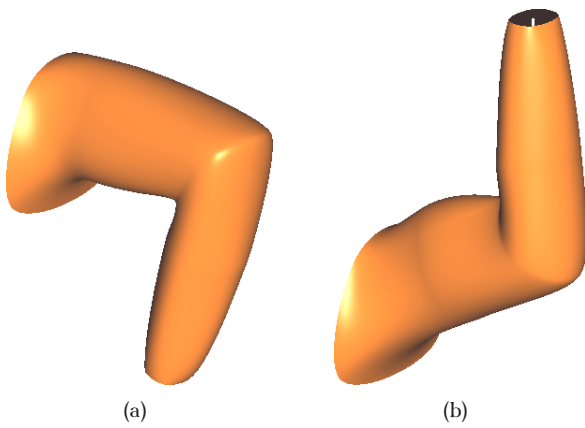
Oznaczmy

$$W_x = \begin{bmatrix} a_0^y & a_0^z \\ a_1^y & a_1^z \end{bmatrix}, \quad W_y = \begin{bmatrix} a_0^x & a_0^z \\ a_1^x & a_1^z \end{bmatrix}, \quad W_z = \begin{bmatrix} a_0^x & a_0^y \\ a_1^x & a_1^y \end{bmatrix}$$

oraz

$$B_x = \begin{bmatrix} b_0 & a_0^x \\ b_1 & a_1^x \end{bmatrix}, \quad B_y = \begin{bmatrix} b_0 & a_0^y \\ b_1 & a_1^y \end{bmatrix}, \quad B_z = \begin{bmatrix} b_0 & a_0^z \\ b_1 & a_1^z \end{bmatrix}.$$

Aby rozwiązać układ (1) musimy, w zależności od tego, który z wyznaczników W_x, W_y, W_z jest niezerowy,



Rysunek 11. Pozycje bazowe modelu ramienia 'arm5.skl': (a) Plik 'arm3.skl'. (b) Plik 'arm4.skl'.

rozwiązać jeden z układów (2.1), (2.2) lub (2.3):

$$\begin{cases} a_0^x x + a_0^y y = b_0 - a_0^z z \\ a_1^x x + a_1^y y = b_1 - a_1^z z \end{cases} \quad (2.1)$$

$$\begin{cases} a_0^z z + a_0^x x = b_0 - a_0^y y \\ a_1^z z + a_1^x x = b_1 - a_1^y y \end{cases} \quad (2.2)$$

$$\begin{cases} a_0^y y + a_0^z z = b_0 - a_0^x x \\ a_1^y y + a_1^z z = b_1 - a_1^x x \end{cases} \quad (2.3)$$

Stosując wzory Cramera otrzymujemy — w przypadku układu (2.1):

$$y = \frac{xW_y + B_z}{W_x}, \quad z = \frac{xW_z - B_y}{W_x}, \quad (3.1)$$

— w przypadku układu (2.2):

$$z = \frac{yW_z + B_x}{W_y}, \quad x = \frac{yW_x - B_z}{W_y}, \quad (3.2)$$

— w przypadku układu (2.3):

$$x = \frac{zW_x + B_y}{W_z}, \quad y = \frac{zW_y - B_x}{W_z}. \quad (3.3)$$

Ponieważ, dla przypadku (2.1) jest

$$\begin{aligned} \min(x^2 + y^2 + z^2) &= \\ &= \frac{1}{W_x^2} \min(W_x^2 x^2 + (W_y^2 x^2 + 2W_y B_z x + B_z^2) + \\ &\quad + (W_z^2 x^2 - 2W_z B_y x + B_y^2)) = \\ &= \frac{1}{W_x^2} \min((W_x^2 + W_y^2 + W_z^2)x^2 + \\ &\quad + 2(W_y B_z - W_z B_y)x + B_y^2 + B_z^2), \end{aligned}$$

to

$$x = \frac{B_y W_z - B_z W_y}{W_x^2 + W_y^2 + W_z^2}. \quad (4.1)$$

Analogicznie dla przypadku (2.2) otrzymujemy

$$y = \frac{B_z W_x - B_x W_z}{W_x^2 + W_y^2 + W_z^2}, \quad (4.2)$$

zaś dla przypadku (2.3)

$$z = \frac{B_x W_y - B_y W_x}{W_x^2 + W_y^2 + W_z^2}. \quad (4.3)$$

Jeśli $W_x \neq 0$, to x , y i z minimalizujące sumę kwadratów wyliczymy ze wzorów (4.1) i (3.1). Podobnie w przypadkach $W_y \neq 0$ oraz $W_z \neq 0$ korzystamy ze wzorów (4.2), (3.2) oraz (4.3), (3.3). Zauważmy jednak, że zadanie minimalizacji sumy kwadratów przy ograniczeniu (1) ma jednoznaczne rozwiązanie (o ile któryś z wyznaczników W_x , W_y lub W_z jest niezerowy), zatem możemy stosować wzory (4.1), (4.2) i (4.3), niezależnie od wartości W_x , W_y i W_z , jeśli tylko $W_x^2 + W_y^2 + W_z^2 \neq 0$ ⁽⁶⁾.

W przypadku, gdy $W_x^2 + W_y^2 + W_z^2 = 0$ oraz $B_x^2 + B_y^2 + B_z^2 = 0$ ⁽⁷⁾, tzn. wektory współczynników $[a_0^x \ a_0^y \ a_0^z \ b_0]^T$ i $[a_1^x \ a_1^y \ a_1^z \ b_1]^T$ są liniowo zależne, albo któryś z nich jest zerowy, układ (1) sprowadza się do równania postaci

$$\chi x + \gamma y + \zeta z = \beta. \quad (5)$$

($\chi = a_0^x$, $\gamma = a_0^y$, $\zeta = a_0^z$ i $\beta = b_0$.) Bez straty ogólności możemy założyć, że $\chi \neq 0$, wtedy

$$x = \frac{\beta - \gamma y - \zeta z}{\chi}. \quad (6)$$

Tak więc

$$\begin{aligned} \min(x^2 + y^2 + z^2) &= \\ &= \frac{1}{\chi^2} \min(\beta^2 + \gamma^2 y^2 + \zeta^2 z^2 - \\ &\quad - 2\beta\gamma y - 2\beta\zeta z + 2\gamma\zeta yz + \chi^2 y^2 + \chi^2 z^2) = \\ &= \frac{1}{\chi^2} \min((\chi^2 + \gamma^2)y^2 + 2\gamma(\zeta z - \beta)y + \\ &\quad + (\chi^2 + \zeta^2)z^2 - 2\beta\zeta z + \beta^2). \end{aligned}$$

Z drugiej strony

$$\begin{aligned} \min(x^2 + y^2 + z^2) &= \\ &= \frac{1}{\chi^2} \min((\chi^2 + \zeta^2)z^2 + 2\zeta(\gamma y - \beta)z + \\ &\quad + (\chi^2 + \gamma^2)y^2 - 2\beta\gamma y + \beta^2). \end{aligned}$$

Otrzymujemy stąd układ równań

$$y = \frac{\gamma(\beta - \zeta z)}{\chi^2 + \gamma^2}, \quad z = \frac{\zeta(\beta - \gamma y)}{\chi^2 + \zeta^2}. \quad (7)$$

⁽⁶⁾ W interpretacji geometrycznej poszukujemy sfery o środku w punkcie $(0, 0, 0)$ stycznej do płaszczyzny wyznaczonej przez układ (1).

⁽⁷⁾ W interpretacji geometrycznej poszukujemy sfery stycznej do prostej.

Podstawiamy drugie równanie do pierwszego:

$$\begin{aligned} \chi^2 y + \gamma^2 y &= \beta\gamma - \gamma\zeta \frac{\beta\zeta - \gamma\zeta y}{\chi^2 + \zeta^2} \iff \\ \iff \chi^4 y + \chi^2 \zeta^2 y + \chi^2 \gamma^2 y + \cancel{\gamma^2 \zeta^2 y} &= \\ = \beta\chi^2 \gamma + \cancel{\beta\gamma\zeta^2} - \cancel{\beta\gamma\zeta^2} + \cancel{\gamma^2 \zeta^2 y}. \end{aligned}$$

A stąd

$$y = \frac{\beta\gamma}{\chi^2 + \gamma^2 + \zeta^2}. \quad (8.2)$$

Teraz wobec (7) i (6) łatwo otrzymujemy

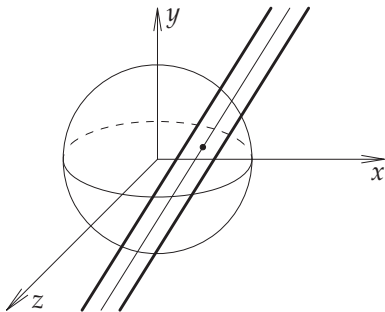
$$z = \frac{\beta\zeta}{\chi^2 + \gamma^2 + \zeta^2} \quad (8.3)$$

oraz

$$x = \frac{\beta\chi}{\chi^2 + \gamma^2 + \zeta^2}. \quad (8.1)$$

Znowu okazuje się, że wzory (8.1), (8.2) i (8.3) możemy stosować bez względu na to czy $\chi \neq 0$ (o ile tylko $\chi^2 + \gamma^2 + \zeta^2 \neq 0$).

W ostatnim przypadku, tj. gdy $W_x^2 + W_y^2 + W_z^2 = 0$ i $B_x^2 + B_y^2 + B_z^2 \neq 0$ nie istnieje dokładne rozwiązanie, gdyż układ (1) jest wtedy sprzeczny. Możemy jednak wyznaczyć rozwiązanie spełniające „w przybliżeniu” zadane ograniczenie. Zauważmy, że w interpretacji geometrycznej poszukujemy sfery o środku w punkcie $(0,0,0)$ stycznej do dwóch prostych równoległych. (zob. rys. 12). Sensownym wydaje się znalezienie punk-



Rysunek 12. Geometryczna interpretacja zadania minimalizacji $x^2 + y^2 + z^2$ przy ograniczeniu (1) w przypadku, gdy $W_x^2 + W_y^2 + W_z^2 = 0$ i $B_x^2 + B_y^2 + B_z^2 \neq 0$.

tu styczności sfery z prostą równoległą do danych prostych i leżącą pośrodku nich. Tak więc wystarczy nam zastosować wzory (8.1), (8.2) i (8.3) do zmodyfikowanego równania (5):

$$(a_0^x + a_1^x)x + (a_0^y + a_1^y)y + (a_0^z + a_1^z)z = b_0 + b_1.$$

6. Podsumowanie

No dobrze, ale dlaczego to nie działa? Ależ to działa! W pracy [WP] autorzy zastrzegają, że standardowa minimalizacja sumy kwadratów zastosowana w celu wyznaczenia wag sprawdza się jedynie w przypadku pozycji

szkieletu odpowiadających pozycjom bazowym, zaś pomiędzy nimi punkty kontrolne mogą „odlatywać daleko”. (Autorzy podają też inne, dużo bardziej skomplikowane metody wyznaczania wag.)

Dla osób, które nie są w stanie samodzielnie sprawdzić modelu ‘arm5.sk1’ do drugiej pozycji bazowej, podajemy przepis na rozwiązanie tego „trudnego” zadania: wybrać pierwszą kość⁽⁸⁾ i nacisnąć sześć razy klawisz ‘↓’, następnie wybrać drugą kość i nacisnąć szesnaście razy klawisz ‘↓’, w końcu wybrać trzecią kość i nacisnąć osiemnaście razy klawisz ‘↓’ (ustawienie kości „do pionu”).

Ułożenie skóry w pozycjach odpowiadających pozycjom bazowym różni się nieznacznie od dokładnego ułożenia skóry w pozycjach bazowych, gdyż w procesie wyznaczania wag algorytm 68 razy zastosował przypadek przybliżony.

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⁽⁸⁾ Nie mylić z kością zerową!

Kod źródłowy — plik 'skinning).cpp':

```
#include <GL/glut.h>
#include <fstream>
#include <vector>

using namespace std;

// //////////////////////////////////////

struct BONE
{
    int    jointnum;
    float  length;
    float  ax, ay, az;
    float  m[4][4];
};

typedef vector <BONE> SKELETON;

SKELETON skeleton;

struct WEIGHT
{
    int    bone_id;
    float  weights[4][3];
};

typedef vector <WEIGHT> WEIGHTS;

struct PATCH
{
    float  ctrlpts[4][4][3];
    WEIGHTS point[4][4];
};

typedef vector <PATCH> SKIN;

SKIN skin;

// //////////////////////////////////////

boolean  bones_enabled   = true,
         skin_enabled    = true,
         ctrlpts_enabled = false;

long  selected;

SKELETON::iterator  musty_bone;

float  zoom = 0.1f;

long  main_menu,
      file_submenu,
      test_submenu,
      edit_submenu,
      view_submenu,
      help_submenu;
```



//

```
void ReadSKN(char *filename)
{
    char      c;
    long      i , j , patch_id , point_i , point_j;
    BONE      bone;
    PATCH     patch;
    WEIGHT    weight;
    ifstream  file(filename);
    SKIN::iterator p;

    skeleton.erase(skeleton.begin(), skeleton.end());
    skin.erase(skin.begin(), skin.end());

    while (!file.eof())
    {
        file >> c;
        switch (c)
        {
            case '|':
                file >> bone.jointnum >> c
                    >> bone.length >> c
                    >> bone.ax >> c
                    >> bone.ay >> c
                    >> bone.az >> c;
                skeleton.push_back(bone);
                break;
            case '@':
                for (i = 0; i < 4; i++)
                    for (j = 0; j < 4; j++)
                        file >> patch.ctrlpts[i][j][0] >> c
                            >> patch.ctrlpts[i][j][1] >> c
                            >> patch.ctrlpts[i][j][2] >> c;
                skin.push_back(patch);
                break;
            case '#':
                file >> patch_id >> c
                    >> point_i >> c
                    >> point_j >> c
                    >> weight.bone_id >> c;
                for (i = 0; i < 4; i++)
                    for (j = 0; j < 3; j++)
                        file >> weight.weights[i][j] >> c;
                if (patch_id < skin.size())
                {
                    p = skin.begin() + patch_id;
                    (*p).point[point_i][point_j].push_back(weight);
                }
                break;
        }
    }
    file.close();
    selected = 0;
    musty_bone = skeleton.begin();
}
```

//




```

void WriteSKN(char *filename)
{
    long      i, j, k, l, patch_id = -1;
    ofstream file(filename);
    SKELETON::iterator b;
    SKIN::iterator p;
    WEIGHTS::iterator w;

    for (b = skeleton.begin(); b != skeleton.end(); b++)
        file << '|' << (*b).jointnum << ', '
            << (*b).length << ', '
            << (*b).ax << ', '
            << (*b).ay << ', '
            << (*b).az << '; ' << endl;
    for (p = skin.begin(); p != skin.end(); p++)
    {
        file << endl << '@';
        for (i = 0; i < 4; i++)
            for (j = 0; j < 4; j++)
            {
                file << (*p).ctrlpts[i][j][0] << ', '
                    << (*p).ctrlpts[i][j][1] << ', '
                    << (*p).ctrlpts[i][j][2];
                if (i == 3 && j == 3)
                    file << '; ' << endl;
                else
                    file << ', ' << endl;
            }
    }
    for (p = skin.begin(); p != skin.end(); p++)
    {
        file << endl;
        patch_id ++;
        for (i = 0; i < 4; i++)
            for (j = 0; j < 4; j++)
                for (w = (*p).point[i][j].begin(); w != (*p).point[i][j].end(); w++)
                {
                    file << '#' << patch_id << ', '
                        << i << ', '
                        << j << ', '
                        << (*w).bone_id;
                    for (k = 0; k < 4; k++)
                        for (l = 0; l < 3; l++)
                            file << ', ' << (*w).weights[k][l];
                    file << '; ' << endl;
                }
    }
    file.close();
}

////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////////

void DrawCurrentSKN(GLenum mode)
{
    long      i, j, k, name = -1, pushcounter = 0;
    float m[4][4][3];
    SKELETON::iterator b;
    SKIN::iterator p;
    WEIGHTS::iterator w;

```



```

glDisable(GL_LIGHTING);
glClear(GL_COLOR_BUFFER_BIT);
glLineWidth(3);

glPushMatrix();
glScalef(zoom, zoom, zoom);

for (b = skeleton.begin(); b != skeleton.end(); b++)
{
    if (++name == selected)
        glColor3f(0, 1, 0);
    else
        glColor3f(1, 1, 1);

    for (i = 1; i <= (*b).jointnum; i++)
        if (pushcounter-- > 0)
            glPopMatrix();

    if (mode == GL_SELECT)
        glLoadName(name);

    glPushMatrix();
    glRotatef((*b).ax, 1, 0, 0);
    glRotatef((*b).ay, 0, 1, 0);
    glRotatef((*b).az, 0, 0, 1);
    if (bones_enabled)
    {
        glBegin(GL_LINES);
        glVertex3f(0, 0, 0);
        glVertex3f(0, -(*b).length, 0);
        glEnd();
    }
    glTranslatef(0, -0.5 * (*b).length, 0);
    glGetFloatv(GL_MODELVIEW_MATRIX, &(*b).m[0][0]);
    glTranslatef(0, -0.5 * (*b).length, 0);

    pushcounter++;
}

while (pushcounter-- > 0)
    glPopMatrix();

glPopMatrix();

if (mode == GL_SELECT)
    glLoadName(-1);

for (p = skin.begin(); p != skin.end(); p++)
{
    if (skin_enabled || ctrlpts_enabled)
        for (i = 0; i < 4; i++)
            for (j = 0; j < 4; j++)
                for (k = 0; k < 3; k++)
                {
                    m[i][j][k] = 0;
                    for (w = (*p).point[i][j].begin(); w != (*p).point[i][j].end(); w++)
                        if ((*w).bone_id < skeleton.size())
                        {

```



```

        b = skeleton.begin() + (*w).bone_id;
        m[i][j][k] += (*w).weights[0][k] * (*b).m[0][k] * (*p).ctrlpts[i][j][0]
                    + (*w).weights[1][k] * (*b).m[1][k] * (*p).ctrlpts[i][j][1]
                    + (*w).weights[2][k] * (*b).m[2][k] * (*p).ctrlpts[i][j][2]
                    + (*w).weights[3][k] * (*b).m[3][k];
    }
}

if (skin_enabled)
{
    glEnable(GL_LIGHTING);

    glMapGrid2f(15, 0.0, 1.0, 15, 0.0, 1.0);
    glMap2f(GL_MAP2_VERTEX_3, 0, 1, 3, 4, 0, 1, 12, 4, &m[0][0][0]);
    glEvalMesh2(GL_FILL, 0, 15, 0, 15);
}

if (ctrlpts_enabled)
{
    glDisable(GL_LIGHTING);
    glColor3f(1, 1, 1);
    glLineWidth(1);

    for (i = 0; i < 4; i++)
    {
        glBegin(GL_LINE_STRIP);
        for (j = 0; j < 4; j++)
            glVertex3f(m[i][j][0], m[i][j][1], m[i][j][2]);
        glEnd();
    }
    for (j = 0; j < 4; j++)
    {
        glBegin(GL_LINE_STRIP);
        for (i = 0; i < 4; i++)
            glVertex3f(m[i][j][0], m[i][j][1], m[i][j][2]);
        glEnd();
    }
    glColor3f(1, 0, 0);
    glPointSize(3);
    glBegin(GL_POINTS);
    for (i = 0; i < 4; i++)
        for (j = 0; j < 4; j++)
            glVertex3f(m[i][j][0], m[i][j][1], m[i][j][2]);
    glEnd();
}
}

//////////////////////////////////////////////////

void Display(void)
{
    glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
    DrawCurrentSKN(GL_RENDER);
    glFlush();
    glutSwapBuffers();
}

//////////////////////////////////////////////////

void Reshape(GLsizei w, GLsizei h)

```



```

{
    glViewport(0, 0, w, h);
    glMatrixMode(GL_PROJECTION);
    glLoadIdentity();
    glOrtho(((double)-w) / h, ((double) w) / h, -1, 1, 300, -300);
    glMatrixMode(GL_MODELVIEW);
    glLoadIdentity();
    // Display();
}

////////////////////////////////////

#define NON_KEY
#define NORMAL_KEY 256+
#define SPECIAL_KEY 512+

void UpdateMenu(void)
{
    glutSetMenu(view_submenu);
    if (bones_enabled)
        glutChangeToMenuEntry(1, "Hide_Bones\tCtrl+B", NORMAL_KEY 2);
    else
        glutChangeToMenuEntry(1, "Show_Bones\tCtrl+B", NORMAL_KEY 2);
    if (skin_enabled)
        glutChangeToMenuEntry(2, "Hide_Skin\tSpace", NORMAL_KEY ' ');
    else
        glutChangeToMenuEntry(2, "Show_Skin\tSpace", NORMAL_KEY ' ');
    if (ctrlpts_enabled)
        glutChangeToMenuEntry(3, "Hide_Control_Points\tCtrl+P", NORMAL_KEY 16);
    else
        glutChangeToMenuEntry(3, "Show_Control_Points\tCtrl+P", NORMAL_KEY 16);
}

////////////////////////////////////

static void ExecuteOption(int option)
{
    switch(option)
    {
        case NON_KEY 0:
            MessageBox(NULL,
                "Program:\tSkinning_v0.(9)\nAuthor:\tJacek_Czekaj\nDate:\t2004.7.01-2004.8.07",
                "About...", MB_OK);
            break;
        case NORMAL_KEY 2:
            bones_enabled = !bones_enabled;
            UpdateMenu();
            glutPostRedisplay();
            break;
        case NORMAL_KEY 15:
            ReadSKN("noname.skl");
            glutPostRedisplay();
            break;
        case NORMAL_KEY 16:
            ctrlpts_enabled = !ctrlpts_enabled;
            UpdateMenu();
            glutPostRedisplay();
            break;
        case NORMAL_KEY 19:

```



```

    WriteSKN("noname.sk1");
break;
case NORMAL_KEY 27:
    exit(0);
break;
case NORMAL_KEY 127:
    (*musty_bone).length -= 0.1f;
    glutPostRedisplay();
break;
case NORMAL_KEY '_':
    skin_enabled = !skin_enabled;
    UpdateMenu();
    glutPostRedisplay();
break;
case NORMAL_KEY '+':
    zoom += 0.01f;
    glutPostRedisplay();
break;
case NORMAL_KEY '-':
    zoom -= 0.01f;
    glutPostRedisplay();
break;
case NORMAL_KEY '1':
    ReadSKN("arm1.sk1");
    glutPostRedisplay();
break;
case NORMAL_KEY '2':
    ReadSKN("arm2.sk1");
    glutPostRedisplay();
break;
case NORMAL_KEY '3':
    ReadSKN("arm3.sk1");
    glutPostRedisplay();
break;
case NORMAL_KEY '4':
    ReadSKN("arm4.sk1");
    glutPostRedisplay();
break;
case NORMAL_KEY '5':
    ReadSKN("arm5.sk1");
    glutPostRedisplay();
break;
case NORMAL_KEY 'C': case NORMAL_KEY 'c':
    ReadSKN("cube.sk1");
    glutPostRedisplay();
break;
case NORMAL_KEY 'D': case NORMAL_KEY 'd':
    ReadSKN("disk.sk1");
    glutPostRedisplay();
break;
case NORMAL_KEY 'E': case NORMAL_KEY 'e':
    ReadSKN("egg.sk1");
    glutPostRedisplay();
break;
case NORMAL_KEY 'F': case NORMAL_KEY 'f':
    ReadSKN("first-step.sk1");
    glutPostRedisplay();
break;
case NORMAL_KEY 'I': case NORMAL_KEY 'i':

