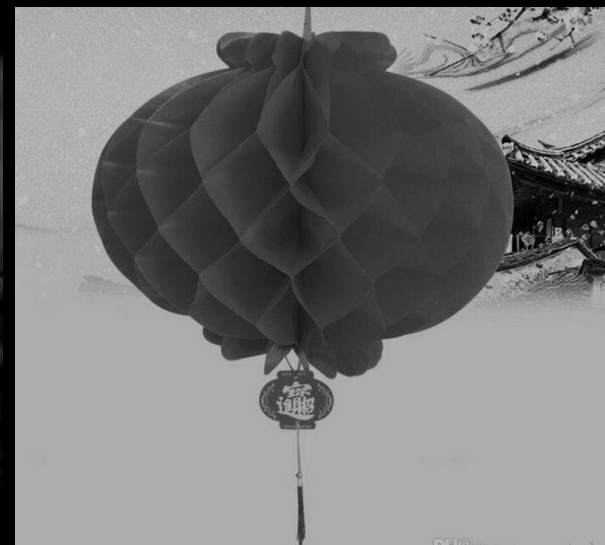
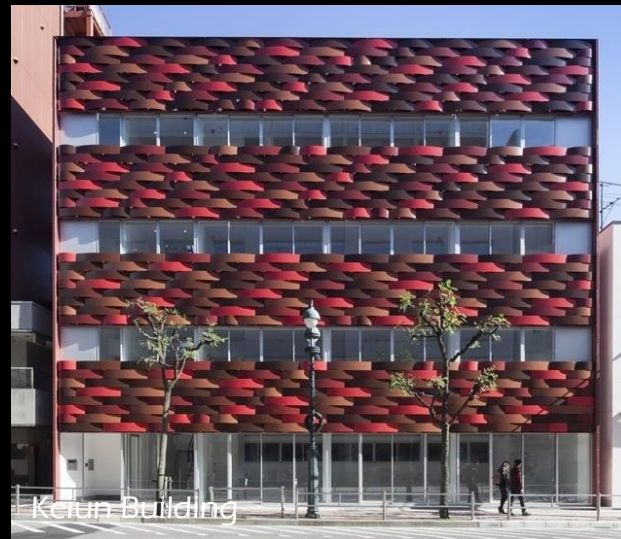
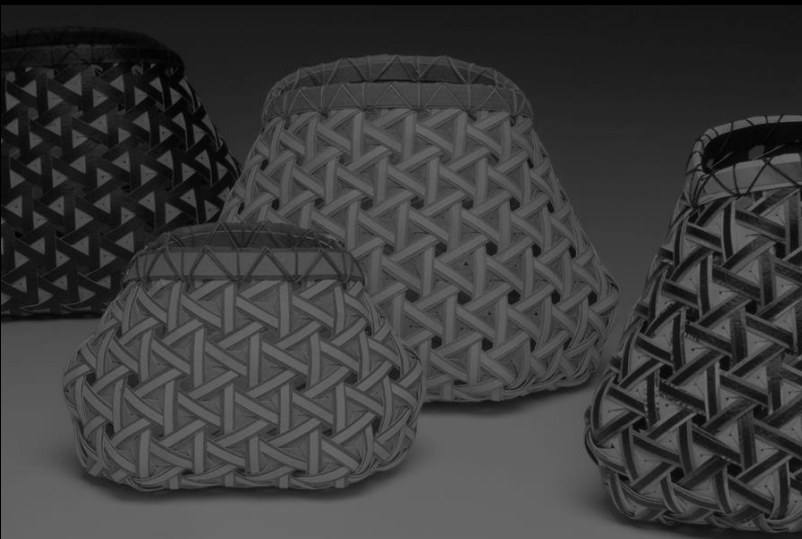


Weaving Architectural Façades

Exploring Algorithmic Stripe-based Design Patterns





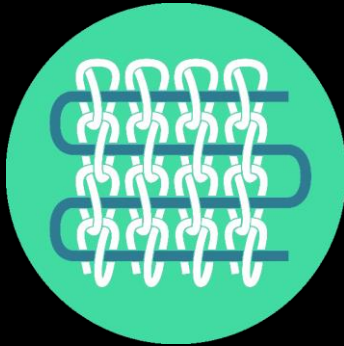


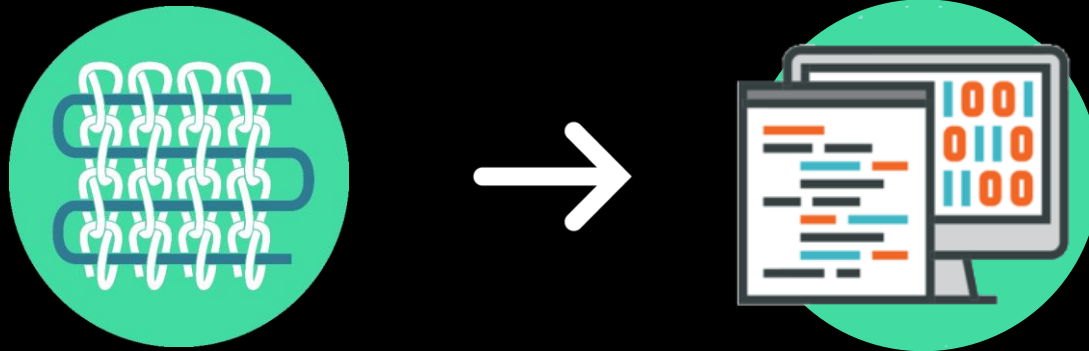


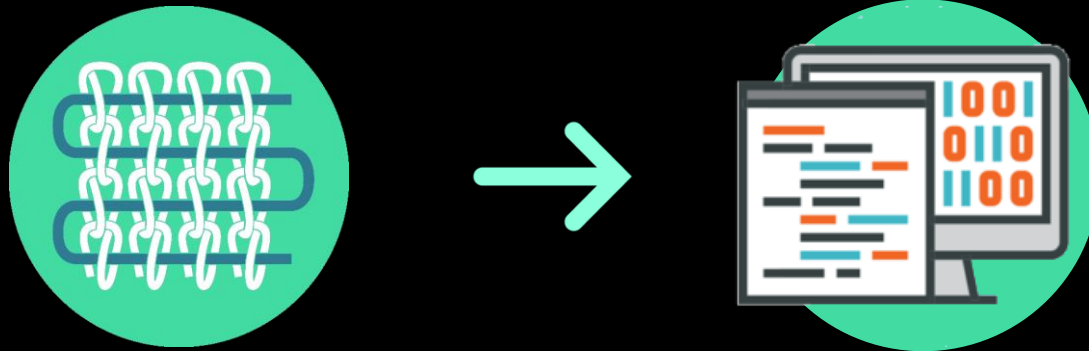
Mumbai Airport Terminal

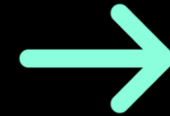