```



```

    ReadSKN("interactive-teapot.skl");
    glutPostRedisplay();
break;
case NORMAL_KEY 'J': case NORMAL_KEY 'j':
    ReadSKN("jackens.skl");
    glutPostRedisplay();
break;
case NORMAL_KEY 'P': case NORMAL_KEY 'p':
    ReadSKN("pine.skl");
    glutPostRedisplay();
break;
case NORMAL_KEY 'S': case NORMAL_KEY 's':
    ReadSKN("skeleton.skl");
    glutPostRedisplay();
break;
case NORMAL_KEY 'T': case NORMAL_KEY 't':
    ReadSKN("teapot.skl");
    glutPostRedisplay();
break;
case SPECIAL_KEY GLUT_KEY_LEFT:
    (*musty_bone).ay += 5;
    if ((*musty_bone).ay > 360)
        (*musty_bone).ay -= 360;
    glutPostRedisplay();
break;
case SPECIAL_KEY GLUT_KEY_RIGHT:
    (*musty_bone).ay -= 5;
    if ((*musty_bone).ay < 0)
        (*musty_bone).ay += 360;
    glutPostRedisplay();
break;
case SPECIAL_KEY GLUT_KEY_UP:
    (*musty_bone).ax += 5;
    if ((*musty_bone).ax > 360)
        (*musty_bone).ax -= 360;
    glutPostRedisplay();
break;
case SPECIAL_KEY GLUT_KEY_DOWN:
    (*musty_bone).ax -= 5;
    if ((*musty_bone).ax < 0)
        (*musty_bone).ax += 360;
    glutPostRedisplay();
break;
case SPECIAL_KEY GLUT_KEY_PAGE_UP:
    (*musty_bone).az += 5;
    if ((*musty_bone).az > 360)
        (*musty_bone).az -= 360;
    glutPostRedisplay();
break;
case SPECIAL_KEY GLUT_KEY_PAGE_DOWN:
    (*musty_bone).az -= 5;
    if ((*musty_bone).az < 0)
        (*musty_bone).az += 360;
    glutPostRedisplay();
break;
case SPECIAL_KEY GLUT_KEY_INSERT:
    (*musty_bone).length += 0.1f;
    glutPostRedisplay();
break;

```




```

    case SPECIAL_KEY GLUT_KEY_F1:
        system("skinning.pdf");
    break;
    case SPECIAL_KEY GLUT_KEY_F5:
        glutPostRedisplay();
    break;
}
}

////////////////////////////////////

void Keyboard(unsigned char key, int x, int y)
{
    ExecuteOption(NORMAL_KEY key);
}

////////////////////////////////////

void Special(int key, int x, int y)
{
    ExecuteOption(SPECIAL_KEY key);
}

////////////////////////////////////

#define BUFSIZE 512

static void Mouse(int button, int state, int x, int y)
{
    long w, h;
    GLuint selectbuffer[BUFSIZE];
    GLint viewport[4];

    if (state == GLUT_DOWN && button == GLUT_LEFT_BUTTON)
    {
        glGetIntegerv(GL_VIEWPORT, viewport);

        glSelectBuffer(BUFSIZE, selectbuffer);
        (void) glRenderMode(GL_SELECT);

        glInitNames();
        glPushName(0);

        glMatrixMode(GL_MODELVIEW);
        glPushMatrix();
        glLoadIdentity();
        gluPickMatrix((GLdouble) x, (GLdouble) (viewport[3]-y), 5, 5, viewport);

        w = viewport[2] - viewport[0];
        h = viewport[3] - viewport[1];

        glOrtho(((double)-w) / h, ((double) w) / h, -1, 1, 300, -300);

        glMatrixMode(GL_MODELVIEW);
        DrawCurrentSKN(GL_SELECT);
        glPopMatrix();
        glFlush();

        if (glRenderMode(GL_RENDER) && selectbuffer[3] >= 0)

```



```

    {
        selected = selectbuffer[3];
        musty_bone = skeleton.begin() + selected;
    }

    glutPostRedisplay();
}
}

////////////////////////////////////

int main(int argc, char** argv)
{
    GLfloat ambient[] = {1, 0.75f, 0.75f, 1};
    GLfloat position[] = {0, 0, 1, 1};
    GLfloat mat_diffuse[] = {1, 0.5f, 0.1f, 1};
    GLfloat mat_specular[] = {0.5, 0.5, 0.5, 1};
    GLfloat mat_shininess[] = {50.0};

    glutInit(&argc, argv);
    glutInitDisplayMode(GLUT_DOUBLE | GLUT_RGB | GLUT_DEPTH);
    glutInitWindowSize(800, 600);
    glutInitWindowPosition(0, 0);
    glutCreateWindow(argv[0]);
    glutFullScreen();

    glClearColor(0, 0, 0, 0);
    glShadeModel(GL_SMOOTH);
    glEnable(GL_DEPTH_TEST);

    glEnable(GL_MAP2_VERTEX_3);
    glEnable(GL_AUTO_NORMAL);
    glEnable(GL_LIGHTING);
    glEnable(GL_LIGHT0);
    glLightfv(GL_LIGHT0, GL_AMBIENT, ambient);
    glLightfv(GL_LIGHT0, GL_POSITION, position);
    glMaterialfv(GL_FRONT, GL_DIFFUSE, mat_diffuse);
    glMaterialfv(GL_FRONT, GL_SPECULAR, mat_specular);
    glMaterialfv(GL_FRONT, GL_SHININESS, mat_shininess);

    file_submenu = glutCreateMenu(ExecuteOption);
    glutAddMenuEntry("First_Step\tF", NORMAL_KEY 'F');
    glutAddMenuEntry("Disk\tD", NORMAL_KEY 'D');
    glutAddMenuEntry("Pine\tP", NORMAL_KEY 'P');
    glutAddMenuEntry("Jackens\tJ", NORMAL_KEY 'J');
    glutAddMenuEntry("Skeleton\tS", NORMAL_KEY 'S');
    glutAddMenuEntry("Cube\tC", NORMAL_KEY 'C');
    glutAddMenuEntry("Arm_1\t1", NORMAL_KEY '1');
    glutAddMenuEntry("Teapot\tT", NORMAL_KEY 'T');
    glutAddMenuEntry("Interactive_Teapot\tI", NORMAL_KEY 'I');
    glutAddMenuEntry("Arm_2\t2", NORMAL_KEY '2');
    glutAddMenuEntry("Egg\tE", NORMAL_KEY 'E');
    glutAddMenuEntry("Arm_3\t3", NORMAL_KEY '3');
    glutAddMenuEntry("Arm_4\t4", NORMAL_KEY '4');
    glutAddMenuEntry("Arm_5\t5", NORMAL_KEY '5');
    glutAddMenuEntry("Open_'noname.skl'\tCtrl+O", NORMAL_KEY 15);
    glutAddMenuEntry("Save_'noname.skl'\tCtrl+S", NORMAL_KEY 19);
    glutAddMenuEntry("Exit\tEscape", NORMAL_KEY 27);
}

```



```

edit_submenu = glutCreateMenu(ExecuteOption);
glutAddMenuEntry("Rotate_By_5\xb0_Around_X_Axis\tUp_Arrow",
                  SPECIAL_KEY GLUT_KEY_UP);
glutAddMenuEntry("Rotate_By_-5\xb0_Around_X_Axis\tDown_Arrow",
                  SPECIAL_KEY GLUT_KEY_DOWN);
glutAddMenuEntry("Rotate_By_5\xb0_Around_Y_Axis\tLeft_Arrow",
                  SPECIAL_KEY GLUT_KEY_LEFT);
glutAddMenuEntry("Rotate_By_-5\xb0_Around_Y_Axis\tRight_Arrow",
                  SPECIAL_KEY GLUT_KEY_RIGHT);
glutAddMenuEntry("Rotate_By_5\xb0_Around_Z_Axis\tPage_Up",
                  SPECIAL_KEY GLUT_KEY_PAGE_UP);
glutAddMenuEntry("Rotate_By_-5\xb0_Around_Z_Axis\tPage_Down",
                  SPECIAL_KEY GLUT_KEY_PAGE_DOWN);
glutAddMenuEntry("Stretch_Musty_Bone\tInsert", SPECIAL_KEY GLUT_KEY_INSERT);
glutAddMenuEntry("Shrink_Musty_Bone\tDelete", NORMAL_KEY 127);

view_submenu = glutCreateMenu(ExecuteOption);
glutAddMenuEntry("I", 1980);
glutAddMenuEntry("Love", 3);
glutAddMenuEntry("TeX", 31);
glutAddMenuEntry("Zoom_In\t+", NORMAL_KEY '+' );
glutAddMenuEntry("Zoom_Out\t-", NORMAL_KEY '-' );
glutAddMenuEntry("Refresh\tF5", SPECIAL_KEY GLUT_KEY_F5);

help_submenu = glutCreateMenu(ExecuteOption);
glutAddMenuEntry("Contents\tF1", SPECIAL_KEY GLUT_KEY_F1);
glutAddMenuEntry("About...", NON_KEY 0);

main_menu = glutCreateMenu(ExecuteOption);
glutAddSubMenu("File", file_submenu);
glutAddSubMenu("Edit", edit_submenu);
glutAddSubMenu("View", view_submenu);
glutAddSubMenu("Help", help_submenu);

glutAttachMenu(GLUT_RIGHT_BUTTON);
UpdateMenu();

glutDisplayFunc(Display);
glutReshapeFunc(Reshape);
glutKeyboardFunc(Keyboard);
glutSpecialFunc(Special);
glutMouseFunc(Mouse);

// Paste file 'find-weights.cpp' here...

ExecuteOption(NORMAL_KEY 'F');

glutMainLoop();

return 0;
}

```



Kod źródłowy algorytmu szukającego wag — plik ‘find-weights.cpp’:

```
#define ABS(x) (((x)>0)?(x):-(x))
#define EPS 0.00001
#define CORRECT(x) (((ABS(x))<(EPS))?0:(x))

GLfloat pt[2][16][4][4][3];
GLfloat m[2][5][4][4];
float w[16][4][4][5][4][3];
float ax0, ay0, az0, b0,
      ax1, ay1, az1, b1,
      ax2, ay2, az2, b2,
      Wx, Wy, Wz, Bx, By, Bz,
      MW2, MB2, Ma02, Ma12, Ma22;
      x, y, z,
long bn[16][4][4];
long p, i, j, b, k, l;
boolean non_zero;
SKELETON::iterator bone;
SKIN::iterator patch;
WEIGHTS::iterator weight;
ofstream file("arm_5_.skl");

for (p = 0; p < 16; p++)
  for (i = 0; i < 4; i++)
    for (j = 0; j < 4; j++)
      for (b = 0; b < 5; b++)
        for (k = 0; k < 4; k++)
          for (l = 0; l < 3; l++)
            w[p][i][j][b][k][l] = 0;

ExecuteOption(NORMALKEY '3');
DrawCurrentSKN(GLRENDER);

for (bone = skeleton.begin(), b = 0; bone != skeleton.end(); bone++, b++)
  for (i = 0; i < 4; i++)
    for (j = 0; j < 4; j++)
      m[0][b][i][j] = (*bone).m[i][j];

for (patch = skin.begin(), p = 0; patch != skin.end(); patch++, p++)
  for (i = 0; i < 4; i++)
    for (j = 0; j < 4; j++)
    {
      weight = (*patch).point[i][j].begin();
      bn[p][i][j] = (*weight).bone_id;
    }

for (patch = skin.begin(), p = 0; patch != skin.end(); patch++, p++)
  for (i = 0; i < 4; i++)
    for (j = 0; j < 4; j++)
      for (k = 0; k < 3; k++)
        pt[0][p][i][j][k] = (*patch).ctrlpts[i][j][k];

ExecuteOption(NORMALKEY '4');
DrawCurrentSKN(GLRENDER);

for (bone = skeleton.begin(), b = 0; bone != skeleton.end(); bone++, b++)
  for (i = 0; i < 4; i++)
    for (j = 0; j < 4; j++)
```



```

m[1][b][i][j] = (*bone).m[i][j];

for (patch = skin.begin(), p = 0; patch != skin.end(); patch++, p++)
    for (i = 0; i < 4; i++)
        for (j = 0; j < 4; j++)
            for (k = 0; k < 3; k++)
                pt[1][p][i][j][k] = (*patch).ctrlpts[i][j][k];

ExecuteOption(NORMALKEY '5');
DrawCurrentSKN(GLRENDER);

for (p = 0; p < 16; p++)
    for (i = 0; i < 4; i++)
        for (j = 0; j < 4; j++)
        {
            for (l = 0; l < 3; l++)
            {
                if (bn[p][i][j] > 0)
                {
                    ax0 = CORRECT(m[0][ bn[p][i][j]-1 ][0][1] * pt[0][p][i][j][0] +
                                   m[0][ bn[p][i][j]-1 ][1][1] * pt[0][p][i][j][1] +
                                   m[0][ bn[p][i][j]-1 ][2][1] * pt[0][p][i][j][2] +
                                   m[0][ bn[p][i][j]-1 ][3][1]);
                    ax1 = CORRECT(m[1][ bn[p][i][j]-1 ][0][1] * pt[0][p][i][j][0] +
                                   m[1][ bn[p][i][j]-1 ][1][1] * pt[0][p][i][j][1] +
                                   m[1][ bn[p][i][j]-1 ][2][1] * pt[0][p][i][j][2] +
                                   m[1][ bn[p][i][j]-1 ][3][1]);
                }
                else
                    ax0 = ax1 = 0;

                ay0 = CORRECT(m[0][ bn[p][i][j] ][0][1] * pt[0][p][i][j][0] +
                               m[0][ bn[p][i][j] ][1][1] * pt[0][p][i][j][1] +
                               m[0][ bn[p][i][j] ][2][1] * pt[0][p][i][j][2] +
                               m[0][ bn[p][i][j] ][3][1]);
                ay1 = CORRECT(m[1][ bn[p][i][j] ][0][1] * pt[0][p][i][j][0] +
                               m[1][ bn[p][i][j] ][1][1] * pt[0][p][i][j][1] +
                               m[1][ bn[p][i][j] ][2][1] * pt[0][p][i][j][2] +
                               m[1][ bn[p][i][j] ][3][1]);

                if (bn[p][i][j] < 4)
                {
                    az0 = CORRECT(m[0][ bn[p][i][j]+1 ][0][1] * pt[0][p][i][j][0] +
                                   m[0][ bn[p][i][j]+1 ][1][1] * pt[0][p][i][j][1] +
                                   m[0][ bn[p][i][j]+1 ][2][1] * pt[0][p][i][j][2] +
                                   m[0][ bn[p][i][j]+1 ][3][1]);
                    az1 = CORRECT(m[1][ bn[p][i][j]+1 ][0][1] * pt[0][p][i][j][0] +
                                   m[1][ bn[p][i][j]+1 ][1][1] * pt[0][p][i][j][1] +
                                   m[1][ bn[p][i][j]+1 ][2][1] * pt[0][p][i][j][2] +
                                   m[1][ bn[p][i][j]+1 ][3][1]);
                }
                else
                    az0 = az1 = 0;

                b0 = CORRECT(m[0][ bn[p][i][j] ][0][1] * pt[0][p][i][j][0] +
                               m[0][ bn[p][i][j] ][1][1] * pt[0][p][i][j][1] +
                               m[0][ bn[p][i][j] ][2][1] * pt[0][p][i][j][2] +
                               m[0][ bn[p][i][j] ][3][1]);
                b1 = CORRECT(m[1][ bn[p][i][j] ][0][1] * pt[1][p][i][j][0] +

```



$$\begin{aligned} & m[1][bn[p][i][j]][1][1] * pt[1][p][i][j][1] + \\ & m[1][bn[p][i][j]][2][1] * pt[1][p][i][j][2] + \\ & m[1][bn[p][i][j]][3][1]); \end{aligned}$$

```

ax2 = CORRECT(ax0 + ax1);
ay2 = CORRECT(ay0 + ay1);
az2 = CORRECT(az0 + az1);
b2 = CORRECT(b0 + b1);

Wx = CORRECT(ay0 * az1 - ay1 * az0);
Wy = CORRECT(az0 * ax1 - az1 * ax0);
Wz = CORRECT(ax0 * ay1 - ax1 * ay0);

Bx = CORRECT(b0 * ax1 - b1 * ax0);
By = CORRECT(b0 * ay1 - b1 * ay0);
Bz = CORRECT(b0 * az1 - b1 * az0);

MW2 = CORRECT(Wx * Wx + Wy * Wy + Wz * Wz);
MB2 = CORRECT(Bx * Bx + By * By + Bz * Bz);
Ma02= CORRECT(ax0 * ax0 + ay0 * ay0 + az0 * az0);
Ma12= CORRECT(ax1 * ax1 + ay1 * ay1 + az1 * az1);
Ma22= CORRECT(ax2 * ax2 + ay2 * ay2 + az2 * az2);

if (MW2 > 0)
{
    x = CORRECT((By * Wz - Bz * Wy) / MW2);
    y = CORRECT((Bz * Wx - Bx * Wz) / MW2);
    z = CORRECT((Bx * Wy - By * Wx) / MW2);
}
else
{
    if (MB2 == 0)
    {
        if (Ma02 > 0)
        {
            x = CORRECT((ax0 * b0) / Ma02);
            y = CORRECT((ay0 * b0) / Ma02);
            z = CORRECT((az0 * b0) / Ma02);
        }
        else if (Ma12 > 0)
        {
            x = CORRECT((ax1 * b1) / Ma12);
            y = CORRECT((ay1 * b1) / Ma12);
            z = CORRECT((az1 * b1) / Ma12);
        }
        else
        {
            x = 0;
            y = 0;
            z = 0;
        }
    }
    else
    {
        if (Ma22 > 0)
        {
            x = CORRECT((ax2 * b2) / Ma22);
            y = CORRECT((ay2 * b2) / Ma22);
            z = CORRECT((az2 * b2) / Ma22);
        }
    }
}

```




```

    }
    else
    {
        x = 0;
        y = 0;
        z = 0;
    }
}

if (bn[p][i][j] > 0)
{
    w[p][i][j][ bn[p][i][j]-1 ][0][1] = x;
    w[p][i][j][ bn[p][i][j]-1 ][1][1] = x;
    w[p][i][j][ bn[p][i][j]-1 ][2][1] = x;
    w[p][i][j][ bn[p][i][j]-1 ][3][1] = x;
}

w[p][i][j][ bn[p][i][j] ][0][1] = y;
w[p][i][j][ bn[p][i][j] ][1][1] = y;
w[p][i][j][ bn[p][i][j] ][2][1] = y;
w[p][i][j][ bn[p][i][j] ][3][1] = y;

if (bn[p][i][j] < 4)
{
    w[p][i][j][ bn[p][i][j]+1 ][0][1] = z;
    w[p][i][j][ bn[p][i][j]+1 ][1][1] = z;
    w[p][i][j][ bn[p][i][j]+1 ][2][1] = z;
    w[p][i][j][ bn[p][i][j]+1 ][3][1] = z;
}
}

for (p = 0; p < 16; p++)
    for (i = 0; i < 4; i++)
        for (j = 0; j < 4; j++)
            for (b = 0; b < 5; b++)
            {
                non_zero = false;
                for (k = 0; k < 4; k++)
                    for (l = 0; l < 3; l++)
                        if (w[p][i][j][b][k][l] != 0)
                            non_zero = true;
                if (non_zero)
                {
                    file << '#' << p << ',' << i << ',' << j << ',' << b << ',' << endl;
                    for (k = 0; k < 4; k++)
                        for (l = 0; l < 3; l++)
                        {
                            file << w[p][i][j][b][k][l];
                            if (k == 3 && l == 2)
                                file << ';' << endl << endl;
                            else if (l == 2)
                                file << ',' << endl;
                            else
                                file << ',';
                        }
                }
            }
}

```



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*/***

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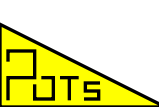
OpenGL(TM) is a trademark of Silicon Graphics, Inc.

**/*

#include "glutint.h"

/ Rim, body, lid, and bottom data must be reflected in x and y; handle and spout data across the y axis only. */*

```
static int patchdata[[[16] =  
{  
    /* rim */  
    {102, 103, 104, 105, 4, 5, 6, 7, 8, 9, 10, 11,  
      12, 13, 14, 15},  
    /* body */
```



```

{12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23,
 24, 25, 26, 27},
{24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36,
 37, 38, 39, 40},
/* lid */
{96, 96, 96, 96, 97, 98, 99, 100, 101, 101, 101,
 101, 0, 1, 2, 3},
{0, 1, 2, 3, 106, 107, 108, 109, 110, 111, 112,
 113, 114, 115, 116, 117},
/* bottom */
{118, 118, 118, 118, 124, 122, 119, 121, 123, 126,
 125, 120, 40, 39, 38, 37},
/* handle */
{41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52,
 53, 54, 55, 56},
{53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64,
 28, 65, 66, 67},
/* spout */
{68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79,
 80, 81, 82, 83},
{80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91,
 92, 93, 94, 95}
};
/* *INDENT-OFF* */

static float cpdata[][3] =
{
    {0.2, 0, 2.7}, {0.2, -0.112, 2.7}, {0.112, -0.2, 2.7}, {0,
    -0.2, 2.7}, {1.3375, 0, 2.53125}, {1.3375, -0.749, 2.53125},
    {0.749, -1.3375, 2.53125}, {0, -1.3375, 2.53125}, {1.4375,
    0, 2.53125}, {1.4375, -0.805, 2.53125}, {0.805, -1.4375,
    2.53125}, {0, -1.4375, 2.53125}, {1.5, 0, 2.4}, {1.5, -0.84,
    2.4}, {0.84, -1.5, 2.4}, {0, -1.5, 2.4}, {1.75, 0, 1.875},
    {1.75, -0.98, 1.875}, {0.98, -1.75, 1.875}, {0, -1.75,
    1.875}, {2, 0, 1.35}, {2, -1.12, 1.35}, {1.12, -2, 1.35},
    {0, -2, 1.35}, {2, 0, 0.9}, {2, -1.12, 0.9}, {1.12, -2,
    0.9}, {0, -2, 0.9}, {-2, 0, 0.9}, {2, 0, 0.45}, {2, -1.12,
    0.45}, {1.12, -2, 0.45}, {0, -2, 0.45}, {1.5, 0, 0.225},
    {1.5, -0.84, 0.225}, {0.84, -1.5, 0.225}, {0, -1.5, 0.225},
    {1.5, 0, 0.15}, {1.5, -0.84, 0.15}, {0.84, -1.5, 0.15}, {0,
    -1.5, 0.15}, {-1.6, 0, 2.025}, {-1.6, -0.3, 2.025}, {-1.5,
    -0.3, 2.25}, {-1.5, 0, 2.25}, {-2.3, 0, 2.025}, {-2.3, -0.3,
    2.025}, {-2.5, -0.3, 2.25}, {-2.5, 0, 2.25}, {-2.7, 0,
    2.025}, {-2.7, -0.3, 2.025}, {-3, -0.3, 2.25}, {-3, 0,
    2.25}, {-2.7, 0, 1.8}, {-2.7, -0.3, 1.8}, {-3, -0.3, 1.8},
    {-3, 0, 1.8}, {-2.7, 0, 1.575}, {-2.7, -0.3, 1.575}, {-3,
    -0.3, 1.35}, {-3, 0, 1.35}, {-2.5, 0, 1.125}, {-2.5, -0.3,
    1.125}, {-2.65, -0.3, 0.9375}, {-2.65, 0, 0.9375}, {-2,
    -0.3, 0.9}, {-1.9, -0.3, 0.6}, {-1.9, 0, 0.6}, {1.7, 0,
    1.425}, {1.7, -0.66, 1.425}, {1.7, -0.66, 0.6}, {1.7, 0,
    0.6}, {2.6, 0, 1.425}, {2.6, -0.66, 1.425}, {3.1, -0.66,
    0.825}, {3.1, 0, 0.825}, {2.3, 0, 2.1}, {2.3, -0.25, 2.1},
    {2.4, -0.25, 2.025}, {2.4, 0, 2.025}, {2.7, 0, 2.4}, {2.7,
    -0.25, 2.4}, {3.3, -0.25, 2.4}, {3.3, 0, 2.4}, {2.8, 0,
    2.475}, {2.8, -0.25, 2.475}, {3.525, -0.25, 2.49375},
    {3.525, 0, 2.49375}, {2.9, 0, 2.475}, {2.9, -0.15, 2.475},
    {3.45, -0.15, 2.5125}, {3.45, 0, 2.5125}, {2.8, 0, 2.4},
    {2.8, -0.15, 2.4}, {3.2, -0.15, 2.4}, {3.2, 0, 2.4}, {0, 0,
    3.15}, {0.8, 0, 3.15}, {0.8, -0.45, 3.15}, {0.45, -0.8,

```



```

    3.15}, {0, -0.8, 3.15}, {0, 0, 2.85}, {1.4, 0, 2.4}, {1.4,
    -0.784, 2.4}, {0.784, -1.4, 2.4}, {0, -1.4, 2.4}, {0.4, 0,
    2.55}, {0.4, -0.224, 2.55}, {0.224, -0.4, 2.55}, {0, -0.4,
    2.55}, {1.3, 0, 2.55}, {1.3, -0.728, 2.55}, {0.728, -1.3,
    2.55}, {0, -1.3, 2.55}, {1.3, 0, 2.4}, {1.3, -0.728, 2.4},
    {0.728, -1.3, 2.4}, {0, -1.3, 2.4}, {0, 0, 0}, {1.425,
    -0.798, 0}, {1.5, 0, 0.075}, {1.425, 0, 0}, {0.798, -1.425,
    0}, {0, -1.5, 0.075}, {0, -1.425, 0}, {1.5, -0.84, 0.075},
    {0.84, -1.5, 0.075}
};

static float tex[2][2][2] =
{
    { {0, 0},
      {1, 0}},
    { {0, 1},
      {1, 1}}
};

/* *INDENT-ON* */

static void
teapot(GLint grid, GLdouble scale, GLenum type)
{
    float p[4][4][3], q[4][4][3], r[4][4][3], s[4][4][3];
    long i, j, k, l;

    glPushAttrib(GL_ENABLE_BIT | GL_EVAL_BIT);
    glEnable(GL_AUTO_NORMAL);
    glEnable(GL_NORMALIZE);
    glEnable(GL_MAP2_VERTEX_3);
    glEnable(GL_MAP2_TEXTURE_COORD_2);
    glPushMatrix();
    glRotatef(270.0, 1.0, 0.0, 0.0);
    glScalef(0.5 * scale, 0.5 * scale, 0.5 * scale);
    glTranslatef(0.0, 0.0, -1.5);
    for (i = 0; i < 10; i++) {
        for (j = 0; j < 4; j++) {
            for (k = 0; k < 4; k++) {
                for (l = 0; l < 3; l++) {
                    p[j][k][l] = cpdata[patchdata[i][j * 4 + k]][l];
                    q[j][k][l] = cpdata[patchdata[i][j * 4 + (3 - k)]][l];
                    if (l == 1)
                        q[j][k][l] *= -1.0;
                    if (i < 6) {
                        r[j][k][l] =
                            cpdata[patchdata[i][j * 4 + (3 - k)]][l];
                        if (l == 0)
                            r[j][k][l] *= -1.0;
                        s[j][k][l] = cpdata[patchdata[i][j * 4 + k]][l];
                        if (l == 0)
                            s[j][k][l] *= -1.0;
                        if (l == 1)
                            s[j][k][l] *= -1.0;
                    }
                }
            }
        }
    }
    glMap2f(GL_MAP2_TEXTURE_COORD_2, 0, 1, 2, 2, 0, 1, 4, 2,

```



```

    &tex[0][0][0]);
glMap2f(GL_MAP2_VERTEX_3, 0, 1, 3, 4, 0, 1, 12, 4,
    &p[0][0][0]);
glMapGrid2f(grid, 0.0, 1.0, grid, 0.0, 1.0);
glEvalMesh2(type, 0, grid, 0, grid);
glMap2f(GL_MAP2_VERTEX_3, 0, 1, 3, 4, 0, 1, 12, 4,
    &q[0][0][0]);
glEvalMesh2(type, 0, grid, 0, grid);
if (i < 6) {
    glMap2f(GL_MAP2_VERTEX_3, 0, 1, 3, 4, 0, 1, 12, 4,
        &r[0][0][0]);
    glEvalMesh2(type, 0, grid, 0, grid);
    glMap2f(GL_MAP2_VERTEX_3, 0, 1, 3, 4, 0, 1, 12, 4,
        &s[0][0][0]);
    glEvalMesh2(type, 0, grid, 0, grid);
}
}
glPopMatrix();
glPopAttrib();
}

/* CENTRY */
void APIENTRY
glutSolidTeapot(GLdouble scale)
{
    teapot(7, scale, GL_FILL);
}

void APIENTRY
glutWireTeapot(GLdouble scale)
{
    teapot(10, scale, GL_LINE);
}

/* ENDCENTRY */

```



Pliki '.skl'

Zawartość pliku 'first-step.skl':

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```
|0,1.5,0,0,0;  
|0,3,0,0,-45;  
|1,3,0,0,45;  
|1,4.5,0,0,0;  
|0,3,0,0,-45;  
|1,3,0,0,45;
```

Zawartość pliku 'disk.skl':

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```
|0,0,0,0,0;  
|0,4,-20,-10,0;  
|1,4,-20,-10,-10;  
|1,4,-20,-10,-20;  
|1,4,-20,-10,-30;  
|1,4,-20,-10,-40;  
|1,4,-20,-10,-50;  
|1,4,-20,-10,-60;  
|1,4,-20,-10,-70;  
|1,4,-20,-10,-80;  
|1,4,-20,-10,-90;  
|1,4,-20,-10,-100;  
|1,4,-20,-10,-110;  
|1,4,-20,-10,-120;  
|1,4,-20,-10,-130;  
|1,4,-20,-10,-140;  
|1,4,-20,-10,-150;  
|1,4,-20,-10,-160;  
|1,4,-20,-10,-170;  
|1,4,-20,-10,-180;  
|1,4,-20,-10,-190;  
|1,4,-20,-10,-200;  
|1,4,-20,-10,-210;  
|1,4,-20,-10,-220;  
|1,4,-20,-10,-230;  
|1,4,-20,-10,-240;  
|1,4,-20,-10,-250;  
|1,4,-20,-10,-260;  
|1,4,-20,-10,-270;  
|1,4,-20,-10,-280;  
|1,4,-20,-10,-290;  
|1,4,-20,-10,-300;  
|1,4,-20,-10,-310;  
|1,4,-20,-10,-320;  
|1,4,-20,-10,-330;  
|1,4,-20,-10,-340;  
|1,4,-20,-10,-350;
```

Zawartość pliku 'pine.skl':

Copyright (c) Jacek Czekaj, 2004

```
|0,0,0,0,0;  
|0,3,0,0,30;  
|1,3,0,45,30;  
|1,3,0,90,30;  
|1,3,0,135,30;  
|1,3,0,180,30;  
|1,3,0,225,30;  
|1,3,0,270,30;  
|1,3,0,315,30;  
|1,2,0,0,0;  
|0,3,0,15,45;  
|1,3,0,60,45;  
|1,3,0,105,45;  
|1,3,0,150,45;  
|1,3,0,195,45;  
|1,3,0,240,45;  
|1,3,0,285,45;  
|1,3,0,330,45;  
|1,2,0,0,0;  
|0,3,0,30,60;  
|1,3,0,75,60;  
|1,3,0,120,60;  
|1,3,0,165,60;  
|1,3,0,210,60;  
|1,3,0,255,60;  
|1,3,0,300,60;  
|1,3,0,345,60;  
|1,3,0,0,0;
```

Zawartość pliku 'jackens.skl':

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```
|0,1.2,0,0,100;  
|0,2.2,0,0,-110;  
|0,1.5,0,0,-30;  
|0,0.7,0,0,-120;  
|0,2.2,0,0,-70;  
|0,0.7,0,0,-10;  
|1,0.7,0,0,-140;  
|0,0.7,0,0,130;  
|0,0.5,0,0,35;  
|1,0.5,0,0,-40;  
|0,0.7,0,0,80;  
|0,0.4,0,0,-40;  
|2,0.8,0,0,25;  
|0,1.2,0,0,45;  
|0,0.9,0,0,20;  
|0,2.5,0,0,-190;  
|0,0.8,0,0,150;  
|0,0.8,0,0,0;  
|1,0.6,0,0,-90;  
|0,1,0,0,95;  
|0,0.3,0,0,110;  
|0,0.2,0,0,70;  
|0,0.8,0,0,40;  
|0,0.6,0,0,130;  
|0,0.5,0,0,20;  
|0,0.7,0,0,-160;
```



|0,0.9,0,0,150;
 |0,0.6,0,0,-150;
 |0,0.6,0,0,150;
 |0,0.6,0,0,-10;
 |1,0.5,0,0,-70;
 |0,0.8,0,0,-110;

Zawartość pliku 'skeleton.skl':

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|0,1,0,180,0;
 |0,1.2,0,0,-95;
 |0,1.5,0,0,30;
 |0,1.7,0,0,30;
 |0,0.5,0,0,-45;
 |0,0.5,0,0,15;
 |0,0.5,0,0,15;
 |3,0.55,0,0,-30;
 |0,0.55,0,0,15;
 |0,0.5,0,0,15;
 |3,0.6,0,0,-15;
 |0,0.6,0,0,15;
 |0,0.5,0,0,15;
 |3,0.55,0,0,0;
 |0,0.55,0,0,15;
 |0,0.5,0,0,15;
 |3,0.5,0,0,45;
 |0,0.4,0,0,-15;
 |0,0.3,0,0,-15;
 |6,1.2,0,0,95;
 |0,1.5,0,0,-30;
 |0,1.7,0,0,-30;
 |0,0.5,0,0,-45;
 |0,0.4,0,0,15;
 |0,0.3,0,0,15;
 |3,0.55,0,0,0;
 |0,0.55,0,0,-15;
 |0,0.5,0,0,-15;
 |3,0.6,0,0,15;
 |0,0.6,0,0,-15;
 |0,0.5,0,0,-15;
 |3,0.55,0,0,30;
 |0,0.55,0,0,-15;
 |0,0.5,0,0,-15;
 |3,0.5,0,0,45;
 |0,0.5,0,0,-15;
 |0,0.5,0,0,-15;
 |6,0.3,0,0,0;
 |0,1,30,0,-95;
 |0,0.5,-45,0,0;
 |0,0.5,-45,0,0;
 |0,1.4,-100,0,0;
 |4,1,30,0,95;
 |0,0.5,-45,0,0;
 |0,0.5,-45,0,0;
 |0,1.4,-100,0,0;
 |4,0.4,0,0,0;
 |0,1,30,0,-95;

|0,0.4,-45,0,0;
 |0,0.4,-45,0,0;
 |0,1.4,-100,0,0;
 |4,1,30,0,95;
 |0,0.4,-45,0,0;
 |0,0.4,-45,0,0;
 |0,1.4,-100,0,0;
 |4,0.4,0,0,0;
 |0,1,30,0,-95;
 |0,0.3,-45,0,0;
 |0,0.3,-45,0,0;
 |0,1.3,-100,0,0;
 |4,1,30,0,95;
 |0,0.3,-45,0,0;
 |0,0.3,-45,0,0;
 |0,1.3,-100,0,0;
 |4,0.4,0,0,0;
 |0,1,30,0,-95;
 |0,0.2,-45,0,0;
 |0,0.2,-45,0,0;
 |0,1.2,-100,0,0;
 |4,1,30,0,95;
 |0,0.2,-45,0,0;
 |0,0.2,-45,0,0;
 |0,1.2,-100,0,0;
 |4,0.4,0,0,0;
 |0,1,30,0,-95;
 |0,0.1,-45,0,0;
 |0,0.1,-45,0,0;
 |0,1,-100,0,0;
 |4,1,30,0,95;
 |0,0.1,-45,0,0;
 |0,0.1,-45,0,0;
 |0,1,-100,0,0;
 |4,1.5,0,0,0;
 |0,1,0,0,-110;
 |0,1,0,0,60;
 |0,0.5,0,0,90;
 |0,1.5,0,0,75;
 |1,2.5,0,0,-75;
 |0,2.5,0,0,30;
 |0,1.3,0,0,-80;
 |0,0.3,0,0,15;
 |2,1.3,0,0,-70;
 |0,0.3,0,0,15;
 |2,1.2,0,0,-60;
 |0,0.3,0,0,15;
 |2,1.1,0,0,-50;
 |0,0.3,0,0,15;
 |2,1,0,0,-40;
 |0,0.3,0,0,15;
 |7,1,0,0,110;
 |0,1,0,0,-60;
 |0,0.5,0,0,-90;
 |0,1.5,0,0,-75;
 |1,2.5,0,0,80;
 |0,2.5,0,0,-30;
 |0,1.3,0,0,80;
 |0,0.3,0,0,-15;



```
|2,1.3,0,0,70;
|0,0.3,0,0,-15;
|2,1.2,0,0,60;
|0,0.3,0,0,-15;
|2,1.1,0,0,50;
|0,0.3,0,0,-15;
|2,1,0,0,40;
|0,0.3,0,0,-15;
```

Zawartość pliku 'cube.skl':

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```
|0,7,0,0,90;
|0,7,90,0,0;
|0,7,90,0,0;
|2,7,0,0,90;
|0,7,0,0,90;
|0,7,0,0,90;
|0,7,90,0,0;
|0,7,90,0,0;
|0,7,90,0,0;
|0,7,90,0,0;
|1,7,0,0,90;
|0,7,0,0,90;
|1,7,90,0,0;
```

Zawartość pliku 'arm1.skl':

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```
|0,6,0,0,80;
|0,0.5,0,0,20;
|0,6,0,0,20;
```

```
@-1.5,0,-1.5,
-0.5,0,-2.5,
0.5,0,-2.5,
1.5,0,-1.5,
-1.5,2,-1.5,
-0.5,2,-2.5,
0.5,2,-2.5,
1.5,2,-1.5,
-1.5,1,-1.5,
-0.5,1,-2.5,
0.5,1,-2.5,
1.5,1,-1.5,
-1,3,-1,
-0.5,3,-1.5,
0.5,3,-1.5,
1,3,-1;
```

```
@1.5,0,-1.5,
2.5,0,-0.5,
2.5,0,0.5,
1.5,0,1.5,
1.5,2,-1.5,
2.5,2,-0.5,
2.5,2,0.5,
1.5,2,1.5,
```

```
1.5,1,-1.5,
2.5,1,-0.5,
2.5,1,0.5,
1.5,1,1.5,
1,3,-1,
1.5,3,-0.5,
1.5,3,0.5,
1,3,1;
```

```
@1.5,0,1.5,
0.5,0,2.5,
-0.5,0,2.5,
-1.5,0,1.5,
1.5,2,1.5,
0.5,2,2.5,
-0.5,2,2.5,
-1.5,2,1.5,
1.5,1,1.5,
0.5,1,2.5,
-0.5,1,2.5,
-1.5,1,1.5,
1,3,1,
0.5,3,1.5,
-0.5,3,1.5,
-1,3,1;
```

```
@-1.5,0,1.5,
-2.5,0,0.5,
-2.5,0,-0.5,
-1.5,0,-1.5,
-1.5,2,1.5,
-2.5,2,0.5,
-2.5,2,-0.5,
-1.5,2,-1.5,
-1.5,1,1.5,
-2.5,1,0.5,
-2.5,1,-0.5,
-1.5,1,-1.5,
-1,3,1,
-1.5,3,0.5,
-1.5,3,-0.5,
-1,3,-1;
```

```
@-1,-3,-1,
-0.5,-3,-1.5,
0.5,-3,-1.5,
1,-3,-1,
-1.5,-1,-1.5,
-0.5,-1,-2.5,
0.5,-1,-2.5,
1.5,-1,-1.5,
-1.5,-2,-1.5,
-0.5,-2,-2.5,
0.5,-2,-2.5,
1.5,-2,-1.5,
-1.5,0,-1.5,
-0.5,0,-2.5,
0.5,0,-2.5,
1.5,0,-1.5;
```



@1,-3,-1,
1.5,-3,-0.5,
1.5,-3,0.5,
1,-3,1,
1.5,-1,-1.5,
2.5,-1,-0.5,
2.5,-1,0.5,
1.5,-1,1.5,
1.5,-2,-1.5,
2.5,-2,-0.5,
2.5,-2,0.5,
1.5,-2,1.5,
1.5,0,-1.5,
2.5,0,-0.5,
2.5,0,0.5,
1.5,0,1.5;

@1,-3,1,
0.5,-3,1.5,
-0.5,-3,1.5,
-1,-3,1,
1.5,-1,1.5,
0.5,-1,2.5,
-0.5,-1,2.5,
-1.5,-1,1.5,
1.5,-2,1.5,
0.5,-2,2.5,
-0.5,-2,2.5,
-1.5,-2,1.5,
1.5,0,1.5,
0.5,0,2.5,
-0.5,0,2.5,
-1.5,0,1.5;

@-1,-3,1,
-1.5,-3,0.5,
-1.5,-3,-0.5,
-1,-3,-1,
-1.5,-1,1.5,
-2.5,-1,0.5,
-2.5,-1,-0.5,
-1.5,-1,-1.5,
-1.5,-2,1.5,
-2.5,-2,0.5,
-2.5,-2,-0.5,
-1.5,-2,-1.5,
-1.5,0,1.5,
-2.5,0,0.5,
-2.5,0,-0.5,
-1.5,0,-1.5;

#0,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,0,2,1,1,1,1,1,1,1,1,1,1,1,1;
#0,0,3,1,1,1,1,1,1,1,1,1,1,1,1;
#0,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,1,2,1,1,1,1,1,1,1,1,1,1,1,1;

#0,1,3,1,1,1,1,1,1,1,1,1,1,1,1;
#0,2,0,0,1,1,1,1,1,1,1,1,1,1,1;
#0,2,1,0,1,1,1,1,1,1,1,1,1,1,1;
#0,2,2,0,1,1,1,1,1,1,1,1,1,1,1;
#0,2,3,0,1,1,1,1,1,1,1,1,1,1,1;
#0,3,0,0,1,1,1,1,1,1,1,1,1,1,1;
#0,3,1,0,1,1,1,1,1,1,1,1,1,1,1;
#0,3,2,0,1,1,1,1,1,1,1,1,1,1,1;
#0,3,3,0,1,1,1,1,1,1,1,1,1,1,1;

#1,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,0,2,1,1,1,1,1,1,1,1,1,1,1,1;
#1,0,3,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,2,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,3,1,1,1,1,1,1,1,1,1,1,1,1;
#1,2,0,0,1,1,1,1,1,1,1,1,1,1,1;
#1,2,1,0,1,1,1,1,1,1,1,1,1,1,1;
#1,2,2,0,1,1,1,1,1,1,1,1,1,1,1;
#1,2,3,0,1,1,1,1,1,1,1,1,1,1,1;
#1,3,0,0,1,1,1,1,1,1,1,1,1,1,1;
#1,3,1,0,1,1,1,1,1,1,1,1,1,1,1;
#1,3,2,0,1,1,1,1,1,1,1,1,1,1,1;
#1,3,3,0,1,1,1,1,1,1,1,1,1,1,1;

#2,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#2,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,0,2,1,1,1,1,1,1,1,1,1,1,1,1;
#2,0,3,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,2,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,3,1,1,1,1,1,1,1,1,1,1,1,1;
#2,2,0,0,1,1,1,1,1,1,1,1,1,1,1;
#2,2,1,0,1,1,1,1,1,1,1,1,1,1,1;
#2,2,2,0,1,1,1,1,1,1,1,1,1,1,1;
#2,2,3,0,1,1,1,1,1,1,1,1,1,1,1;
#2,3,0,0,1,1,1,1,1,1,1,1,1,1,1;
#2,3,1,0,1,1,1,1,1,1,1,1,1,1,1;
#2,3,2,0,1,1,1,1,1,1,1,1,1,1,1;
#2,3,3,0,1,1,1,1,1,1,1,1,1,1,1;

#3,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#3,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#3,0,2,1,1,1,1,1,1,1,1,1,1,1,1;
#3,0,3,1,1,1,1,1,1,1,1,1,1,1,1;
#3,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#3,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#3,1,2,1,1,1,1,1,1,1,1,1,1,1,1;
#3,1,3,1,1,1,1,1,1,1,1,1,1,1,1;
#3,2,0,0,1,1,1,1,1,1,1,1,1,1,1;
#3,2,1,0,1,1,1,1,1,1,1,1,1,1,1;
#3,2,2,0,1,1,1,1,1,1,1,1,1,1,1;
#3,2,3,0,1,1,1,1,1,1,1,1,1,1,1;
#3,3,0,0,1,1,1,1,1,1,1,1,1,1,1;
#3,3,1,0,1,1,1,1,1,1,1,1,1,1,1;
#3,3,2,0,1,1,1,1,1,1,1,1,1,1,1;



```

#3,3,3,0,1,1,1,1,1,1,1,1,1,1,1,1;

#4,0,0,2,1,1,1,1,1,1,1,1,1,1,1,1;
#4,0,1,2,1,1,1,1,1,1,1,1,1,1,1,1;
#4,0,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
#4,0,3,2,1,1,1,1,1,1,1,1,1,1,1,1;
#4,1,0,2,1,1,1,1,1,1,1,1,1,1,1,1;
#4,1,1,2,1,1,1,1,1,1,1,1,1,1,1,1;
#4,1,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
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#5,0,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
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#5,1,1,2,1,1,1,1,1,1,1,1,1,1,1,1;
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#5,1,3,2,1,1,1,1,1,1,1,1,1,1,1,1;
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```

Zawartość pliku 'teapot.skl':

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(teapot shape stolen from GLUT sources...)

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0.805,2.53125,-1.4375,
0,2.53125,-1.4375,
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1.5,2.4,-0.84,
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0,2.4,-1.5;

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0,0.45,-2,
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0,0.225,-1.5,
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0,0.15,-1.5;

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1.12,0.45,2,



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 0.84,0.225,1.5,
 1.5,0.225,0.84,
 1.5,0.225,0,
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 0.84,0.15,1.5,
 1.5,0.15,0.84,
 1.5,0.15,0;

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 -2,0.9,-1.12,
 -2,0.9,0,
 0,0.45,-2,
 -1.12,0.45,-2,
 -2,0.45,-1.12,
 -2,0.45,0,
 0,0.225,-1.5,
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 -1.5,0.225,-0.84,
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 -1.12,0.45,2,
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 0.45,3.15,-0.8,
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 0.2,2.7,-0.112,

0.112,2.7,-0.2,
 0,2.7,-0.2;

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 0.8,3.15,0,
 0,2.85,0,
 0,2.85,0,
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 0,2.85,0,
 0,2.7,0.2,
 0.112,2.7,0.2,
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 0.2,2.7,0;

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 0,3.15,0,
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 -0.8,3.15,-0.45,
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 0,2.85,0,
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 0.4,2.55,0,



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1.3,2.55,-0.728,
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1.3,2.4,-0.728,
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0.84,0.075,-1.5,
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0,0,0,
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1.5,0.075,0.84,
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0,0.075,1.5,
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0,0.15,1.5;

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0,0,0,
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-1.425,0,-0.798,
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0,0,-1.425,
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0,0,0,



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 -2.7,1.8,0;

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 3.3,2.4,0;

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#26,3,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
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```

Zawartość pliku 'interactive-teapot.skl':

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(teapot shape stolen from GLUT sources...)

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-0.15,1,-0.84,
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-1.8,0.8,0,



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 -1.125,1,0,
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 -0.9,1.5,0;

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 0.6,1.8,0,
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 1.425,0.9,-0.66,
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 2.4,0.7,0.15,
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 #0,3,3,14,1,1,1,1,1,1,1,1,1,1,1,1;

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#30,3,3,7,1,1,1,1,1,1,1,1,1,1,1,1;
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1.5,0.8,1.5,
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#31,1,2,7,1,1,1,1,1,1,1,1,1,1,1,1;
#31,1,3,7,1,1,1,1,1,1,1,1,1,1,1,1;
#31,2,0,7,1,1,1,1,1,1,1,1,1,1,1,1;
#31,2,1,7,1,1,1,1,1,1,1,1,1,1,1,1;
#31,2,2,7,1,1,1,1,1,1,1,1,1,1,1,1;
#31,2,3,7,1,1,1,1,1,1,1,1,1,1,1,1;
#31,3,0,7,1,1,1,1,1,1,1,1,1,1,1,1;
#31,3,1,7,1,1,1,1,1,1,1,1,1,1,1,1;
#31,3,2,7,1,1,1,1,1,1,1,1,1,1,1,1;
#31,3,3,7,1,1,1,1,1,1,1,1,1,1,1,1;
```

```
@1.5,0,1.5,
0.5,0,2.5,
-0.5,0,2.5,
-1.5,0,1.5,
1.5,0.8,1.5,
0.5,0.8,2.5,
-0.5,0.8,2.5,
-1.5,0.8,1.5,
1.5,1.1,1.5,
0.5,1.1,2.5,
-0.5,1.1,2.5,
-1.5,1.1,1.5,
1,3.1,1,
0.5,3.1,1.5,
-0.5,3.1,1.5,
-1,3.1,1;
```

Zawartość pliku 'arm2.skl':

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```
|0,6,0,0,80;
|0,0.5,0,0,20;
|0,6,0,0,20;
```

```
@-1.5,0,-1.5,
-0.5,0,-2.5,
0.5,0,-2.5,
1.5,0,-1.5,
-1.5,0.8,-1.5,
-0.5,0.8,-2.5,
0.5,0.8,-2.5,
1.5,0.8,-1.5,
-1.5,1.1,-1.5,
-0.5,1.1,-2.5,
0.5,1.1,-2.5,
1.5,1.1,-1.5,
-1,3.1,-1,
-0.5,3.1,-1.5,
0.5,3.1,-1.5,
1,3.1,-1;
```

```
@-1.5,0,1.5,
-2.5,0,0.5,
-2.5,0,-0.5,
-1.5,0,-1.5,
-1.5,0.8,1.5,
-2.5,0.8,0.5,
-2.5,0.8,-0.5,
-1.5,0.8,-1.5,
-1.5,1.1,1.5,
-2.5,1.1,0.5,
-2.5,1.1,-0.5,
-1.5,1.1,-1.5,
-1,3.1,1,
-1.5,3.1,0.5,
-1.5,3.1,-0.5,
-1,3.1,-1;
```

```
@-1,-3,-1,
-0.5,-3,-1.5,
0.5,-3,-1.5,
1,-3,-1,
-1.5,-1,-1.5,
-0.5,-1,-2.5,
0.5,-1,-2.5,
```

1.5,-1,-1.5,
-1.5,-0.7,-1.5,
-0.5,-0.7,-2.5,
0.5,-0.7,-2.5,
1.5,-0.7,-1.5,
-1.5,0,-1.5,
-0.5,0,-2.5,
0.5,0,-2.5,
1.5,0,-1.5;

@1,-3,-1,
1.5,-3,-0.5,
1.5,-3,0.5,
1,-3,1,
1.5,-1,-1.5,
2.5,-1,-0.5,
2.5,-1,0.5,
1.5,-1,1.5,
1.5,-0.7,-1.5,
2.5,-0.7,-0.5,
2.5,-0.7,0.5,
1.5,-0.7,1.5,
1.5,0,-1.5,
2.5,0,-0.5,
2.5,0,0.5,
1.5,0,1.5;

@1,-3,1,
0.5,-3,1.5,
-0.5,-3,1.5,
-1,-3,1,
1.5,-1,1.5,
0.5,-1,2.5,
-0.5,-1,2.5,
-1.5,-1,1.5,
1.5,-0.7,1.5,
0.5,-0.7,2.5,
-0.5,-0.7,2.5,
-1.5,-0.7,1.5,
1.5,0,1.5,
0.5,0,2.5,
-0.5,0,2.5,
-1.5,0,1.5;

@-1,-3,1,
-1.5,-3,0.5,
-1.5,-3,-0.5,
-1,-3,-1,
-1.5,-1,1.5,
-2.5,-1,0.5,
-2.5,-1,-0.5,
-1.5,-1,-1.5,
-1.5,-0.7,1.5,
-2.5,-0.7,0.5,
-2.5,-0.7,-0.5,
-1.5,-0.7,-1.5,
-1.5,0,1.5,
-2.5,0,0.5,
-2.5,0,-0.5,

-1.5,0,-1.5;

#0,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,0,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,0,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,1,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,1,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,2,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,2,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,2,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,2,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,3,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,3,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,3,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,3,3,0,1,1,1,1,1,1,1,1,1,1,1,1;

#1,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,0,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,0,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,2,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,2,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,2,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,2,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,3,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,3,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,3,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,3,3,0,1,1,1,1,1,1,1,1,1,1,1,1;

#2,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,0,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,0,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,2,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#2,2,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#2,2,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#2,2,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#2,3,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#2,3,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#2,3,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#2,3,3,0,1,1,1,1,1,1,1,1,1,1,1,1;

#3,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#3,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#3,0,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#3,0,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#3,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#3,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;



```
#3,1,2,1,1,1,1,1,1,1,1,1,1,1,1;
#3,1,3,1,1,1,1,1,1,1,1,1,1,1,1;
#3,2,0,0,1,1,1,1,1,1,1,1,1,1,1;
#3,2,1,0,1,1,1,1,1,1,1,1,1,1,1;
#3,2,2,0,1,1,1,1,1,1,1,1,1,1,1;
#3,2,3,0,1,1,1,1,1,1,1,1,1,1,1;
#3,3,0,0,1,1,1,1,1,1,1,1,1,1,1;
#3,3,1,0,1,1,1,1,1,1,1,1,1,1,1;
#3,3,2,0,1,1,1,1,1,1,1,1,1,1,1;
#3,3,3,0,1,1,1,1,1,1,1,1,1,1,1;
```

```
#4,0,0,2,1,1,1,1,1,1,1,1,1,1,1;
#4,0,1,2,1,1,1,1,1,1,1,1,1,1,1;
#4,0,2,2,1,1,1,1,1,1,1,1,1,1,1;
#4,0,3,2,1,1,1,1,1,1,1,1,1,1,1;
#4,1,0,2,1,1,1,1,1,1,1,1,1,1,1;
#4,1,1,2,1,1,1,1,1,1,1,1,1,1,1;
#4,1,2,2,1,1,1,1,1,1,1,1,1,1,1;
#4,1,3,2,1,1,1,1,1,1,1,1,1,1,1;
#4,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#4,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#4,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
#4,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#4,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#4,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#4,3,2,1,1,1,1,1,1,1,1,1,1,1,1;
#4,3,3,1,1,1,1,1,1,1,1,1,1,1,1;
```

```
#5,0,0,2,1,1,1,1,1,1,1,1,1,1,1;
#5,0,1,2,1,1,1,1,1,1,1,1,1,1,1;
#5,0,2,2,1,1,1,1,1,1,1,1,1,1,1;
#5,0,3,2,1,1,1,1,1,1,1,1,1,1,1;
#5,1,0,2,1,1,1,1,1,1,1,1,1,1,1;
#5,1,1,2,1,1,1,1,1,1,1,1,1,1,1;
#5,1,2,2,1,1,1,1,1,1,1,1,1,1,1;
#5,1,3,2,1,1,1,1,1,1,1,1,1,1,1;
#5,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#5,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#5,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
#5,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#5,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#5,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#5,3,2,1,1,1,1,1,1,1,1,1,1,1,1;
#5,3,3,1,1,1,1,1,1,1,1,1,1,1,1;
```

```
#6,0,0,2,1,1,1,1,1,1,1,1,1,1,1;
#6,0,1,2,1,1,1,1,1,1,1,1,1,1,1;
#6,0,2,2,1,1,1,1,1,1,1,1,1,1,1;
#6,0,3,2,1,1,1,1,1,1,1,1,1,1,1;
#6,1,0,2,1,1,1,1,1,1,1,1,1,1,1;
#6,1,1,2,1,1,1,1,1,1,1,1,1,1,1;
#6,1,2,2,1,1,1,1,1,1,1,1,1,1,1;
#6,1,3,2,1,1,1,1,1,1,1,1,1,1,1;
#6,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#6,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#6,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
#6,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#6,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#6,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
```

```
#6,3,2,1,1,1,1,1,1,1,1,1,1,1,1;
#6,3,3,1,1,1,1,1,1,1,1,1,1,1,1;
```

```
#7,0,0,2,1,1,1,1,1,1,1,1,1,1,1;
#7,0,1,2,1,1,1,1,1,1,1,1,1,1,1;
#7,0,2,2,1,1,1,1,1,1,1,1,1,1,1;
#7,0,3,2,1,1,1,1,1,1,1,1,1,1,1;
#7,1,0,2,1,1,1,1,1,1,1,1,1,1,1;
#7,1,1,2,1,1,1,1,1,1,1,1,1,1,1;
#7,1,2,2,1,1,1,1,1,1,1,1,1,1,1;
#7,1,3,2,1,1,1,1,1,1,1,1,1,1,1;
#7,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#7,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#7,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
#7,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#7,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#7,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
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#7,3,3,1,1,1,1,1,1,1,1,1,1,1,1;
```

Zawartość pliku 'egg.skl':

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```
|0,0,0,0,0;
|0,2.25,0,0,0;
|1,2.25,0,0,180;
|1,1.5,0,0,90;
|1,1.5,0,0,-90;
|1,1.5,90,0,0;
|1,1.5,-90,0,0;

@0,-1.125,0,
0,-1.125,0,
0,-1.125,0,
0,-1.125,0,
0,-1.125,-1.225,
0.648,-1.125,-1.225,
1.225,-1.125,-0.648,
1.225,-1.125,0,
0,-0.75,1.125,
0.84,-0.75,1.125,
-1.125,-0.75,-0.84,
-1.125,-0.75,0,
0,-0.75,0,
0.84,-0.75,0,
0,-0.75,-0.84,
0,-0.75,0;

@0,-1.125,0,
0,-1.125,0,
0,-1.125,0,
0,-1.125,0,
1.225,-1.125,0,
1.225,-1.125,0.648,
0.648,-1.125,1.225,
0,-1.125,1.225,
-1.125,-0.75,0,
-1.125,-0.75,0.84,
```



0.84,-0.75,-1.125,
 0,-0.75,-1.125,
 0,-0.75,0,
 0,-0.75,0.84,
 0.84,-0.75,0,
 0,-0.75,0;

 @0,-1.125,0,
 0,-1.125,0,
 0,-1.125,0,
 0,-1.125,0,
 -1.225,-1.125,0,
 -1.225,-1.125,-0.648,
 -0.648,-1.125,-1.225,
 0,-1.125,-1.225,
 1.125,-0.75,0,
 1.125,-0.75,-0.84,
 -0.84,-0.75,1.125,
 0,-0.75,1.125,
 0,-0.75,0,
 0,-0.75,-0.84,
 -0.84,-0.75,0,
 0,-0.75,0;

 @0,-1.125,0,
 0,-1.125,0,
 0,-1.125,0,
 0,-1.125,0,
 0,-1.125,1.225,
 -0.648,-1.125,1.225,
 -1.225,-1.125,0.648,
 -1.225,-1.125,0,
 0,-0.75,-1.125,
 -0.84,-0.75,-1.125,
 1.125,-0.75,0.84,
 1.125,-0.75,0,
 0,-0.75,0,
 -0.84,-0.75,0,
 0,-0.75,0.84,
 0,-0.75,0;

 @0,-1.125,0,
 0,-1.125,0,
 0,-1.125,0,
 0,-1.125,0,
 0,-1.125,1.225,
 -0.648,-1.125,1.225,
 -1.225,-1.125,0.648,
 -1.225,-1.125,0,
 0,-0.75,1.125,
 0.84,-0.75,1.125,
 1.125,-0.75,0.84,
 1.125,-0.75,0,
 0,-0.75,0,
 0.84,-0.75,0,
 0,-0.75,0.84,
 0,-0.75,0;

 @0,-1.125,0,

0,-1.125,0,
 0,-1.125,0,
 0,-1.125,0,
 -1.225,-1.125,0,
 -1.225,-1.125,-0.648,
 -0.648,-1.125,-1.225,
 0,-1.125,-1.225,
 1.125,-0.75,0,
 1.125,-0.75,-0.84,
 0.84,-0.75,-1.125,
 0,-0.75,-1.125,
 0,-0.75,0,
 0,-0.75,-0.84,
 0.84,-0.75,0,
 0,-0.75,0;

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 0,-1.125,0,
 0,-1.125,0,
 0,-1.125,0,
 1.225,-1.125,0,
 1.225,-1.125,0.648,
 0.648,-1.125,1.225,
 0,-1.125,1.225,
 -1.125,-0.75,0,
 -1.125,-0.75,0.84,
 -0.84,-0.75,1.125,
 0,-0.75,1.125,
 0,-0.75,0,
 0,-0.75,0.84,
 -0.84,-0.75,0,
 0,-0.75,0;

 @0,-1.125,0,
 0,-1.125,0,
 0,-1.125,0,
 0,-1.125,0,
 0,-1.125,-1.225,
 0.648,-1.125,-1.225,
 1.225,-1.125,-0.648,
 1.225,-1.125,0,
 0,-0.75,-1.125,
 -0.84,-0.75,-1.125,
 -1.125,-0.75,-0.84,
 -1.125,-0.75,0,
 0,-0.75,0,
 -0.84,-0.75,0,
 0,-0.75,-0.84,
 0,-0.75,0;

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 #0,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,0,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,0,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,1,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,1,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,2,0,5,1,1,1,1,1,1,1,1,1,1,1,1;




```
#7,2,0,5,1,1,1,1,1,1,1,1,1,1,1,1;
#7,2,1,5,1,1,1,1,1,1,1,1,1,1,1,1;
#7,2,2,4,1,1,1,1,1,1,1,1,1,1,1,1;
#7,2,3,4,1,1,1,1,1,1,1,1,1,1,1,1;
#7,3,0,5,1,1,1,1,1,1,1,1,1,1,1,1;
#7,3,1,5,1,1,1,1,1,1,1,1,1,1,1,1;
#7,3,2,4,1,1,1,1,1,1,1,1,1,1,1,1;
#7,3,3,4,1,1,1,1,1,1,1,1,1,1,1,1;
```

Zawartość pliku 'arm3.skl':

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```
|0,1,-90,0,90;
|0,8.5,0,0,0;
|0,3,55,0,0;
|0,8,55,0,0;
|0,2.2,0,0,0;
```

```
@-1.95,1.25,-1.9,
-0.95,1.25,-2.9,
0.95,1.25,-2.9,
1.95,1.25,-1.9,
-1.85,2.55,-1.9,
-0.85,2.55,-2.9,
0.85,2.55,-2.9,
1.85,2.55,-1.9,
-1.7,-1,-1.75,
-0.7,-1,-2.75,
0.7,-1,-2.75,
1.7,-1,-1.75,
-3.8,0,-3.85,
-2.55,0,-5.1,
2.55,0,-5.1,
3.8,0,-3.85;
```

```
@1.95,1.25,-1.9,
2.95,1.25,-0.9,
2.95,1.25,0.8,
1.95,1.25,2.5,
1.85,2.55,-1.9,
2.85,2.55,-0.9,
2.85,2.55,0.8,
1.85,2.55,2.5,
1.7,-1,-1.75,
2.7,-1,-0.75,
2.9,-1,0.85,
1.9,-1,2.5,
3.8,0,-3.85,
5.05,0,-2.6,
3.75,0,1.2,
2.5,0,2.45;
```

```
@1.95,1.25,2.5,
0.95,1.25,4.15,
-0.95,1.25,4.15,
-1.95,1.25,2.5,
1.85,2.55,2.5,
0.85,2.55,4.15,
```

```
-0.85,2.55,4.15,
-1.85,2.55,2.5,
1.9,-1,2.5,
0.9,-0.95,4.1,
-0.9,-0.95,4.1,
-1.9,-1,2.5,
2.5,0,2.45,
1.25,0,3.7,
-1.25,0,3.7,
-2.5,0,2.45;
```

```
@-1.95,1.25,2.5,
-2.95,1.25,0.8,
-2.95,1.25,-0.9,
-1.95,1.25,-1.9,
-1.85,2.55,2.5,
-2.85,2.55,0.8,
-2.85,2.55,-0.9,
-1.85,2.55,-1.9,
-1.9,-1,2.5,
-2.9,-1,0.85,
-2.7,-1,-0.75,
-1.7,-1,-1.75,
-2.5,0,2.45,
-3.75,0,1.2,
-5.05,0,-2.6,
-3.8,0,-3.85;
```

```
@-1.65,-0.1,-1.2,
-0.6,-0.1,-2.15,
0.55,-0.1,-2.15,
1.6,-0.1,-1.2,
-1.65,0.25,-1.2,
-0.6,0.25,-2.15,
0.55,0.25,-2.15,
1.6,0.25,-1.2,
-2.3,-1.7,-1.9,
-1.3,-1.7,-2.9,
1.2,-1.7,-2.9,
2.2,-1.7,-1.9,
-1.95,1.25,-1.9,
-0.95,1.25,-2.9,
0.95,1.25,-2.9,
1.95,1.25,-1.9;
```

```
@1.6,-0.1,-1.2,
2.65,-0.1,-0.25,
3.05,0.85,2.55,
2,0.85,3.5,
1.6,0.25,-1.2,
2.65,0.25,-0.25,
3.05,1.8,2.55,
2,1.8,3.5,
2.2,-1.7,-1.9,
3.2,-1.7,-0.9,
3.2,-1.7,0.8,
2.2,-1.7,2.5,
1.95,1.25,-1.9,
2.95,1.25,-0.9,
```

2.95,1.25,0.8,
 1.95,1.25,2.5;

 @2,0.85,3.5,
 0.95,0.85,4.45,
 -1,0.85,4.45,
 -2.1,0.85,3.4,
 2,1.8,3.5,
 0.95,1.8,4.45,
 -1,1.8,4.45,
 -2.1,1.8,3.4,
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 1.2,-1.7,4.15,
 -1.3,-1.7,4.15,
 -2.3,-1.7,2.5,
 1.95,1.25,2.5,
 0.95,1.25,4.15,
 -0.95,1.25,4.15,
 -1.95,1.25,2.5;

 @-2.1,0.85,3.4,
 -3.2,0.85,2.35,
 -2.7,-0.1,-0.25,
 -1.65,-0.1,-1.2,
 -2.1,1.8,3.4,
 -3.2,1.8,2.35,
 -2.7,0.25,-0.25,
 -1.65,0.25,-1.2,
 -2.3,-1.7,2.5,
 -3.25,-1.7,0.8,
 -3.25,-1.7,-0.9,
 -2.3,-1.7,-1.9,
 -1.95,1.25,2.5,
 -2.95,1.25,0.8,
 -2.95,1.25,-0.9,
 -1.95,1.25,-1.9;

 @1.6,-0.1,-1.2,
 0.55,-0.1,-2.15,
 -0.6,-0.1,-2.15,
 -1.65,-0.1,-1.2,
 1.6,-0.45,-1.2,
 0.55,-0.45,-2.15,
 -0.6,-0.45,-2.15,
 -1.65,-0.45,-1.2,
 1.8,2.2,-1.55,
 0.8,2.2,-2.55,
 -0.8,2.2,-2.55,
 -1.8,2.2,-1.55,
 1.75,1.2,-1.5,
 0.75,1.2,-2.5,
 -0.75,1.2,-2.5,
 -1.75,1.2,-1.5;

 @-1.65,-0.1,-1.2,
 -2.7,-0.1,-0.25,
 -3.2,0.85,2.35,
 -2.1,0.85,3.4,
 -1.65,-0.45,-1.2,

-2.7,-0.45,-0.25,
 -3.2,-0.15,2.35,
 -2.1,-0.15,3.4,
 -1.8,2.2,-1.55,
 -2.8,2.2,-0.55,
 -2.8,2.2,0.45,
 -1.7,2.2,1.35,
 -1.75,1.2,-1.5,
 -2.75,1.2,-0.5,
 -2.75,1.2,0.4,
 -1.65,1.2,1.3;

 @-2.1,0.85,3.4,
 -1,0.85,4.45,
 0.95,0.85,4.45,
 2,0.85,3.5,
 -2.1,-0.15,3.4,
 -1,-0.15,4.45,
 0.95,-0.15,4.45,
 2,-0.15,3.5,
 -1.7,2.2,1.35,
 -0.6,2.2,2.25,
 0.6,2.2,2.25,
 1.7,2.2,1.35,
 -1.65,1.2,1.3,
 -0.55,1.2,2.2,
 0.55,1.2,2.2,
 1.65,1.2,1.3;

 @2,0.85,3.5,
 3.05,0.85,2.55,
 2.65,-0.1,-0.25,
 1.6,-0.1,-1.2,
 2,-0.15,3.5,
 3.05,-0.15,2.55,
 2.65,-0.45,-0.25,
 1.6,-0.45,-1.2,
 1.7,2.2,1.35,
 2.8,2.2,0.45,
 2.8,2.2,-0.55,
 1.8,2.2,-1.55,
 1.65,1.2,1.3,
 2.75,1.2,0.4,
 2.75,1.2,-0.5,
 1.75,1.2,-1.5;

 @1.75,1.2,-1.5,
 0.75,1.2,-2.5,
 -0.75,1.2,-2.5,
 -1.75,1.2,-1.5,
 1.7,0.2,-1.45,
 0.7,0.2,-2.45,
 -0.7,0.2,-2.45,
 -1.7,0.2,-1.45,
 1.3,0.5,-1.35,
 0.3,0.5,-2.35,
 -0.3,0.5,-2.35,
 -1.3,0.5,-1.35,
 1,-1.15,-0.85,



0.5,-1.15,-1.15,
-0.5,-1.15,-1.15,
-1,-1.15,-0.85;

@-1.75,1.2,-1.5,
-2.75,1.2,-0.5,
-2.75,1.2,0.4,
-1.65,1.2,1.3,
-1.7,0.2,-1.45,
-2.7,0.2,-0.45,
-2.7,0.2,0.35,
-1.6,0.2,1.25,
-1.3,0.5,-1.35,
-2.3,0.5,-0.35,
-2.3,0.5,0.25,
-1.3,0.5,1.25,
-1,-1.15,-0.85,
-1.5,-1.15,-0.55,
-1.5,-1.15,0.45,
-1,-1.15,0.75;

@-1.65,1.2,1.3,
-0.55,1.2,2.2,
0.55,1.2,2.2,
1.65,1.2,1.3,
-1.6,0.2,1.25,
-0.5,0.2,2.15,
0.5,0.2,2.15,
1.6,0.2,1.25,
-1.3,0.5,1.25,
-0.3,0.5,2.25,
0.3,0.5,2.25,
1.3,0.5,1.25,
-1,-1.15,0.75,
-0.5,-1.15,1.05,
0.5,-1.15,1.05,
1,-1.15,0.75;

@1.65,1.2,1.3,
2.75,1.2,0.4,
2.75,1.2,-0.5,
1.75,1.2,-1.5,
1.6,0.2,1.25,
2.7,0.2,0.35,
2.7,0.2,-0.45,
1.7,0.2,-1.45,
1.3,0.5,1.25,
2.3,0.5,0.25,
2.3,0.5,-0.35,
1.3,0.5,-1.35,
1,-1.15,0.75,
1.5,-1.15,0.45,
1.5,-1.15,-0.55,
1,-1.15,-0.85;

@1.75,1.2,-1.5,
0.75,1.2,-2.5,
-0.75,1.2,-2.5,
-1.75,1.2,-1.5,

1.7,0.2,-1.45,
0.7,0.2,-2.45,
-0.7,0.2,-2.45,
-1.7,0.2,-1.45,
1.3,0.5,-1.35,
0.3,0.5,-2.35,
-0.3,0.5,-2.35,
-1.3,0.5,-1.35,
1,-1.15,-0.85,
0.5,-1.15,-1.15,
-0.5,-1.15,-1.15,
-1,-1.15,-0.85;

#0,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,0,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,0,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,1,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,1,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#0,2,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,2,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,2,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,2,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,3,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,3,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,3,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#0,3,3,0,1,1,1,1,1,1,1,1,1,1,1,1;

#1,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,0,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,0,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,1,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#1,2,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,2,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,2,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,2,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,3,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
#1,3,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
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#1,3,3,0,1,1,1,1,1,1,1,1,1,1,1,1;

#2,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,0,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,0,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#2,1,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
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#2,2,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
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#2,2,3,0,1,1,1,1,1,1,1,1,1,1,1,1;



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#2,3,1,0,1,1,1,1,1,1,1,1,1,1,1;
#2,3,2,0,1,1,1,1,1,1,1,1,1,1,1;
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#3,2,3,0,1,1,1,1,1,1,1,1,1,1,1;
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#4,0,2,2,1,1,1,1,1,1,1,1,1,1,1;
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#4,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
#4,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
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#4,3,2,1,1,1,1,1,1,1,1,1,1,1,1;
#4,3,3,1,1,1,1,1,1,1,1,1,1,1,1;

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#5,0,1,2,1,1,1,1,1,1,1,1,1,1,1;
#5,0,2,2,1,1,1,1,1,1,1,1,1,1,1;
#5,0,3,2,1,1,1,1,1,1,1,1,1,1,1;
#5,1,0,2,1,1,1,1,1,1,1,1,1,1,1;
#5,1,1,2,1,1,1,1,1,1,1,1,1,1,1;
#5,1,2,2,1,1,1,1,1,1,1,1,1,1,1;
#5,1,3,2,1,1,1,1,1,1,1,1,1,1,1;
#5,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#5,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#5,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
#5,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#5,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#5,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#5,3,2,1,1,1,1,1,1,1,1,1,1,1,1;
#5,3,3,1,1,1,1,1,1,1,1,1,1,1,1;

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#6,0,1,2,1,1,1,1,1,1,1,1,1,1,1;
#6,0,2,2,1,1,1,1,1,1,1,1,1,1,1;

#6,0,3,2,1,1,1,1,1,1,1,1,1,1,1;
#6,1,0,2,1,1,1,1,1,1,1,1,1,1,1;
#6,1,1,2,1,1,1,1,1,1,1,1,1,1,1;
#6,1,2,2,1,1,1,1,1,1,1,1,1,1,1;
#6,1,3,2,1,1,1,1,1,1,1,1,1,1,1;
#6,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#6,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#6,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
#6,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#6,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#6,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#6,3,2,1,1,1,1,1,1,1,1,1,1,1,1;
#6,3,3,1,1,1,1,1,1,1,1,1,1,1,1;

#7,0,0,2,1,1,1,1,1,1,1,1,1,1,1;
#7,0,1,2,1,1,1,1,1,1,1,1,1,1,1;
#7,0,2,2,1,1,1,1,1,1,1,1,1,1,1;
#7,0,3,2,1,1,1,1,1,1,1,1,1,1,1;
#7,1,0,2,1,1,1,1,1,1,1,1,1,1,1;
#7,1,1,2,1,1,1,1,1,1,1,1,1,1,1;
#7,1,2,2,1,1,1,1,1,1,1,1,1,1,1;
#7,1,3,2,1,1,1,1,1,1,1,1,1,1,1;
#7,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
#7,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
#7,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
#7,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#7,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
#7,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
#7,3,2,1,1,1,1,1,1,1,1,1,1,1,1;
#7,3,3,1,1,1,1,1,1,1,1,1,1,1,1;

#8,0,0,2,1,1,1,1,1,1,1,1,1,1,1;
#8,0,1,2,1,1,1,1,1,1,1,1,1,1,1;
#8,0,2,2,1,1,1,1,1,1,1,1,1,1,1;
#8,0,3,2,1,1,1,1,1,1,1,1,1,1,1;
#8,1,0,2,1,1,1,1,1,1,1,1,1,1,1;
#8,1,1,2,1,1,1,1,1,1,1,1,1,1,1;
#8,1,2,2,1,1,1,1,1,1,1,1,1,1,1;
#8,1,3,2,1,1,1,1,1,1,1,1,1,1,1;
#8,2,0,3,1,1,1,1,1,1,1,1,1,1,1;
#8,2,1,3,1,1,1,1,1,1,1,1,1,1,1;
#8,2,2,3,1,1,1,1,1,1,1,1,1,1,1;
#8,2,3,3,1,1,1,1,1,1,1,1,1,1,1;
#8,3,0,3,1,1,1,1,1,1,1,1,1,1,1;
#8,3,1,3,1,1,1,1,1,1,1,1,1,1,1;
#8,3,2,3,1,1,1,1,1,1,1,1,1,1,1;
#8,3,3,3,1,1,1,1,1,1,1,1,1,1,1;

#9,0,0,2,1,1,1,1,1,1,1,1,1,1,1;
#9,0,1,2,1,1,1,1,1,1,1,1,1,1,1;
#9,0,2,2,1,1,1,1,1,1,1,1,1,1,1;
#9,0,3,2,1,1,1,1,1,1,1,1,1,1,1;
#9,1,0,2,1,1,1,1,1,1,1,1,1,1,1;
#9,1,1,2,1,1,1,1,1,1,1,1,1,1,1;
#9,1,2,2,1,1,1,1,1,1,1,1,1,1,1;
#9,1,3,2,1,1,1,1,1,1,1,1,1,1,1;
#9,2,0,3,1,1,1,1,1,1,1,1,1,1,1;
#9,2,1,3,1,1,1,1,1,1,1,1,1,1,1;
#9,2,2,3,1,1,1,1,1,1,1,1,1,1,1;




```
#16,2,2,4,1,1,1,1,1,1,1,1,1,1,1,1;
#16,2,3,4,1,1,1,1,1,1,1,1,1,1,1,1;
#16,3,0,4,1,1,1,1,1,1,1,1,1,1,1,1;
#16,3,1,4,1,1,1,1,1,1,1,1,1,1,1,1;
#16,3,2,4,1,1,1,1,1,1,1,1,1,1,1,1;
#16,3,3,4,1,1,1,1,1,1,1,1,1,1,1,1;
```

Zawartość pliku 'arm4.skl':

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```
|0,1,-90,0,90;
|0,8.5,-30,0,0;
|0,3,-25,0,0;
|0,8,-35,0,0;
|0,2.2,0,0,0;
```

```
@-1.95,-0.5,-2.2,
-0.95,-0.5,-3.2,
0.95,-0.5,-3.2,
1.95,-0.5,-2.2,
-1.85,0.5,-2.2,
-0.85,0.5,-3.2,
0.85,0.5,-3.2,
1.85,0.5,-2.2,
-1.7,-1,-1.75,
-0.7,-1,-2.75,
0.7,-1,-2.75,
1.7,-1,-1.75,
-3.8,0,-3.85,
-2.55,0,-5.1,
2.55,0,-5.1,
3.8,0,-3.85;
```

```
@1.95,-0.5,-2.2,
2.95,-0.5,-1.2,
2.95,-0.5,0.5,
1.95,-0.5,2.2,
1.85,0.5,-2.2,
2.85,0.5,-1.2,
2.85,0.5,0.5,
1.85,0.5,2.2,
1.7,-1,-1.75,
2.7,-1,-0.75,
2.9,-1,0.85,
1.9,-1,2.5,
3.8,0,-3.85,
5.05,0,-2.6,
3.75,0,1.2,
2.5,0,2.45;
```

```
@1.95,-0.5,2.2,
0.95,-0.5,3.85,
-0.95,-0.5,3.85,
-1.95,-0.5,2.2,
1.85,0.5,2.2,
0.85,0.5,3.85,
-0.85,0.5,3.85,
-1.85,0.5,2.2,
```

```
1.9,-1,2.5,
0.9,-0.95,4.1,
-0.9,-0.95,4.1,
-1.9,-1,2.5,
2.5,0,2.45,
1.25,0,3.7,
-1.25,0,3.7,
-2.5,0,2.45;
```

```
@-1.95,-0.5,2.2,
-2.95,-0.5,0.5,
-2.95,-0.5,-1.2,
-1.95,-0.5,-2.2,
-1.85,0.5,2.2,
-2.85,0.5,0.5,
-2.85,0.5,-1.2,
-1.85,0.5,-2.2,
-1.9,-1,2.5,
-2.9,-1,0.85,
-2.7,-1,-0.75,
-1.7,-1,-1.75,
-2.5,0,2.45,
-3.75,0,1.2,
-5.05,0,-2.6,
-3.8,0,-3.85;
```

```
@-2.1,-0.15,-2.9,
-0.85,-0.15,-4.5,
0.8,-0.15,-4.5,
2.05,-0.15,-2.9,
-2.1,0.85,-2.9,
-0.85,0.85,-4.5,
0.8,0.85,-4.5,
2.05,0.85,-2.9,
-2.3,-3,-2.2,
-1.3,-3,-3.2,
1.2,-3,-3.2,
2.2,-3,-2.2,
-1.95,-0.5,-2.2,
-0.95,-0.5,-3.2,
0.95,-0.5,-3.2,
1.95,-0.5,-2.2;
```

```
@2.05,-0.15,-2.9,
3.3,-0.15,-1.2,
1.6,-0.6,0.65,
0.55,-0.6,1.35,
2.05,0.85,-2.9,
3.3,0.85,-1.2,
1.55,-0.2,0.6,
0.5,-0.2,1.3,
2.2,-3,-2.2,
3.2,-3,-1.2,
3.2,-3,0.5,
2.2,-3,2.2,
1.95,-0.5,-2.2,
2.95,-0.5,-1.2,
2.95,-0.5,0.5,
1.95,-0.5,2.2;
```

@0.55,-0.6,1.35,	-0.75,-1.1,1.45,
0.05,-0.55,1.6,	-1.8,2.1,-1.8,
-0.05,-0.55,1.65,	-2.8,2.1,-0.8,
-0.65,-0.6,1.35,	-2.8,2.1,0.2,
0.5,-0.2,1.3,	-1.7,2.1,1.1,
0.05,-0.15,1.6,	-1.75,1.1,-1.75,
0,-0.15,1.6,	-2.75,1.1,-0.75,
-0.6,-0.2,1.3,	-2.75,1.1,0.15,
2.2,-3,2.2,	-1.65,1.1,1.05;
1.2,-3,3.85,	@-0.65,-0.6,1.35,
-1.3,-3,3.85,	-0.05,-0.55,1.65,
-2.3,-3,2.2,	0.05,-0.55,1.6,
1.95,-0.5,2.2,	0.55,-0.6,1.35,
0.95,-0.5,3.85,	-0.75,-1.1,1.45,
-0.95,-0.5,3.85,	-0.05,-1.05,1.75,
-1.95,-0.5,2.2;	0,-1.05,1.75,
@-0.65,-0.6,1.35,	0.65,-1.1,1.45,
-1.75,-0.6,0.65,	-1.7,2.1,1.1,
-3.35,-0.15,-1.2,	-0.6,2.1,2,
-2.1,-0.15,-2.9,	0.6,2.1,2,
-0.6,-0.2,1.3,	1.7,2.1,1.1,
-1.7,-0.2,0.6,	-1.65,1.1,1.05,
-3.35,0.85,-1.2,	-0.55,1.1,1.95,
-2.1,0.85,-2.9,	0.55,1.1,1.95,
-2.3,-3,2.2,	1.65,1.1,1.05;
-3.25,-3,0.5,	@0.55,-0.6,1.35,
-3.25,-3,-1.2,	1.6,-0.6,0.65,
-2.3,-3,-2.2,	3.3,-0.15,-1.2,
-1.95,-0.5,2.2,	2.05,-0.15,-2.9,
-2.95,-0.5,0.5,	0.65,-1.1,1.45,
-2.95,-0.5,-1.2,	1.7,-1.1,0.75,
-1.95,-0.5,-2.2;	3.3,-1.1,-1.2,
@2.05,-0.15,-2.9,	2.05,-1.1,-2.9,
0.8,-0.15,-4.5,	1.7,2.1,1.1,
-0.85,-0.15,-4.5,	2.8,2.1,0.2,
-2.1,-0.15,-2.9,	2.8,2.1,-0.8,
2.05,-1.1,-2.9,	1.8,2.1,-1.8,
0.8,-1.1,-4.5,	1.65,1.1,1.05,
-0.85,-1.1,-4.5,	2.75,1.1,0.15,
-2.1,-1.1,-2.9,	2.75,1.1,-0.75,
1.8,2.1,-1.8,	1.75,1.1,-1.75;
0.8,2.1,-2.8,	@1.75,1.1,-1.75,
-0.8,2.1,-2.8,	0.75,1.1,-2.75,
-1.8,2.1,-1.8,	-0.75,1.1,-2.75,
1.75,1.1,-1.75,	-1.75,1.1,-1.75,
0.75,1.1,-2.75,	1.7,0.1,-1.7,
-0.75,1.1,-2.75,	0.7,0.1,-2.7,
-1.75,1.1,-1.75;	-0.7,0.1,-2.7,
@-2.1,-0.15,-2.9,	-1.7,0.1,-1.7,
-3.35,-0.15,-1.2,	1.3,0.5,-1.35,
-1.75,-0.6,0.65,	0.3,0.5,-2.35,
-0.65,-0.6,1.35,	-0.3,0.5,-2.35,
-2.1,-1.1,-2.9,	-1.3,0.5,-1.35,
-3.35,-1.1,-1.2,	1,-1.15,-0.85,
-1.85,-1.1,0.75,	0.5,-1.15,-1.15,
	-0.5,-1.15,-1.15,



-1,-1.15,-0.85;
 @-1.75,1.1,-1.75,
 -2.75,1.1,-0.75,
 -2.75,1.1,0.15,
 -1.65,1.1,1.05,
 -1.7,0.1,-1.7,
 -2.7,0.1,-0.7,
 -2.7,0.1,0.1,
 -1.6,0.1,1,
 -1.3,0.5,-1.35,
 -2.3,0.5,-0.35,
 -2.3,0.5,0.25,
 -1.3,0.5,1.25,
 -1,-1.15,-0.85,
 -1.5,-1.15,-0.55,
 -1.5,-1.15,0.45,
 -1,-1.15,0.75;
 @-1.65,1.1,1.05,
 -0.55,1.1,1.95,
 0.55,1.1,1.95,
 1.65,1.1,1.05,
 -1.6,0.1,1,
 -0.5,0.1,1.9,
 0.5,0.1,1.9,
 1.6,0.1,1,
 -1.3,0.5,1.25,
 -0.3,0.5,2.25,
 0.3,0.5,2.25,
 1.3,0.5,1.25,
 -1,-1.15,0.75,
 -0.5,-1.15,1.05,
 0.5,-1.15,1.05,
 1,-1.15,0.75;
 @1.65,1.1,1.05,
 2.75,1.1,0.15,
 2.75,1.1,-0.75,
 1.75,1.1,-1.75,
 1.6,0.1,1,
 2.7,0.1,0.1,
 2.7,0.1,-0.7,
 1.7,0.1,-1.7,
 1.3,0.5,1.25,
 2.3,0.5,0.25,
 2.3,0.5,-0.35,
 1.3,0.5,-1.35,
 1,-1.15,0.75,
 1.5,-1.15,0.45,
 1.5,-1.15,-0.55,
 1,-1.15,-0.85;
 @1.75,1.1,-1.75,
 0.75,1.1,-2.75,
 -0.75,1.1,-2.75,
 -1.75,1.1,-1.75,
 1.7,0.1,-1.7,
 0.7,0.1,-2.7,

-0.7,0.1,-2.7,
 -1.7,0.1,-1.7,
 1.3,0.5,-1.35,
 0.3,0.5,-2.35,
 -0.3,0.5,-2.35,
 -1.3,0.5,-1.35,
 1,-1.15,-0.85,
 0.5,-1.15,-1.15,
 -0.5,-1.15,-1.15,
 -1,-1.15,-0.85;
 #0,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,0,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,0,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,1,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,1,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,2,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,2,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,2,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,2,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,3,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,3,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,3,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #0,3,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,0,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,0,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,1,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,1,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,2,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,2,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,2,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,2,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,3,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,3,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,3,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #1,3,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,0,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,0,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,0,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,0,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,1,0,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,1,2,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,1,3,1,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,2,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,2,1,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,2,2,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,2,3,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,3,0,0,1,1,1,1,1,1,1,1,1,1,1,1;
 #2,3,1,0,1,1,1,1,1,1,1,1,1,1,1,1;



#9,3,1,3,1,1,1,1,1,1,1,1,1,1,1,1;
#9,3,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#9,3,3,3,1,1,1,1,1,1,1,1,1,1,1,1;

#10,0,0,2,1,1,1,1,1,1,1,1,1,1,1,1;
#10,0,1,2,1,1,1,1,1,1,1,1,1,1,1,1;
#10,0,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
#10,0,3,2,1,1,1,1,1,1,1,1,1,1,1,1;
#10,1,0,2,1,1,1,1,1,1,1,1,1,1,1,1;
#10,1,1,2,1,1,1,1,1,1,1,1,1,1,1,1;
#10,1,2,2,1,1,1,1,1,1,1,1,1,1,1,1;
#10,1,3,2,1,1,1,1,1,1,1,1,1,1,1,1;
#10,2,0,3,1,1,1,1,1,1,1,1,1,1,1,1;
#10,2,1,3,1,1,1,1,1,1,1,1,1,1,1,1;
#10,2,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#10,2,3,3,1,1,1,1,1,1,1,1,1,1,1,1;
#10,3,0,3,1,1,1,1,1,1,1,1,1,1,1,1;
#10,3,1,3,1,1,1,1,1,1,1,1,1,1,1,1;
#10,3,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#10,3,3,3,1,1,1,1,1,1,1,1,1,1,1,1;

#11,0,0,2,1,1,1,1,1,1,1,1,1,1,1;
#11,0,1,2,1,1,1,1,1,1,1,1,1,1,1;
#11,0,2,2,1,1,1,1,1,1,1,1,1,1,1;
#11,0,3,2,1,1,1,1,1,1,1,1,1,1,1;
#11,1,0,2,1,1,1,1,1,1,1,1,1,1,1;
#11,1,1,2,1,1,1,1,1,1,1,1,1,1,1;
#11,1,2,2,1,1,1,1,1,1,1,1,1,1,1;
#11,1,3,2,1,1,1,1,1,1,1,1,1,1,1;
#11,2,0,3,1,1,1,1,1,1,1,1,1,1,1;
#11,2,1,3,1,1,1,1,1,1,1,1,1,1,1;
#11,2,2,3,1,1,1,1,1,1,1,1,1,1,1;
#11,2,3,3,1,1,1,1,1,1,1,1,1,1,1;
#11,3,0,3,1,1,1,1,1,1,1,1,1,1,1;
#11,3,1,3,1,1,1,1,1,1,1,1,1,1,1;
#11,3,2,3,1,1,1,1,1,1,1,1,1,1,1;
#11,3,3,3,1,1,1,1,1,1,1,1,1,1,1;

#12,0,0,3,1,1,1,1,1,1,1,1,1,1,1,1;
#12,0,1,3,1,1,1,1,1,1,1,1,1,1,1,1;
#12,0,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#12,0,3,3,1,1,1,1,1,1,1,1,1,1,1,1;
#12,1,0,3,1,1,1,1,1,1,1,1,1,1,1,1;
#12,1,1,3,1,1,1,1,1,1,1,1,1,1,1,1;
#12,1,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#12,1,3,3,1,1,1,1,1,1,1,1,1,1,1,1;
#12,2,0,4,1,1,1,1,1,1,1,1,1,1,1,1;
#12,2,1,4,1,1,1,1,1,1,1,1,1,1,1,1;
#12,2,2,4,1,1,1,1,1,1,1,1,1,1,1,1;
#12,2,3,4,1,1,1,1,1,1,1,1,1,1,1,1;
#12,3,0,4,1,1,1,1,1,1,1,1,1,1,1,1;
#12,3,1,4,1,1,1,1,1,1,1,1,1,1,1,1;
#12,3,2,4,1,1,1,1,1,1,1,1,1,1,1,1;
#12,3,3,4,1,1,1,1,1,1,1,1,1,1,1,1;

```
#13,0,0,3,1,1,1,1,1,1,1,1,1,1,1,1;
#13,0,1,3,1,1,1,1,1,1,1,1,1,1,1,1;
#13,0,2,3,1,1,1,1,1,1,1,1,1,1,1,1;
#13,0,3,3,1,1,1,1,1,1,1,1,1,1,1,1;
```

```
#16,3,0,4,1,1,1,1,1,1,1,1,1,1,1,1;
#16,3,1,4,1,1,1,1,1,1,1,1,1,1,1,1;
#16,3,2,4,1,1,1,1,1,1,1,1,1,1,1,1;
#16,3,3,4,1,1,1,1,1,1,1,1,1,1,1,1;
```

Zawartość pliku 'arm5.skl':

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```
|0,1,-90,0,90;
|0,8.5,0,0,0;
|0,3,55,0,0;
|0,8,55,0,0;
|0,2.2,0,0,0;
```

```
@-1.95,1.25,-1.9,
-0.95,1.25,-2.9,
0.95,1.25,-2.9,
1.95,1.25,-1.9,
-1.85,2.55,-1.9,
-0.85,2.55,-2.9,
0.85,2.55,-2.9,
1.85,2.55,-1.9,
-1.7,-1,-1.75,
-0.7,-1,-2.75,
0.7,-1,-2.75,
1.7,-1,-1.75,
-3.8,0,-3.85,
-2.55,0,-5.1,
2.55,0,-5.1,
3.8,0,-3.85;
```

```
@1.95,1.25,-1.9,
2.95,1.25,-0.9,
2.95,1.25,0.8,
1.95,1.25,2.5,
1.85,2.55,-1.9,
2.85,2.55,-0.9,
2.85,2.55,0.8,
1.85,2.55,2.5,
1.7,-1,-1.75,
2.7,-1,-0.75,
2.9,-1,0.85,
1.9,-1,2.5,
3.8,0,-3.85,
5.05,0,-2.6,
3.75,0,1.2,
2.5,0,2.45;
```

```
@1.95,1.25,2.5,
0.95,1.25,4.15,
-0.95,1.25,4.15,
-1.95,1.25,2.5,
1.85,2.55,2.5,
0.85,2.55,4.15,
-0.85,2.55,4.15,
-1.85,2.55,2.5,
1.9,-1,2.5,
0.9,-0.95,4.1,
```

```
-0.9,-0.95,4.1,
-1.9,-1,2.5,
2.5,0,2.45,
1.25,0,3.7,
-1.25,0,3.7,
-2.5,0,2.45;
```

```
@-1.95,1.25,2.5,
-2.95,1.25,0.8,
-2.95,1.25,-0.9,
-1.95,1.25,-1.9,
-1.85,2.55,2.5,
-2.85,2.55,0.8,
-2.85,2.55,-0.9,
-1.85,2.55,-1.9,
-1.9,-1,2.5,
-2.9,-1,0.85,
-2.7,-1,-0.75,
-1.7,-1,-1.75,
-2.5,0,2.45,
-3.75,0,1.2,
-5.05,0,-2.6,
-3.8,0,-3.85;
```

```
@-1.65,-0.1,-1.2,
-0.6,-0.1,-2.15,
0.55,-0.1,-2.15,
1.6,-0.1,-1.2,
-1.65,0.25,-1.2,
-0.6,0.25,-2.15,
0.55,0.25,-2.15,
1.6,0.25,-1.2,
-2.3,-1.7,-1.9,
-1.3,-1.7,-2.9,
1.2,-1.7,-2.9,
2.2,-1.7,-1.9,
-1.95,1.25,-1.9,
-0.95,1.25,-2.9,
0.95,1.25,-2.9,
1.95,1.25,-1.9;
```

```
@1.6,-0.1,-1.2,
2.65,-0.1,-0.25,
3.05,0.85,2.55,
2,0.85,3.5,
1.6,0.25,-1.2,
2.65,0.25,-0.25,
3.05,1.8,2.55,
2,1.8,3.5,
2.2,-1.7,-1.9,
3.2,-1.7,-0.9,
3.2,-1.7,0.8,
2.2,-1.7,2.5,
1.95,1.25,-1.9,
2.95,1.25,-0.9,
2.95,1.25,0.8,
1.95,1.25,2.5;
```

```
@2,0.85,3.5,
```



0.95,0.85,4.45,
 -1,0.85,4.45,
 -2.1,0.85,3.4,
 2,1.8,3.5,
 0.95,1.8,4.45,
 -1,1.8,4.45,
 -2.1,1.8,3.4,
 2.2,-1.7,2.5,
 1.2,-1.7,4.15,
 -1.3,-1.7,4.15,
 -2.3,-1.7,2.5,
 1.95,1.25,2.5,
 0.95,1.25,4.15,
 -0.95,1.25,4.15,
 -1.95,1.25,2.5;

@-2.1,0.85,3.4,
 -3.2,0.85,2.35,
 -2.7,-0.1,-0.25,
 -1.65,-0.1,-1.2,
 -2.1,1.8,3.4,
 -3.2,1.8,2.35,
 -2.7,0.25,-0.25,
 -1.65,0.25,-1.2,
 -2.3,-1.7,2.5,
 -3.25,-1.7,0.8,
 -3.25,-1.7,-0.9,
 -2.3,-1.7,-1.9,
 -1.95,1.25,2.5,
 -2.95,1.25,0.8,
 -2.95,1.25,-0.9,
 -1.95,1.25,-1.9;

@1.6,-0.1,-1.2,
 0.55,-0.1,-2.15,
 -0.6,-0.1,-2.15,
 -1.65,-0.1,-1.2,
 1.6,-0.45,-1.2,
 0.55,-0.45,-2.15,
 -0.6,-0.45,-2.15,
 -1.65,-0.45,-1.2,
 1.8,2.2,-1.55,
 0.8,2.2,-2.55,
 -0.8,2.2,-2.55,
 -1.8,2.2,-1.55,
 1.75,1.2,-1.5,
 0.75,1.2,-2.5,
 -0.75,1.2,-2.5,
 -1.75,1.2,-1.5;

@-1.65,-0.1,-1.2,
 -2.7,-0.1,-0.25,
 -3.2,0.85,2.35,
 -2.1,0.85,3.4,
 -1.65,-0.45,-1.2,
 -2.7,-0.45,-0.25,
 -3.2,-0.15,2.35,
 -2.1,-0.15,3.4,
 -1.8,2.2,-1.55,

-2.8,2.2,-0.55,
 -2.8,2.2,0.45,
 -1.7,2.2,1.35,
 -1.75,1.2,-1.5,
 -2.75,1.2,-0.5,
 -2.75,1.2,0.4,
 -1.65,1.2,1.3;

@-2.1,0.85,3.4,
 -1,0.85,4.45,
 0.95,0.85,4.45,
 2,0.85,3.5,
 -2.1,-0.15,3.4,
 -1,-0.15,4.45,
 0.95,-0.15,4.45,
 2,-0.15,3.5,
 -1.7,2.2,1.35,
 -0.6,2.2,2.25,
 0.6,2.2,2.25,
 1.7,2.2,1.35,
 -1.65,1.2,1.3,
 -0.55,1.2,2.2,
 0.55,1.2,2.2,
 1.65,1.2,1.3;

@2,0.85,3.5,
 3.05,0.85,2.55,
 2.65,-0.1,-0.25,
 1.6,-0.1,-1.2,
 2,-0.15,3.5,
 3.05,-0.15,2.55,
 2.65,-0.45,-0.25,
 1.6,-0.45,-1.2,
 1.7,2.2,1.35,
 2.8,2.2,0.45,
 2.8,2.2,-0.55,
 1.8,2.2,-1.55,
 1.65,1.2,1.3,
 2.75,1.2,0.4,
 2.75,1.2,-0.5,
 1.75,1.2,-1.5;

@1.75,1.2,-1.5,
 0.75,1.2,-2.5,
 -0.75,1.2,-2.5,
 -1.75,1.2,-1.5,
 1.7,0.2,-1.45,
 0.7,0.2,-2.45,
 -0.7,0.2,-2.45,
 -1.7,0.2,-1.45,
 1.3,0.5,-1.35,
 0.3,0.5,-2.35,
 -0.3,0.5,-2.35,
 -1.3,0.5,-1.35,
 1,-1.15,-0.85,
 0.5,-1.15,-1.15,
 -0.5,-1.15,-1.15,
 -1,-1.15,-0.85;



@-1.75,1.2,-1.5,
 -2.75,1.2,-0.5,
 -2.75,1.2,0.4,
 -1.65,1.2,1.3,
 -1.7,0.2,-1.45,
 -2.7,0.2,-0.45,
 -2.7,0.2,0.35,
 -1.6,0.2,1.25,
 -1.3,0.5,-1.35,
 -2.3,0.5,-0.35,
 -2.3,0.5,0.25,
 -1.3,0.5,1.25,
 -1,-1.15,-0.85,
 -1.5,-1.15,-0.55,
 -1.5,-1.15,0.45,
 -1,-1.15,0.75;

@-1.65,1.2,1.3,
 -0.55,1.2,2.2,
 0.55,1.2,2.2,
 1.65,1.2,1.3,
 -1.6,0.2,1.25,
 -0.5,0.2,2.15,
 0.5,0.2,2.15,
 1.6,0.2,1.25,
 -1.3,0.5,1.25,
 -0.3,0.5,2.25,
 0.3,0.5,2.25,
 1.3,0.5,1.25,
 -1,-1.15,0.75,
 -0.5,-1.15,1.05,
 0.5,-1.15,1.05,
 1,-1.15,0.75;

@1.65,1.2,1.3,
 2.75,1.2,0.4,
 2.75,1.2,-0.5,
 1.75,1.2,-1.5,
 1.6,0.2,1.25,
 2.7,0.2,0.35,
 2.7,0.2,-0.45,
 1.7,0.2,-1.45,
 1.3,0.5,1.25,
 2.3,0.5,0.25,
 2.3,0.5,-0.35,
 1.3,0.5,-1.35,
 1,-1.15,0.75,
 1.5,-1.15,0.45,
 1.5,-1.15,-0.55,
 1,-1.15,-0.85;

@1.75,1.2,-1.5,
 0.75,1.2,-2.5,
 -0.75,1.2,-2.5,
 -1.75,1.2,-1.5,
 1.7,0.2,-1.45,
 0.7,0.2,-2.45,
 -0.7,0.2,-2.45,
 -1.7,0.2,-1.45,

1.3,0.5,-1.35,
 0.3,0.5,-2.35,
 -0.3,0.5,-2.35,
 -1.3,0.5,-1.35,
 1,-1.15,-0.85,
 0.5,-1.15,-1.15,
 -0.5,-1.15,-1.15,
 -1,-1.15,-0.85;

#0,0,0,0,
 1.22245,0.356311,0.333333,
 1.22245,0.356311,0.333333,
 1.22245,0.356311,0.333333,
 1.22245,0.356311,0.333333;

#0,0,0,1,
 -2.3662,0.399721,0.333333,
 -2.3662,0.399721,0.333333,
 -2.3662,0.399721,0.333333,
 -2.3662,0.399721,0.333333;

#0,0,0,2,
 1.77837,0.358061,0.333333,
 1.77837,0.358061,0.333333,
 1.77837,0.358061,0.333333,
 1.77837,0.358061,0.333333;

#0,0,1,0,
 0.35734,0.351028,0.333333,
 0.35734,0.351028,0.333333,
 0.35734,0.351028,0.333333,
 0.35734,0.351028,0.333333;

#0,0,1,1,
 -0.630113,0.409834,0.333333,
 -0.630113,0.409834,0.333333,
 -0.630113,0.409834,0.333333,
 -0.630113,0.409834,0.333333;

#0,0,1,2,
 0.934039,0.371222,0.333333,
 0.934039,0.371222,0.333333,
 0.934039,0.371222,0.333333,
 0.934039,0.371222,0.333333;

#0,0,2,0,
 0.35734,0.351028,0.333333,
 0.35734,0.351028,0.333333,
 0.35734,0.351028,0.333333,
 0.35734,0.351028,0.333333;

#0,0,2,1,
 -0.630112,0.409834,0.333333,
 -0.630112,0.409834,0.333333,
 -0.630112,0.409834,0.333333,
 -0.630112,0.409834,0.333333;

#0,0,2,2,
 0.934039,0.371222,0.333333,



0.934039,0.371222,0.333333,
0.934039,0.371222,0.333333,
0.934039,0.371222,0.333333;

#0,0,3,0,
1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333;

#0,0,3,1,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333;

#0,0,3,2,
1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333;

#0,1,0,0,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333;

#0,1,0,1,
0.411853,0.567706,0.333333,
0.411853,0.567706,0.333333,
0.411853,0.567706,0.333333,
0.411853,0.567706,0.333333;

#0,1,0,2,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333;

#0,1,1,0,
1.44386,0.318355,0.333333,
1.44386,0.318355,0.333333,
1.44386,0.318355,0.333333,
1.44386,0.318355,0.333333;

#0,1,1,1,
-0.0471287,0.534776,0.333333,
-0.0471287,0.534776,0.333333,
-0.0471287,0.534776,0.333333,
-0.0471287,0.534776,0.333333;

#0,1,1,2,
0.887302,0.530237,0.333333,
0.887302,0.530237,0.333333,
0.887302,0.530237,0.333333,
0.887302,0.530237,0.333333;

#0,1,2,0,

1.44386,0.318355,0.333333,
1.44386,0.318355,0.333333,
1.44386,0.318355,0.333333,
1.44386,0.318355,0.333333;

#0,1,2,1,
-0.0471291,0.534776,0.333333,
-0.0471291,0.534776,0.333333,
-0.0471291,0.534776,0.333333,
-0.0471291,0.534776,0.333333;

#0,1,2,2,
0.887302,0.530237,0.333333,
0.887302,0.530237,0.333333,
0.887302,0.530237,0.333333,
0.887302,0.530237,0.333333;

#0,1,3,0,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333;

#0,1,3,1,
0.411851,0.567706,0.333333,
0.411851,0.567706,0.333333,
0.411851,0.567706,0.333333,
0.411851,0.567706,0.333333;

#0,1,3,2,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333;

#0,2,0,0,
0.0544629,1,0.5,
0.0544629,1,0.5,
0.0544629,1,0.5,
0.0544629,1,0.5;

#0,2,0,1,
0.226929,0,0.5,
0.226929,0,0.5,
0.226929,0,0.5,
0.226929,0,0.5;

#0,2,1,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#0,2,1,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#0,2,2,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#0,2,2,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;

#0,2,3,0,
0.0544629,1,0.5,
0.0544629,1,0.5,
0.0544629,1,0.5,
0.0544629,1,0.5;

#0,2,3,1,



0.226929,0,0.5,
0.226929,0,0.5,
0.226929,0,0.5,
0.226929,0,0.5;

#0,3,0,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#0,3,0,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#0,3,1,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#0,3,1,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#0,3,2,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#0,3,2,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#0,3,3,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#0,3,3,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;

#1,0,0,0,
1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333;

#1,0,0,1,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333;

#1,0,0,2,
1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333;

#1,0,1,0,
4.1553,0.347086,0.333333,
4.1553,0.347086,0.333333,
4.1553,0.347086,0.333333,
4.1553,0.347086,0.333333;

#1,0,1,1,
-14.0751,0.372233,0.333333,
-14.0751,0.372233,0.333333,
-14.0751,0.372233,0.333333,
-14.0751,0.372233,0.333333;

#1,0,1,2,
7.12055,0.350362,0.333333,
7.12055,0.350362,0.333333,
7.12055,0.350362,0.333333,
7.12055,0.350362,0.333333;

#1,0,2,0,
-6.28112,0.431581,0.333333,
-6.28112,0.431581,0.333333,
-6.28112,0.431581,0.333333,
-6.28112,0.431581,0.333333;

#1,0,2,1,
4.64808,0.476821,0.333333,
4.64808,0.476821,0.333333,

4.64808,0.476821,0.333333,
4.64808,0.476821,0.333333;

#1,0,2,2,
-1.87433,0.288414,0.333333,
-1.87433,0.288414,0.333333,
-1.87433,0.288414,0.333333,
-1.87433,0.288414,0.333333;

#1,0,3,0,
-4.64967,0.425351,0.333333,
-4.64967,0.425351,0.333333,
-4.64967,0.425351,0.333333,
-4.64967,0.425351,0.333333;

#1,0,3,1,
1.74961,0.441019,0.333333,
1.74961,0.441019,0.333333,
1.74961,0.441019,0.333333,
1.74961,0.441019,0.333333;

#1,0,3,2,
-0.554745,0.271793,0.333333,
-0.554745,0.271793,0.333333,
-0.554745,0.271793,0.333333,
-0.554745,0.271793,0.333333;

#1,1,0,0,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333;

#1,1,0,1,
0.411851,0.567706,0.333333,
0.411851,0.567706,0.333333,
0.411851,0.567706,0.333333,
0.411851,0.567706,0.333333;

#1,1,0,2,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333;

#1,1,1,0,
9.17734,0.465549,0.333333,
9.17734,0.465549,0.333333,
9.17734,0.465549,0.333333,
9.17734,0.465549,0.333333;

#1,1,1,1,
11.3569,0.694772,0.333333,
11.3569,0.694772,0.333333,
11.3569,0.694772,0.333333,
11.3569,0.694772,0.333333;

#1,1,1,2,
-1.12126,0.419578,0.333333,



-1.12126,0.419578,0.333333,
-1.12126,0.419578,0.333333,
-1.12126,0.419578,0.333333;

#1,1,2,0,
-3.74837,-0.0529595,0.333333,
-3.74837,-0.0529595,0.333333,
-3.74837,-0.0529595,0.333333,
-3.74837,-0.0529595,0.333333;

#1,1,2,1,
0.304411,0.135988,0.333333,
0.304411,0.135988,0.333333,
0.304411,0.135988,0.333333,
0.304411,0.135988,0.333333;

#1,1,2,2,
-0.607771,0.556174,0.333333,
-0.607771,0.556174,0.333333,
-0.607771,0.556174,0.333333,
-0.607771,0.556174,0.333333;

#1,1,3,0,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333;

#1,1,3,1,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333;

#1,1,3,2,
0.00597234,0.441673,0.333333,
0.00597234,0.441673,0.333333,
0.00597234,0.441673,0.333333,
0.00597234,0.441673,0.333333;

#1,2,0,0,
0.0544629,1,0.5,
0.0544629,1,0.5,
0.0544629,1,0.5,
0.0544629,1,0.5;

#1,2,0,1,
0.226929,0,0.5,
0.226929,0,0.5,
0.226929,0,0.5,
0.226929,0,0.5;

#1,2,1,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#1,2,1,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#1,2,2,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#1,2,2,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#1,2,3,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#1,2,3,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#1,3,0,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;

#1,3,0,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#1,3,1,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#1,3,1,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#1,3,2,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#1,3,2,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#1,3,3,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#1,3,3,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;

#2,0,0,0,
-4.64967,0.425351,0.333333,
-4.64967,0.425351,0.333333,
-4.64967,0.425351,0.333333,
-4.64967,0.425351,0.333333;

#2,0,0,1,
1.74961,0.441019,0.333333,
1.74961,0.441019,0.333333,
1.74961,0.441019,0.333333,
1.74961,0.441019,0.333333;

#2,0,0,2,
-0.554745,0.271793,0.333333,
-0.554745,0.271793,0.333333,
-0.554745,0.271793,0.333333,
-0.554745,0.271793,0.333333;

#2,0,1,0,
-3.53044,0.433626,0.333333,
-3.53044,0.433626,0.333333,
-3.53044,0.433626,0.333333,
-3.53044,0.433626,0.333333;

#2,0,1,1,
-0.270978,0.437411,0.333333,
-0.270978,0.437411,0.333333,
-0.270978,0.437411,0.333333,
-0.270978,0.437411,0.333333;

#2,0,1,2,
0.186775,0.246005,0.333333,
0.186775,0.246005,0.333333,
0.186775,0.246005,0.333333,
0.186775,0.246005,0.333333;

#2,0,2,0,
-3.53044,0.433626,0.333333,
-3.53044,0.433626,0.333333,
-3.53044,0.433626,0.333333,
-3.53044,0.433626,0.333333;

#2,0,2,1,
-0.270977,0.437411,0.333333,
-0.270977,0.437411,0.333333,
-0.270977,0.437411,0.333333,
-0.270977,0.437411,0.333333;

#2,0,2,2,
0.186775,0.246005,0.333333,
0.186775,0.246005,0.333333,



0.186775,0.246005,0.333333,
0.186775,0.246005,0.333333;

#2,0,3,0,
-4.64966,0.425351,0.333333,
-4.64966,0.425351,0.333333,
-4.64966,0.425351,0.333333,
-4.64966,0.425351,0.333333;

#2,0,3,1,
1.74961,0.441019,0.333333,
1.74961,0.441019,0.333333,
1.74961,0.441019,0.333333,
1.74961,0.441019,0.333333;

#2,0,3,2,
-0.554746,0.271793,0.333333,
-0.554746,0.271793,0.333333,
-0.554746,0.271793,0.333333,
-0.554746,0.271793,0.333333;

#2,1,0,0,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333;

#2,1,0,1,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333;

#2,1,0,2,
0.00597234,0.441673,0.333333,
0.00597234,0.441673,0.333333,
0.00597234,0.441673,0.333333,
0.00597234,0.441673,0.333333;

#2,1,1,0,
-0.890223,0.346649,0.333333,
-0.890223,0.346649,0.333333,
-0.890223,0.346649,0.333333,
-0.890223,0.346649,0.333333;

#2,1,1,1,
-0.334731,0.359002,0.333333,
-0.334731,0.359002,0.333333,
-0.334731,0.359002,0.333333,
-0.334731,0.359002,0.333333;

#2,1,1,2,
0.144652,0.376969,0.333333,
0.144652,0.376969,0.333333,
0.144652,0.376969,0.333333,
0.144652,0.376969,0.333333;

#2,1,2,0,
-0.890223,0.346649,0.333333,

-0.890223,0.346649,0.333333,
-0.890223,0.346649,0.333333,
-0.890223,0.346649,0.333333;

#2,1,2,1,
-0.334731,0.359002,0.333333,
-0.334731,0.359002,0.333333,
-0.334731,0.359002,0.333333,
-0.334731,0.359002,0.333333;

#2,1,2,2,
0.144652,0.376969,0.333333,
0.144652,0.376969,0.333333,
0.144652,0.376969,0.333333,
0.144652,0.376969,0.333333;

#2,1,3,0,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333;

#2,1,3,1,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333;

#2,1,3,2,
0.00597233,0.441673,0.333333,
0.00597233,0.441673,0.333333,
0.00597233,0.441673,0.333333,
0.00597233,0.441673,0.333333;

#2,2,0,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#2,2,0,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#2,2,1,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#2,2,1,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#2,2,2,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#2,2,2,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#2,2,3,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#2,2,3,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#2,3,0,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#2,3,0,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#2,3,1,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#2,3,1,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#2,3,2,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#2,3,2,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#2,3,3,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#2,3,3,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;

#3,0,0,0,
-4.64966,0.425351,0.333333,
-4.64966,0.425351,0.333333,
-4.64966,0.425351,0.333333,
-4.64966,0.425351,0.333333;

#3,0,0,1,
1.74961,0.441019,0.333333,



1.74961,0.441019,0.333333,
1.74961,0.441019,0.333333,
1.74961,0.441019,0.333333;

#3,0,0,2,
-0.554746,0.271793,0.333333,
-0.554746,0.271793,0.333333,
-0.554746,0.271793,0.333333,
-0.554746,0.271793,0.333333;

#3,0,1,0,
-6.28112,0.431581,0.333333,
-6.28112,0.431581,0.333333,
-6.28112,0.431581,0.333333,
-6.28112,0.431581,0.333333;

#3,0,1,1,
4.64808,0.476821,0.333333,
4.64808,0.476821,0.333333,
4.64808,0.476821,0.333333,
4.64808,0.476821,0.333333;

#3,0,1,2,
-1.87433,0.288414,0.333333,
-1.87433,0.288414,0.333333,
-1.87433,0.288414,0.333333,
-1.87433,0.288414,0.333333;

#3,0,2,0,
4.15531,0.347086,0.333333,
4.15531,0.347086,0.333333,
4.15531,0.347086,0.333333,
4.15531,0.347086,0.333333;

#3,0,2,1,
-14.0751,0.372233,0.333333,
-14.0751,0.372233,0.333333,
-14.0751,0.372233,0.333333,
-14.0751,0.372233,0.333333;

#3,0,2,2,
7.12055,0.350362,0.333333,
7.12055,0.350362,0.333333,
7.12055,0.350362,0.333333,
7.12055,0.350362,0.333333;

#3,0,3,0,
1.22245,0.356311,0.333333,
1.22245,0.356311,0.333333,
1.22245,0.356311,0.333333,
1.22245,0.356311,0.333333;

#3,0,3,1,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333;

#3,0,3,2,

1.77837,0.358061,0.333333,
1.77837,0.358061,0.333333,
1.77837,0.358061,0.333333,
1.77837,0.358061,0.333333;

#3,1,0,0,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333,
-1.71197,0.2784,0.333333;

#3,1,0,1,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333,
-0.324043,0.316312,0.333333;

#3,1,0,2,
0.00597233,0.441673,0.333333,
0.00597233,0.441673,0.333333,
0.00597233,0.441673,0.333333,
0.00597233,0.441673,0.333333;

#3,1,1,0,
-3.74837,-0.0529595,0.333333,
-3.74837,-0.0529595,0.333333,
-3.74837,-0.0529595,0.333333,
-3.74837,-0.0529595,0.333333;

#3,1,1,1,
0.304412,0.135988,0.333333,
0.304412,0.135988,0.333333,
0.304412,0.135988,0.333333,
0.304412,0.135988,0.333333;

#3,1,1,2,
-0.607771,0.556174,0.333333,
-0.607771,0.556174,0.333333,
-0.607771,0.556174,0.333333,
-0.607771,0.556174,0.333333;

#3,1,2,0,
9.17737,0.465549,0.333333,
9.17737,0.465549,0.333333,
9.17737,0.465549,0.333333,
9.17737,0.465549,0.333333;

#3,1,2,1,
11.3569,0.694772,0.333333,
11.3569,0.694772,0.333333,
11.3569,0.694772,0.333333,
11.3569,0.694772,0.333333;

#3,1,2,2,
-1.12125,0.419578,0.333333,
-1.12125,0.419578,0.333333,
-1.12125,0.419578,0.333333,
-1.12125,0.419578,0.333333;



#3,1,3,0,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333,
3.4889,0.372912,0.333333;

#3,1,3,1,
0.411853,0.567706,0.333333,
0.411853,0.567706,0.333333,
0.411853,0.567706,0.333333,
0.411853,0.567706,0.333333;

#3,1,3,2,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333,
1.19055,0.491222,0.333333;

#3,2,0,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#3,2,0,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#3,2,1,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#3,2,1,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#3,2,2,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#3,2,2,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;

#3,2,3,0,
0.0544629,1,0.5,
0.0544629,1,0.5,
0.0544629,1,0.5,
0.0544629,1,0.5;

#3,2,3,1,
0.226929,0,0.5,
0.226929,0,0.5,
0.226929,0,0.5,
0.226929,0,0.5;

#3,3,0,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#3,3,0,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#3,3,1,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#3,3,1,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#3,3,2,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#3,3,2,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#3,3,3,0,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#3,3,3,1,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;

#4,0,0,1,
0.0200641,-0.034403,0.378788,
0.0200641,-0.034403,0.378788,
0.0200641,-0.034403,0.378788,
0.0200641,-0.034403,0.378788;

#4,0,0,2,
0.268338,0.198199,0.378788,
0.268338,0.198199,0.378788,
0.268338,0.198199,0.378788,
0.268338,0.198199,0.378788;

#4,0,0,3,

0.781941,0.27866,0.378788,
0.781941,0.27866,0.378788,
0.781941,0.27866,0.378788,
0.781941,0.27866,0.378788;

#4,0,1,1,
-0.0616285,0.471496,0.333333,
-0.0616285,0.471496,0.333333,
-0.0616285,0.471496,0.333333,
-0.0616285,0.471496,0.333333;

#4,0,1,2,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333;

#4,0,1,3,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333;

#4,0,2,1,
-0.0616283,0.471496,0.333333,
-0.0616283,0.471496,0.333333,
-0.0616283,0.471496,0.333333,
-0.0616283,0.471496,0.333333;

#4,0,2,2,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333;

#4,0,2,3,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333;

#4,0,3,1,
0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208;

#4,0,3,2,
0.268338,0.198199,0.380208,
0.268338,0.198199,0.380208,
0.268338,0.198199,0.380208,
0.268338,0.198199,0.380208;

#4,0,3,3,
0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208;



#4,1,0,1,
0.101646,0.107943,0.378788,
0.101646,0.107943,0.378788,
0.101646,0.107943,0.378788,
0.101646,0.107943,0.378788;

#4,1,0,2,
0.328167,0.0323593,0.378788,
0.328167,0.0323593,0.378788,
0.328167,0.0323593,0.378788,
0.328167,0.0323593,0.378788;

#4,1,0,3,
0.646439,0.274157,0.378788,
0.646439,0.274157,0.378788,
0.646439,0.274157,0.378788,
0.646439,0.274157,0.378788;

#4,1,1,1,
-0.0155402,0.54075,0.333333,
-0.0155402,0.54075,0.333333,
-0.0155402,0.54075,0.333333,
-0.0155402,0.54075,0.333333;

#4,1,1,2,
0.304352,0.120203,0.333333,
0.304352,0.120203,0.333333,
0.304352,0.120203,0.333333,
0.304352,0.120203,0.333333;

#4,1,1,3,
0.752727,0.156921,0.333333,
0.752727,0.156921,0.333333,
0.752727,0.156921,0.333333,
0.752727,0.156921,0.333333;

#4,1,2,1,
-0.0155402,0.54075,0.333333,
-0.0155402,0.54075,0.333333,
-0.0155402,0.54075,0.333333,
-0.0155402,0.54075,0.333333;

#4,1,2,2,
0.304352,0.120203,0.333333,
0.304352,0.120203,0.333333,
0.304352,0.120203,0.333333,
0.304352,0.120203,0.333333;

#4,1,2,3,
0.752727,0.156921,0.333333,
0.752727,0.156921,0.333333,
0.752727,0.156921,0.333333,
0.752727,0.156921,0.333333;

#4,1,3,1,
0.101646,0.107943,0.380208,
0.101646,0.107943,0.380208,
0.101646,0.107943,0.380208,
0.101646,0.107943,0.380208;

#4,1,3,2,
0.328167,0.0323591,0.380208,
0.328167,0.0323591,0.380208,
0.328167,0.0323591,0.380208,
0.328167,0.0323591,0.380208;

#4,1,3,3,
0.646439,0.274157,0.380208,
0.646439,0.274157,0.380208,
0.646439,0.274157,0.380208,
0.646439,0.274157,0.380208;

#4,2,0,0,
-0.0242014,0.19638,0.333333,
-0.0242014,0.19638,0.333333,
-0.0242014,0.19638,0.333333,
-0.0242014,0.19638,0.333333;

#4,2,0,1,
-0.0120107,0.175323,0.333333,
-0.0120107,0.175323,0.333333,
-0.0120107,0.175323,0.333333,
-0.0120107,0.175323,0.333333;

#4,2,0,2,
0.724683,0.321676,0.333333,
0.724683,0.321676,0.333333,
0.724683,0.321676,0.333333,
0.724683,0.321676,0.333333;

#4,2,1,0,
0.113409,0.296608,0.333333,
0.113409,0.296608,0.333333,
0.113409,0.296608,0.333333,
0.113409,0.296608,0.333333;

#4,2,1,1,
0.359545,0.250051,0.333333,
0.359545,0.250051,0.333333,
0.359545,0.250051,0.333333,
0.359545,0.250051,0.333333;

#4,2,1,2,
0.468941,0.306836,0.333333,
0.468941,0.306836,0.333333,
0.468941,0.306836,0.333333,
0.468941,0.306836,0.333333;

#4,2,2,0,
0.113409,0.296608,0.333333,
0.113409,0.296608,0.333333,
0.113409,0.296608,0.333333,
0.113409,0.296608,0.333333;

#4,2,2,1,
0.359545,0.250051,0.333333,
0.359545,0.250051,0.333333,
0.359545,0.250051,0.333333,
0.359545,0.250051,0.333333;



0.359545,0.250051,0.333333;

#4,2,2,2,

0.468941,0.306836,0.333333,
0.468941,0.306836,0.333333,
0.468941,0.306836,0.333333,
0.468941,0.306836,0.333333;

#4,2,3,0,

-0.0242012,0.19638,0.333333,
-0.0242012,0.19638,0.333333,
-0.0242012,0.19638,0.333333,
-0.0242012,0.19638,0.333333;

#4,2,3,1,

-0.0120103,0.175323,0.333333,
-0.0120103,0.175323,0.333333,
-0.0120103,0.175323,0.333333,
-0.0120103,0.175323,0.333333;

#4,2,3,2,

0.724683,0.321676,0.333333,
0.724683,0.321676,0.333333,
0.724683,0.321676,0.333333,
0.724683,0.321676,0.333333;

#4,3,0,0,

1.22245,0.356311,0.333333,
1.22245,0.356311,0.333333,
1.22245,0.356311,0.333333,
1.22245,0.356311,0.333333;

#4,3,0,1,

-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333;

#4,3,0,2,

1.77837,0.358061,0.333333,
1.77837,0.358061,0.333333,
1.77837,0.358061,0.333333,
1.77837,0.358061,0.333333;

#4,3,1,0,

0.35734,0.351028,0.333333,
0.35734,0.351028,0.333333,
0.35734,0.351028,0.333333,
0.35734,0.351028,0.333333;

#4,3,1,1,

-0.630113,0.409834,0.333333,
-0.630113,0.409834,0.333333,
-0.630113,0.409834,0.333333,
-0.630113,0.409834,0.333333;

#4,3,1,2,

0.934039,0.371222,0.333333,
0.934039,0.371222,0.333333,

0.934039,0.371222,0.333333,
0.934039,0.371222,0.333333;

#4,3,2,0,

0.35734,0.351028,0.333333,
0.35734,0.351028,0.333333,
0.35734,0.351028,0.333333,
0.35734,0.351028,0.333333;

#4,3,2,1,

-0.630112,0.409834,0.333333,
-0.630112,0.409834,0.333333,
-0.630112,0.409834,0.333333,
-0.630112,0.409834,0.333333;

#4,3,2,2,

0.934039,0.371222,0.333333,
0.934039,0.371222,0.333333,
0.934039,0.371222,0.333333,
0.934039,0.371222,0.333333;

#4,3,3,0,

1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333;

#4,3,3,1,

-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333;

#4,3,3,2,

1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333;

#5,0,0,1,

0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208;

#5,0,0,2,

0.268338,0.198199,0.380208,
0.268338,0.198199,0.380208,
0.268338,0.198199,0.380208,
0.268338,0.198199,0.380208;

#5,0,0,3,

0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208;

#5,0,1,1,

0.180685,0.336143,0.374214,



0.180685,0.336143,0.374214,
0.180685,0.336143,0.374214,
0.180685,0.336143,0.374214;

#5,0,1,2,
0.367899,0.648645,0.374214,
0.367899,0.648645,0.374214,
0.367899,0.648645,0.374214,
0.367899,0.648645,0.374214;

#5,0,1,3,
0.572748,0.0685732,0.374214,
0.572748,0.0685732,0.374214,
0.572748,0.0685732,0.374214,
0.572748,0.0685732,0.374214;

#5,0,2,1,
1.59273,0.490583,0.254098,
1.59273,0.490583,0.254098,
1.59273,0.490583,0.254098,
1.59273,0.490583,0.254098;

#5,0,2,2,
-3.34699,0.509273,0.254098,
-3.34699,0.509273,0.254098,
-3.34699,0.509273,0.254098,
-3.34699,0.509273,0.254098;

#5,0,2,3,
3.58777,0.126323,0.254098,
3.58777,0.126323,0.254098,
3.58777,0.126323,0.254098,
3.58777,0.126323,0.254098;

#5,0,3,1,
2.84191,0.477946,0.2125,
2.84191,0.477946,0.2125,
2.84191,0.477946,0.2125,
2.84191,0.477946,0.2125;

#5,0,3,2,
-5.61169,0.466017,0.2125,
-5.61169,0.466017,0.2125,
-5.61169,0.466017,0.2125,
-5.61169,0.466017,0.2125;

#5,0,3,3,
5.33994,0.133818,0.2125,
5.33994,0.133818,0.2125,
5.33994,0.133818,0.2125,
5.33994,0.133818,0.2125;

#5,1,0,1,
0.101646,0.107943,0.380208,
0.101646,0.107943,0.380208,
0.101646,0.107943,0.380208,
0.101646,0.107943,0.380208;

#5,1,0,2,

0.328167,0.0323591,0.380208,
0.328167,0.0323591,0.380208,
0.328167,0.0323591,0.380208,
0.328167,0.0323591,0.380208;

#5,1,0,3,
0.646439,0.274157,0.380208,
0.646439,0.274157,0.380208,
0.646439,0.274157,0.380208,
0.646439,0.274157,0.380208;

#5,1,1,1,
0.275304,0.240115,0.374214,
0.275304,0.240115,0.374214,
0.275304,0.240115,0.374214,
0.275304,0.240115,0.374214;

#5,1,1,2,
0.53818,0.556162,0.374214,
0.53818,0.556162,0.374214,
0.53818,0.556162,0.374214,
0.53818,0.556162,0.374214;

#5,1,1,3,
0.334662,0.0776958,0.374214,
0.334662,0.0776958,0.374214,
0.334662,0.0776958,0.374214,
0.334662,0.0776958,0.374214;

#5,1,2,1,
-0.988781,0.518556,0.251366,
-0.988781,0.518556,0.251366,
-0.988781,0.518556,0.251366,
-0.988781,0.518556,0.251366;

#5,1,2,2,
-3.4062,0.584503,0.251366,
-3.4062,0.584503,0.251366,
-3.4062,0.584503,0.251366,
-3.4062,0.584503,0.251366;

#5,1,2,3,
4.17551,0.11349,0.251366,
4.17551,0.11349,0.251366,
4.17551,0.11349,0.251366,
4.17551,0.11349,0.251366;

#5,1,3,1,
-2.79292,0.50708,0.208333,
-2.79292,0.50708,0.208333,
-2.79292,0.50708,0.208333,
-2.79292,0.50708,0.208333;

#5,1,3,2,
-3.23598,0.5226,0.208333,
-3.23598,0.5226,0.208333,
-3.23598,0.5226,0.208333,
-3.23598,0.5226,0.208333;



#5,1,3,3,
4.45535,0.122176,0.208333,
4.45535,0.122176,0.208333,
4.45535,0.122176,0.208333,
4.45535,0.122176,0.208333;

#5,2,0,0,
-0.0242012,0.19638,0.333333,
-0.0242012,0.19638,0.333333,
-0.0242012,0.19638,0.333333,
-0.0242012,0.19638,0.333333;

#5,2,0,1,
-0.0120103,0.175323,0.333333,
-0.0120103,0.175323,0.333333,
-0.0120103,0.175323,0.333333,
-0.0120103,0.175323,0.333333;

#5,2,0,2,
0.724683,0.321676,0.333333,
0.724683,0.321676,0.333333,
0.724683,0.321676,0.333333,
0.724683,0.321676,0.333333;

#5,2,1,0,
0.0328972,-0.26091,0.333333,
0.0328972,-0.26091,0.333333,
0.0328972,-0.26091,0.333333,
0.0328972,-0.26091,0.333333;

#5,2,1,1,
-1.25306,0.14051,0.333333,
-1.25306,0.14051,0.333333,
-1.25306,0.14051,0.333333,
-1.25306,0.14051,0.333333;

#5,2,1,2,
1.47066,0.321389,0.333333,
1.47066,0.321389,0.333333,
1.47066,0.321389,0.333333,
1.47066,0.321389,0.333333;

#5,2,2,0,
2.7884,0.436152,0.333333,
2.7884,0.436152,0.333333,
2.7884,0.436152,0.333333,
2.7884,0.436152,0.333333;

#5,2,2,1,
1.10202,0.821072,0.333333,
1.10202,0.821072,0.333333,
1.10202,0.821072,0.333333,
1.10202,0.821072,0.333333;

#5,2,2,2,
-0.57073,0.0951613,0.333333,
-0.57073,0.0951613,0.333333,
-0.57073,0.0951613,0.333333,
-0.57073,0.0951613,0.333333;

#5,2,3,0,
1.45561,0.483337,0.333333,
1.45561,0.483337,0.333333,
1.45561,0.483337,0.333333,
1.45561,0.483337,0.333333;

#5,2,3,1,
1.03474,0.590302,0.333333,
1.03474,0.590302,0.333333,
1.03474,0.590302,0.333333,
1.03474,0.590302,0.333333;

#5,2,3,2,
-0.257319,0.15505,0.333333,
-0.257319,0.15505,0.333333,
-0.257319,0.15505,0.333333,
-0.257319,0.15505,0.333333;

#5,3,0,0,
1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333,
1.22244,0.356311,0.333333;

#5,3,0,1,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333;

#5,3,0,2,
1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333,
1.77836,0.358061,0.333333;

#5,3,1,0,
4.1553,0.347086,0.333333,
4.1553,0.347086,0.333333,
4.1553,0.347086,0.333333,
4.1553,0.347086,0.333333;

#5,3,1,1,
-14.0751,0.372233,0.333333,
-14.0751,0.372233,0.333333,
-14.0751,0.372233,0.333333,
-14.0751,0.372233,0.333333;

#5,3,1,2,
7.12055,0.350362,0.333333,
7.12055,0.350362,0.333333,
7.12055,0.350362,0.333333,
7.12055,0.350362,0.333333;

#5,3,2,0,
-6.28112,0.431581,0.333333,
-6.28112,0.431581,0.333333,
-6.28112,0.431581,0.333333,
-6.28112,0.431581,0.333333;



-6.28112,0.431581,0.333333;

#5,3,2,1,

4.64808,0.476821,0.333333,

4.64808,0.476821,0.333333,

4.64808,0.476821,0.333333,

4.64808,0.476821,0.333333;

#5,3,2,2,

-1.87433,0.288414,0.333333,

-1.87433,0.288414,0.333333,

-1.87433,0.288414,0.333333,

-1.87433,0.288414,0.333333;

#5,3,3,0,

-4.64967,0.425351,0.333333,

-4.64967,0.425351,0.333333,

-4.64967,0.425351,0.333333,

-4.64967,0.425351,0.333333;

#5,3,3,1,

1.74961,0.441019,0.333333,

1.74961,0.441019,0.333333,

1.74961,0.441019,0.333333,

1.74961,0.441019,0.333333;

#5,3,3,2,

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#6,0,0,1,

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-5.61169,0.466017,0.2125,

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#6,0,3,2,

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#6,0,3,3,

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#7,0,0,1,
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2.64101,0.481333,0.218254;

#7,0,0,2,
-5.13137,0.472114,0.218254,
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-5.13137,0.472114,0.218254;

#7,0,0,3,
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#7,0,1,1,
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3.19407,0.126481,0.257812,
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#7,0,2,1,

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#7,0,2,2,

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#7,0,2,3,

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#7,0,3,1,

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#7,0,3,3,

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#7,1,0,1,

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-2.5256,0.510354,0.214286,
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-2.5256,0.510354,0.214286;

#7,1,0,2,

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#7,1,0,3,

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#7,1,1,3,

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#7,1,2,1,

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#7,1,2,3,

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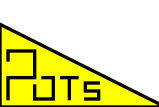
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-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333,
-2.3662,0.399721,0.333333;

#7,3,3,2,
1.77837,0.358061,0.333333,
1.77837,0.358061,0.333333,
1.77837,0.358061,0.333333,
1.77837,0.358061,0.333333;

#8,0,0,1,
0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208;

#8,0,0,2,
0.268338,0.198199,0.380208,
0.268338,0.198199,0.380208,
0.268338,0.198199,0.380208,
0.268338,0.198199,0.380208;

#8,0,0,3,
0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208;

#8,0,1,1,
-0.0616283,0.471496,0.333333,
-0.0616283,0.471496,0.333333,
-0.0616283,0.471496,0.333333,
-0.0616283,0.471496,0.333333;

#8,0,1,2,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333;

#8,0,1,3,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333;

#8,0,2,1,
-0.0616285,0.471496,0.333333,
-0.0616285,0.471496,0.333333,
-0.0616285,0.471496,0.333333,
-0.0616285,0.471496,0.333333;

#8,0,2,2,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333,
0.292238,0.154606,0.333333;

#8,0,2,3,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333,
0.827956,0.20392,0.333333;

#8,0,3,1,
0.0200641,-0.034403,0.378788,
0.0200641,-0.034403,0.378788,
0.0200641,-0.034403,0.378788,
0.0200641,-0.034403,0.378788;

#8,0,3,2,
0.268338,0.198199,0.378788,
0.268338,0.198199,0.378788,
0.268338,0.198199,0.378788,
0.268338,0.198199,0.378788;

#8,0,3,3,
0.781941,0.27866,0.378788,
0.781941,0.27866,0.378788,
0.781941,0.27866,0.378788,
0.781941,0.27866,0.378788;

#8,1,0,1,
-0.0375916,-0.208785,0.380208,
-0.0375916,-0.208785,0.380208,
-0.0375916,-0.208785,0.380208,
-0.0375916,-0.208785,0.380208;

#8,1,0,2,
0.235913,0.41982,0.380208,
0.235913,0.41982,0.380208,
0.235913,0.41982,0.380208,
0.235913,0.41982,0.380208;

#8,1,0,3,
0.883973,0.253124,0.380208,
0.883973,0.253124,0.380208,
0.883973,0.253124,0.380208,
0.883973,0.253124,0.380208;

#8,1,1,1,
-0.0896627,0.396347,0.333333,
-0.0896627,0.396347,0.333333,
-0.0896627,0.396347,0.333333,
-0.0896627,0.396347,0.333333;

#8,1,1,2,
0.290832,0.181814,0.333333,
0.290832,0.181814,0.333333,
0.290832,0.181814,0.333333,
0.290832,0.181814,0.333333;



0.290832,0.181814,0.333333;

#8,1,1,3,

0.88461,0.247937,0.333333,

0.88461,0.247937,0.333333,

0.88461,0.247937,0.333333,

0.88461,0.247937,0.333333;

#8,1,2,1,

-0.0896627,0.396348,0.333333,

-0.0896627,0.396348,0.333333,

-0.0896627,0.396348,0.333333,

-0.0896627,0.396348,0.333333;

#8,1,2,2,

0.290832,0.181814,0.333333,

0.290832,0.181814,0.333333,

0.290832,0.181814,0.333333,

0.290832,0.181814,0.333333;

#8,1,2,3,

0.88461,0.247937,0.333333,

0.88461,0.247937,0.333333,

0.88461,0.247937,0.333333,

0.88461,0.247937,0.333333;

#8,1,3,1,

-0.0375916,-0.208785,0.378788,

-0.0375916,-0.208785,0.378788,

-0.0375916,-0.208785,0.378788,

-0.0375916,-0.208785,0.378788;

#8,1,3,2,

0.235913,0.41982,0.378788,

0.235913,0.41982,0.378788,

0.235913,0.41982,0.378788,

0.235913,0.41982,0.378788;

#8,1,3,3,

0.883973,0.253124,0.378788,

0.883973,0.253124,0.378788,

0.883973,0.253124,0.378788,

0.883973,0.253124,0.378788;

#8,2,0,2,

0.415475,0.485195,0.333333,

0.415475,0.485195,0.333333,

0.415475,0.485195,0.333333,

0.415475,0.485195,0.333333;

#8,2,0,3,

0.443375,0.621291,0.333333,

0.443375,0.621291,0.333333,

0.443375,0.621291,0.333333,

0.443375,0.621291,0.333333;

#8,2,0,4,

0.248458,0.144726,0.333333,

0.248458,0.144726,0.333333,

0.248458,0.144726,0.333333,

0.248458,0.144726,0.333333;

#8,2,1,2,

0.434995,0.233998,0.333333,

0.434995,0.233998,0.333333,

0.434995,0.233998,0.333333,

0.434995,0.233998,0.333333;

#8,2,1,3,

0.461015,0.977469,0.333333,

0.461015,0.977469,0.333333,

0.461015,0.977469,0.333333,

0.461015,0.977469,0.333333;

#8,2,1,4,

0.212743,-0.016637,0.333333,

0.212743,-0.016637,0.333333,

0.212743,-0.016637,0.333333,

0.212743,-0.016637,0.333333;

#8,2,2,2,

0.434995,0.233998,0.333333,

0.434995,0.233998,0.333333,

0.434995,0.233998,0.333333,

0.434995,0.233998,0.333333;

#8,2,2,3,

0.461015,0.977469,0.333333,

0.461015,0.977469,0.333333,

0.461015,0.977469,0.333333,

0.461015,0.977469,0.333333;

#8,2,2,4,

0.212743,-0.016637,0.333333,

0.212743,-0.016637,0.333333,

0.212743,-0.016637,0.333333,

0.212743,-0.016637,0.333333;

#8,2,3,2,

0.415475,0.485195,0.333333,

0.415475,0.485195,0.333333,

0.415475,0.485195,0.333333,

0.415475,0.485195,0.333333;

#8,2,3,3,

0.443375,0.621291,0.333333,

0.443375,0.621291,0.333333,

0.443375,0.621291,0.333333,

0.443375,0.621291,0.333333;

#8,2,3,4,

0.248458,0.144726,0.333333,

0.248458,0.144726,0.333333,

0.248458,0.144726,0.333333,

0.248458,0.144726,0.333333;

#8,3,0,2,

0.370705,0.49,0.333333,



0.370705,0.49,0.333333,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333;

#8,3,0,3,
0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333;

#8,3,0,4,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333;

#8,3,1,2,
0.383068,0.127811,0.333333,
0.383068,0.127811,0.333333,
0.383068,0.127811,0.333333,
0.383068,0.127811,0.333333;

#8,3,1,3,
0.394808,1.02112,0.333333,
0.394808,1.02112,0.333333,
0.394808,1.02112,0.333333,
0.394808,1.02112,0.333333;

#8,3,1,4,
0.302909,-0.033693,0.333333,
0.302909,-0.033693,0.333333,
0.302909,-0.033693,0.333333,
0.302909,-0.033693,0.333333;

#8,3,2,2,
0.383068,0.127811,0.333333,
0.383068,0.127811,0.333333,
0.383068,0.127811,0.333333,
0.383068,0.127811,0.333333;

#8,3,2,3,
0.394808,1.02112,0.333333,
0.394808,1.02112,0.333333,
0.394808,1.02112,0.333333,
0.394808,1.02112,0.333333;

#8,3,2,4,
0.302909,-0.0336931,0.333333,
0.302909,-0.0336931,0.333333,
0.302909,-0.0336931,0.333333,
0.302909,-0.0336931,0.333333;

#8,3,3,2,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333;

#8,3,3,3,

0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333;

#8,3,3,4,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333;

#9,0,0,1,
0.0200641,-0.034403,0.378788,
0.0200641,-0.034403,0.378788,
0.0200641,-0.034403,0.378788,
0.0200641,-0.034403,0.378788;

#9,0,0,2,
0.268338,0.198199,0.378788,
0.268338,0.198199,0.378788,
0.268338,0.198199,0.378788,
0.268338,0.198199,0.378788;

#9,0,0,3,
0.781941,0.27866,0.378788,
0.781941,0.27866,0.378788,
0.781941,0.27866,0.378788,
0.781941,0.27866,0.378788;

#9,0,1,1,
0.180686,0.336143,0.373457,
0.180686,0.336143,0.373457,
0.180686,0.336143,0.373457,
0.180686,0.336143,0.373457;

#9,0,1,2,
0.3679,0.648645,0.373457,
0.3679,0.648645,0.373457,
0.3679,0.648645,0.373457,
0.3679,0.648645,0.373457;

#9,0,1,3,
0.572747,0.0685733,0.373457,
0.572747,0.0685733,0.373457,
0.572747,0.0685733,0.373457,
0.572747,0.0685733,0.373457;

#9,0,2,1,
1.29235,0.498839,0.257812,
1.29235,0.498839,0.257812,
1.29235,0.498839,0.257812,
1.29235,0.498839,0.257812;

#9,0,2,2,
-2.82599,0.527379,0.257812,
-2.82599,0.527379,0.257812,
-2.82599,0.527379,0.257812,
-2.82599,0.527379,0.257812;



#9,0,2,3,
3.19407,0.126481,0.257812,
3.19407,0.126481,0.257812,
3.19407,0.126481,0.257812,
3.19407,0.126481,0.257812;

#9,0,3,1,
2.64101,0.481333,0.218254,
2.64101,0.481333,0.218254,
2.64101,0.481333,0.218254,
2.64101,0.481333,0.218254;

#9,0,3,2,
-5.13137,0.472114,0.218254,
-5.13137,0.472114,0.218254,
-5.13137,0.472114,0.218254,
-5.13137,0.472114,0.218254;

#9,0,3,3,
4.9474,0.134969,0.218254,
4.9474,0.134969,0.218254,
4.9474,0.134969,0.218254,
4.9474,0.134969,0.218254;

#9,1,0,1,
-0.0375916,-0.208785,0.378788,
-0.0375916,-0.208785,0.378788,
-0.0375916,-0.208785,0.378788,
-0.0375916,-0.208785,0.378788;

#9,1,0,2,
0.235913,0.41982,0.378788,
0.235913,0.41982,0.378788,
0.235913,0.41982,0.378788,
0.235913,0.41982,0.378788;

#9,1,0,3,
0.883973,0.253124,0.378788,
0.883973,0.253124,0.378788,
0.883973,0.253124,0.378788,
0.883973,0.253124,0.378788;

#9,1,1,1,
0.102656,0.441568,0.373457,
0.102656,0.441568,0.373457,
0.102656,0.441568,0.373457,
0.102656,0.441568,0.373457;

#9,1,1,2,
0.254066,0.720258,0.373457,
0.254066,0.720258,0.373457,
0.254066,0.720258,0.373457,
0.254066,0.720258,0.373457;

#9,1,1,3,
0.758973,0.0574595,0.373457,
0.758973,0.0574595,0.373457,
0.758973,0.0574595,0.373457,
0.758973,0.0574595,0.373457;

#9,1,2,1,
1.8625,0.464473,0.263021,
1.8625,0.464473,0.263021,
1.8625,0.464473,0.263021,
1.8625,0.464473,0.263021;

#9,1,2,2,
-1.67844,0.458288,0.263021,
-1.67844,0.458288,0.263021,
-1.67844,0.458288,0.263021,
-1.67844,0.458288,0.263021;

#9,1,2,3,
1.92168,0.152701,0.263021,
1.92168,0.152701,0.263021,
1.92168,0.152701,0.263021,
1.92168,0.152701,0.263021;

#9,1,3,1,
4.0573,0.44918,0.22619,
4.0573,0.44918,0.22619,
4.0573,0.44918,0.22619,
4.0573,0.44918,0.22619;

#9,1,3,2,
-1.80519,0.422993,0.22619,
-1.80519,0.422993,0.22619,
-1.80519,0.422993,0.22619,
-1.80519,0.422993,0.22619;

#9,1,3,3,
1.17014,0.157158,0.22619,
1.17014,0.157158,0.22619,
1.17014,0.157158,0.22619,
1.17014,0.157158,0.22619;

#9,2,0,2,
0.415475,0.485195,0.333333,
0.415475,0.485195,0.333333,
0.415475,0.485195,0.333333,
0.415475,0.485195,0.333333;

#9,2,0,3,
0.443375,0.621291,0.333333,
0.443375,0.621291,0.333333,
0.443375,0.621291,0.333333,
0.443375,0.621291,0.333333;

#9,2,0,4,
0.248458,0.144726,0.333333,
0.248458,0.144726,0.333333,
0.248458,0.144726,0.333333,
0.248458,0.144726,0.333333;

#9,2,1,2,
0.392059,0.407531,0.333333,
0.392059,0.407531,0.333333,
0.392059,0.407531,0.333333,
0.392059,0.407531,0.333333;



0.392059,0.407531,0.333333;

#9,2,1,3,

0.427291,0.390177,0.333333,
0.427291,0.390177,0.333333,
0.427291,0.390177,0.333333,
0.427291,0.390177,0.333333;

#9,2,1,4,

0.286091,0.287951,0.333333,
0.286091,0.287951,0.333333,
0.286091,0.287951,0.333333,
0.286091,0.287951,0.333333;

#9,2,2,2,

0.364111,0.29847,0.333333,
0.364111,0.29847,0.333333,
0.364111,0.29847,0.333333,
0.364111,0.29847,0.333333;

#9,2,2,3,

0.412953,0.301591,0.333333,
0.412953,0.301591,0.333333,
0.412953,0.301591,0.333333,
0.412953,0.301591,0.333333;

#9,2,2,4,

0.32604,0.357693,0.333333,
0.32604,0.357693,0.333333,
0.32604,0.357693,0.333333,
0.32604,0.357693,0.333333;

#9,2,3,2,

0.334326,0.224531,0.333333,
0.334326,0.224531,0.333333,
0.334326,0.224531,0.333333,
0.334326,0.224531,0.333333;

#9,2,3,3,

0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333;

#9,2,3,4,

0.364419,0.389465,0.333333,
0.364419,0.389465,0.333333,
0.364419,0.389465,0.333333,
0.364419,0.389465,0.333333;

#9,3,0,2,

0.370705,0.49,0.333333,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333;

#9,3,0,3,

0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333,

0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333;

#9,3,0,4,

0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333;

#9,3,1,2,

0.357113,0.407982,0.333333,
0.357113,0.407982,0.333333,
0.357113,0.407982,0.333333,
0.357113,0.407982,0.333333;

#9,3,1,3,

0.387283,0.388349,0.333333,
0.387283,0.388349,0.333333,
0.387283,0.388349,0.333333,
0.387283,0.388349,0.333333;

#9,3,1,4,

0.334544,0.287392,0.333333,
0.334544,0.287392,0.333333,
0.334544,0.287392,0.333333,
0.334544,0.287392,0.333333;

#9,3,2,2,

0.343491,0.299193,0.333333,
0.343491,0.299193,0.333333,
0.343491,0.299193,0.333333,
0.343491,0.299193,0.333333;

#9,3,2,3,

0.383636,0.307955,0.333333,
0.383636,0.307955,0.333333,
0.383636,0.307955,0.333333,
0.383636,0.307955,0.333333;

#9,3,2,4,

0.35107,0.36049,0.333333,
0.35107,0.36049,0.333333,
0.35107,0.36049,0.333333,
0.35107,0.36049,0.333333;

#9,3,3,2,

0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333;

#9,3,3,3,

0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333;

#9,3,3,4,

0.369912,0.396468,0.333333,



0.369912,0.396468,0.333333,
0.369912,0.396468,0.333333,
0.369912,0.396468,0.333333;

#10,0,0,1,
2.64101,0.481333,0.218254,
2.64101,0.481333,0.218254,
2.64101,0.481333,0.218254,
2.64101,0.481333,0.218254;

#10,0,0,2,
-5.13137,0.472114,0.218254,
-5.13137,0.472114,0.218254,
-5.13137,0.472114,0.218254,
-5.13137,0.472114,0.218254;

#10,0,0,3,
4.9474,0.134969,0.218254,
4.9474,0.134969,0.218254,
4.9474,0.134969,0.218254,
4.9474,0.134969,0.218254;

#10,0,1,1,
2.63786,0.456019,0.175,
2.63786,0.456019,0.175,
2.63786,0.456019,0.175,
2.63786,0.456019,0.175;

#10,0,1,2,
-12.8308,0.424314,0.175,
-12.8308,0.424314,0.175,
-12.8308,0.424314,0.175,
-12.8308,0.424314,0.175;

#10,0,1,3,
12.2415,0.124853,0.175,
12.2415,0.124853,0.175,
12.2415,0.124853,0.175,
12.2415,0.124853,0.175;

#10,0,2,1,
2.67217,0.454783,0.175439,
2.67217,0.454783,0.175439,
2.67217,0.454783,0.175439,
2.67217,0.454783,0.175439;

#10,0,2,2,
-13.0138,0.422942,0.175439,
-13.0138,0.422942,0.175439,
-13.0138,0.422942,0.175439,
-13.0138,0.422942,0.175439;

#10,0,2,3,
12.4036,0.123661,0.175439,
12.4036,0.123661,0.175439,
12.4036,0.123661,0.175439,
12.4036,0.123661,0.175439;

#10,0,3,1,

2.84191,0.477946,0.2125,
2.84191,0.477946,0.2125,
2.84191,0.477946,0.2125,
2.84191,0.477946,0.2125;

#10,0,3,2,
-5.61169,0.466017,0.2125,
-5.61169,0.466017,0.2125,
-5.61169,0.466017,0.2125,
-5.61169,0.466017,0.2125;

#10,0,3,3,
5.33994,0.133818,0.2125,
5.33994,0.133818,0.2125,
5.33994,0.133818,0.2125,
5.33994,0.133818,0.2125;

#10,1,0,1,
4.0573,0.44918,0.22619,
4.0573,0.44918,0.22619,
4.0573,0.44918,0.22619,
4.0573,0.44918,0.22619;

#10,1,0,2,
-1.80519,0.422993,0.22619,
-1.80519,0.422993,0.22619,
-1.80519,0.422993,0.22619,
-1.80519,0.422993,0.22619;

#10,1,0,3,
1.17014,0.157158,0.22619,
1.17014,0.157158,0.22619,
1.17014,0.157158,0.22619,
1.17014,0.157158,0.22619;

#10,1,1,1,
6.58375,0.426283,0.175,
6.58375,0.426283,0.175,
6.58375,0.426283,0.175,
6.58375,0.426283,0.175;

#10,1,1,2,
-0.877346,0.387682,0.175,
-0.877346,0.387682,0.175,
-0.877346,0.387682,0.175,
-0.877346,0.387682,0.175;

#10,1,1,3,
-0.650605,0.147437,0.175,
-0.650605,0.147437,0.175,
-0.650605,0.147437,0.175,
-0.650605,0.147437,0.175;

#10,1,2,1,
6.58375,0.426283,0.166667,
6.58375,0.426283,0.166667,
6.58375,0.426283,0.166667,
6.58375,0.426283,0.166667;



#10,1,2,2,
-0.877346,0.387682,0.166667,
-0.877346,0.387682,0.166667,
-0.877346,0.387682,0.166667,
-0.877346,0.387682,0.166667;

#10,1,2,3,
-0.650605,0.147437,0.166667,
-0.650605,0.147437,0.166667,
-0.650605,0.147437,0.166667,
-0.650605,0.147437,0.166667;

#10,1,3,1,
4.37392,0.445961,0.220833,
4.37392,0.445961,0.220833,
4.37392,0.445961,0.220833,
4.37392,0.445961,0.220833;

#10,1,3,2,
-1.81471,0.418386,0.220833,
-1.81471,0.418386,0.220833,
-1.81471,0.418386,0.220833,
-1.81471,0.418386,0.220833;

#10,1,3,3,
1.05837,0.156121,0.220833,
1.05837,0.156121,0.220833,
1.05837,0.156121,0.220833,
1.05837,0.156121,0.220833;

#10,2,0,2,
0.334326,0.224531,0.333333,
0.334326,0.224531,0.333333,
0.334326,0.224531,0.333333,
0.334326,0.224531,0.333333;

#10,2,0,3,
0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333;

#10,2,0,4,
0.364419,0.389465,0.333333,
0.364419,0.389465,0.333333,
0.364419,0.389465,0.333333,
0.364419,0.389465,0.333333;

#10,2,1,2,
0.299156,0.170993,0.333333,
0.299156,0.170993,0.333333,
0.299156,0.170993,0.333333,
0.299156,0.170993,0.333333;

#10,2,1,3,
0.392653,0.259671,0.333333,
0.392653,0.259671,0.333333,
0.392653,0.259671,0.333333,
0.392653,0.259671,0.333333;

#10,2,1,4,
0.405631,0.407789,0.333333,
0.405631,0.407789,0.333333,
0.405631,0.407789,0.333333,
0.405631,0.407789,0.333333;

#10,2,2,2,
0.299156,0.170993,0.333333,
0.299156,0.170993,0.333333,
0.299156,0.170993,0.333333,
0.299156,0.170993,0.333333;

#10,2,2,3,
0.392653,0.259671,0.333333,
0.392653,0.259671,0.333333,
0.392653,0.259671,0.333333,
0.392653,0.259671,0.333333;

#10,2,2,4,
0.405631,0.407789,0.333333,
0.405631,0.407789,0.333333,
0.405631,0.407789,0.333333,
0.405631,0.407789,0.333333;

#10,2,3,2,
0.334325,0.224531,0.333333,
0.334325,0.224531,0.333333,
0.334325,0.224531,0.333333,
0.334325,0.224531,0.333333;

#10,2,3,3,
0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333;

#10,2,3,4,
0.36442,0.389465,0.333333,
0.36442,0.389465,0.333333,
0.36442,0.389465,0.333333,
0.36442,0.389465,0.333333;

#10,3,0,2,
0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333;

#10,3,0,3,
0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333;

#10,3,0,4,
0.369912,0.396468,0.333333,
0.369912,0.396468,0.333333,
0.369912,0.396468,0.333333,
0.369912,0.396468,0.333333;



0.369912,0.396468,0.333333;

#10,3,1,2,

0.310315,0.165138,0.333333,
0.310315,0.165138,0.333333,
0.310315,0.165138,0.333333,
0.310315,0.165138,0.333333;

#10,3,1,3,

0.374541,0.271099,0.333333,
0.374541,0.271099,0.333333,
0.374541,0.271099,0.333333,
0.374541,0.271099,0.333333;

#10,3,1,4,

0.392169,0.416171,0.333333,
0.392169,0.416171,0.333333,
0.392169,0.416171,0.333333,
0.392169,0.416171,0.333333;

#10,3,2,2,

0.310315,0.165138,0.333333,
0.310315,0.165138,0.333333,
0.310315,0.165138,0.333333,
0.310315,0.165138,0.333333;

#10,3,2,3,

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0.374541,0.271099,0.333333,
0.374541,0.271099,0.333333,
0.374541,0.271099,0.333333;

#10,3,2,4,

0.392169,0.416171,0.333333,
0.392169,0.416171,0.333333,
0.392169,0.416171,0.333333,
0.392169,0.416171,0.333333;

#10,3,3,2,

0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333;

#10,3,3,3,

0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333;

#10,3,3,4,

0.369912,0.396468,0.333333,
0.369912,0.396468,0.333333,
0.369912,0.396468,0.333333,
0.369912,0.396468,0.333333;

#11,0,0,1,

2.84191,0.477946,0.2125,
2.84191,0.477946,0.2125,

2.84191,0.477946,0.2125,

2.84191,0.477946,0.2125;

#11,0,0,2,

-5.61169,0.466017,0.2125,
-5.61169,0.466017,0.2125,
-5.61169,0.466017,0.2125,
-5.61169,0.466017,0.2125;

#11,0,0,3,

5.33994,0.133818,0.2125,
5.33994,0.133818,0.2125,
5.33994,0.133818,0.2125,
5.33994,0.133818,0.2125;

#11,0,1,1,

1.59273,0.490583,0.254098,
1.59273,0.490583,0.254098,
1.59273,0.490583,0.254098,
1.59273,0.490583,0.254098;

#11,0,1,2,

-3.34699,0.509273,0.254098,
-3.34699,0.509273,0.254098,
-3.34699,0.509273,0.254098,
-3.34699,0.509273,0.254098;

#11,0,1,3,

3.58777,0.126323,0.254098,
3.58777,0.126323,0.254098,
3.58777,0.126323,0.254098,
3.58777,0.126323,0.254098;

#11,0,2,1,

0.180685,0.336143,0.374214,
0.180685,0.336143,0.374214,
0.180685,0.336143,0.374214,
0.180685,0.336143,0.374214;

#11,0,2,2,

0.367899,0.648645,0.374214,
0.367899,0.648645,0.374214,
0.367899,0.648645,0.374214,
0.367899,0.648645,0.374214;

#11,0,2,3,

0.572748,0.0685732,0.374214,
0.572748,0.0685732,0.374214,
0.572748,0.0685732,0.374214,
0.572748,0.0685732,0.374214;

#11,0,3,1,

0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208,
0.0200641,-0.0344029,0.380208;

#11,0,3,2,

0.268338,0.198199,0.380208,



0.268338,0.198199,0.380208,
0.268338,0.198199,0.380208,
0.268338,0.198199,0.380208;

#11,0,3,3,
0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208,
0.781941,0.27866,0.380208;

#11,1,0,1,
4.37392,0.445961,0.220833,
4.37392,0.445961,0.220833,
4.37392,0.445961,0.220833,
4.37392,0.445961,0.220833;

#11,1,0,2,
-1.81471,0.418386,0.220833,
-1.81471,0.418386,0.220833,
-1.81471,0.418386,0.220833,
-1.81471,0.418386,0.220833;

#11,1,0,3,
1.05837,0.156121,0.220833,
1.05837,0.156121,0.220833,
1.05837,0.156121,0.220833,
1.05837,0.156121,0.220833;

#11,1,1,1,
2.39898,0.456119,0.259563,
2.39898,0.456119,0.259563,
2.39898,0.456119,0.259563,
2.39898,0.456119,0.259563;

#11,1,1,2,
-1.94643,0.44519,0.259563,
-1.94643,0.44519,0.259563,
-1.94643,0.44519,0.259563,
-1.94643,0.44519,0.259563;

#11,1,1,3,
1.96594,0.152367,0.259563,
1.96594,0.152367,0.259563,
1.96594,0.152367,0.259563,
1.96594,0.152367,0.259563;

#11,1,2,1,
0.102656,0.441568,0.374214,
0.102656,0.441568,0.374214,
0.102656,0.441568,0.374214,
0.102656,0.441568,0.374214;

#11,1,2,2,
0.254066,0.720259,0.374214,
0.254066,0.720259,0.374214,
0.254066,0.720259,0.374214,
0.254066,0.720259,0.374214;

#11,1,2,3,

0.758973,0.0574595,0.374214,
0.758973,0.0574595,0.374214,
0.758973,0.0574595,0.374214,
0.758973,0.0574595,0.374214;

#11,1,3,1,
-0.0375916,-0.208785,0.380208,
-0.0375916,-0.208785,0.380208,
-0.0375916,-0.208785,0.380208,
-0.0375916,-0.208785,0.380208;

#11,1,3,2,
0.235913,0.41982,0.380208,
0.235913,0.41982,0.380208,
0.235913,0.41982,0.380208,
0.235913,0.41982,0.380208;

#11,1,3,3,
0.883973,0.253124,0.380208,
0.883973,0.253124,0.380208,
0.883973,0.253124,0.380208,
0.883973,0.253124,0.380208;

#11,2,0,2,
0.334325,0.224531,0.333333,
0.334325,0.224531,0.333333,
0.334325,0.224531,0.333333,
0.334325,0.224531,0.333333;

#11,2,0,3,
0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333,
0.401793,0.271346,0.333333;

#11,2,0,4,
0.36442,0.389465,0.333333,
0.36442,0.389465,0.333333,
0.36442,0.389465,0.333333,
0.36442,0.389465,0.333333;

#11,2,1,2,
0.364111,0.29847,0.333333,
0.364111,0.29847,0.333333,
0.364111,0.29847,0.333333,
0.364111,0.29847,0.333333;

#11,2,1,3,
0.412953,0.301591,0.333333,
0.412953,0.301591,0.333333,
0.412953,0.301591,0.333333,
0.412953,0.301591,0.333333;

#11,2,1,4,
0.32604,0.357693,0.333333,
0.32604,0.357693,0.333333,
0.32604,0.357693,0.333333,
0.32604,0.357693,0.333333;



#11,2,2,2,
0.392059,0.407531,0.333333,
0.392059,0.407531,0.333333,
0.392059,0.407531,0.333333,
0.392059,0.407531,0.333333;

#11,2,2,3,
0.427291,0.390177,0.333333,
0.427291,0.390177,0.333333,
0.427291,0.390177,0.333333,
0.427291,0.390177,0.333333;

#11,2,2,4,
0.286091,0.287951,0.333333,
0.286091,0.287951,0.333333,
0.286091,0.287951,0.333333,
0.286091,0.287951,0.333333;

#11,2,3,2,
0.415475,0.485195,0.333333,
0.415475,0.485195,0.333333,
0.415475,0.485195,0.333333,
0.415475,0.485195,0.333333;

#11,2,3,3,
0.443375,0.621291,0.333333,
0.443375,0.621291,0.333333,
0.443375,0.621291,0.333333,
0.443375,0.621291,0.333333;

#11,2,3,4,
0.248458,0.144726,0.333333,
0.248458,0.144726,0.333333,
0.248458,0.144726,0.333333,
0.248458,0.144726,0.333333;

#11,3,0,2,
0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333;

#11,3,0,3,
0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333,
0.379526,0.28003,0.333333;

#11,3,0,4,
0.369912,0.396468,0.333333,
0.369912,0.396468,0.333333,
0.369912,0.396468,0.333333,
0.369912,0.396468,0.333333;

#11,3,1,2,
0.343491,0.299193,0.333333,
0.343491,0.299193,0.333333,
0.343491,0.299193,0.333333,
0.343491,0.299193,0.333333;

#11,3,1,3,
0.383636,0.307955,0.333333,
0.383636,0.307955,0.333333,
0.383636,0.307955,0.333333,
0.383636,0.307955,0.333333;

#11,3,1,4,
0.35107,0.360491,0.333333,
0.35107,0.360491,0.333333,
0.35107,0.360491,0.333333,
0.35107,0.360491,0.333333;

#11,3,2,2,
0.357113,0.407982,0.333333,
0.357113,0.407982,0.333333,
0.357113,0.407982,0.333333,
0.357113,0.407982,0.333333;

#11,3,2,3,
0.387283,0.388349,0.333333,
0.387283,0.388349,0.333333,
0.387283,0.388349,0.333333,
0.387283,0.388349,0.333333;

#11,3,2,4,
0.334544,0.287392,0.333333,
0.334544,0.287392,0.333333,
0.334544,0.287392,0.333333,
0.334544,0.287392,0.333333;

#11,3,3,2,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333;

#11,3,3,3,
0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333;

#11,3,3,4,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333;

#12,0,0,2,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333,
0.370705,0.49,0.333333;

#12,0,0,3,
0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333;



0.391083,0.647587,0.333333;

#12,0,0,4,

0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333,
0.318048,0.114272,0.333333;

#12,0,1,2,

0.383068,0.127811,0.333333,
0.383068,0.127811,0.333333,
0.383068,0.127811,0.333333,
0.383068,0.127811,0.333333;

#12,0,1,3,

0.394808,1.02112,0.333333,
0.394808,1.02112,0.333333,
0.394808,1.02112,0.333333,
0.394808,1.02112,0.333333;

#12,0,1,4,

0.302909,-0.033693,0.333333,
0.302909,-0.033693,0.333333,
0.302909,-0.033693,0.333333,
0.302909,-0.033693,0.333333;

#12,0,2,2,

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0.383068,0.127811,0.333333,
0.383068,0.127811,0.333333,
0.383068,0.127811,0.333333;

#12,0,2,3,

0.394808,1.02112,0.333333,
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0.394808,1.02112,0.333333,
0.394808,1.02112,0.333333;

#12,0,2,4,

0.302909,-0.0336931,0.333333,
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0.302909,-0.0336931,0.333333,
0.302909,-0.0336931,0.333333;

#12,0,3,2,

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0.370705,0.49,0.333333,
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#12,0,3,3,

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0.391083,0.647587,0.333333,
0.391083,0.647587,0.333333;

#12,0,3,4,

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0.318048,0.114272,0.333333;

#12,1,0,2,

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0.322726,0.491386,0.333333,
0.322726,0.491386,0.333333;

#12,1,0,3,

0.36492,0.676285,0.333333,
0.36492,0.676285,0.333333,
0.36492,0.676285,0.333333,
0.36492,0.676285,0.333333;

#12,1,0,4,

0.36866,0.0831935,0.333333,
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0.36866,0.0831935,0.333333;

#12,1,1,2,

0.326298,0.0147768,0.333333,
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0.326298,0.0147768,0.333333;

#12,1,1,3,

0.366196,1.0415,0.333333,
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0.366196,1.0415,0.333333,
0.366196,1.0415,0.333333;

#12,1,1,4,

0.364381,-0.0252333,0.333333,
0.364381,-0.0252333,0.333333,
0.364381,-0.0252333,0.333333,
0.364381,-0.0252333,0.333333;

#12,1,2,2,

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#12,1,2,3,

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#12,1,2,4,

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#12,1,3,2,

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#12,1,3,3,
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#12,1,3,4,
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#12,2,0,4,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#12,2,1,3,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#12,2,1,4,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#12,2,2,3,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
#12,2,2,4,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
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#12,2,3,4,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
#12,3,0,3,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
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#12,3,2,4,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;
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#12,3,3,4,1,1,0.5,1,1,0.5,1,1,0.5,1,1,0.5;

#13,0,0,2,
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0.370705,0.49,0.333333,
0.370705,0.49,0.333333;

#13,0,0,3,
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0.391083,0.647587,0.333333;

#13,0,0,4,
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#13,0,1,2,
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0.357113,0.407982,0.333333;

#13,0,1,3,
0.387283,0.388349,0.333333,

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0.387283,0.388349,0.333333;

#13,0,1,4,
0.334544,0.287392,0.333333,
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#13,0,2,2,
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0.343491,0.299193,0.333333;

#13,0,2,3,
0.383636,0.307955,0.333333,
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0.383636,0.307955,0.333333;

#13,0,2,4,
0.35107,0.36049,0.333333,
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0.35107,0.36049,0.333333;

#13,0,3,2,
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0.328106,0.220113,0.333333;

#13,0,3,3,
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0.379526,0.28003,0.333333;

#13,0,3,4,
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#13,1,0,2,
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0.322726,0.491386,0.333333;

#13,1,0,3,
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#13,1,0,4,



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0.36866,0.0831935,0.333333;

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#13,1,1,3,
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#13,1,1,4,
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#13,1,2,2,
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#13,1,2,3,
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0.361638,0.313962,0.333333;

#13,1,2,4,
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0.376777,0.361702,0.333333;

#13,1,3,2,
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0.314646,0.216908,0.333333;

#13,1,3,3,
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0.359171,0.287843,0.333333;

#13,1,3,4,
0.381174,0.402026,0.333333,
0.381174,0.402026,0.333333,
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0.381174,0.402026,0.333333;

#13,2,0,3,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
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#13,2,1,3,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
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#13,2,2,3,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
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#13,2,3,3,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
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#14,0,0,2,
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0.328106,0.220113,0.333333,
0.328106,0.220113,0.333333;

#14,0,0,3,
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0.379526,0.28003,0.333333;

#14,0,0,4,
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0.369912,0.396468,0.333333;

#14,0,1,2,
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#14,0,1,3,
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#14,0,1,4,
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#14,0,2,3,
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#14,0,3,4,
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#14,1,0,2,
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0.314646,0.216908,0.333333,
0.314646,0.216908,0.333333;

#14,1,0,3,
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0.359171,0.287843,0.333333;

#14,1,0,4,
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0.381174,0.402026,0.333333,
0.381174,0.402026,0.333333,
0.381174,0.402026,0.333333;

#14,1,1,2,
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#14,1,1,3,
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#14,1,1,4,
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#14,1,2,3,
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#14,1,2,4,
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#14,1,3,2,
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#14,1,3,3,
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0.359171,0.287843,0.333333;

#14,1,3,4,
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#14,2,1,3,0,0,0.5,0,0,0.5,0,0,0.5,0,0,0.5;
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#15,0,0,3, 0.379526,0.28003,0.333333, 0.379526,0.28003,0.333333, 0.379526,0.28003,0.333333, 0.379526,0.28003,0.333333;	#15,0,3,3, 0.391083,0.647587,0.333333, 0.391083,0.647587,0.333333, 0.391083,0.647587,0.333333, 0.391083,0.647587,0.333333;
#15,0,0,4, 0.369912,0.396468,0.333333, 0.369912,0.396468,0.333333, 0.369912,0.396468,0.333333, 0.369912,0.396468,0.333333;	#15,0,3,4, 0.318048,0.114272,0.333333, 0.318048,0.114272,0.333333, 0.318048,0.114272,0.333333, 0.318048,0.114272,0.333333;
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#15,0,2,2, 0.357113,0.407982,0.333333, 0.357113,0.407982,0.333333, 0.357113,0.407982,0.333333, 0.357113,0.407982,0.333333;	#15,1,1,2, 0.31697,0.301555,0.333333, 0.31697,0.301555,0.333333, 0.31697,0.301555,0.333333, 0.31697,0.301555,0.333333;
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0.363302,0.386377,0.333333,
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#15,1,3,4,
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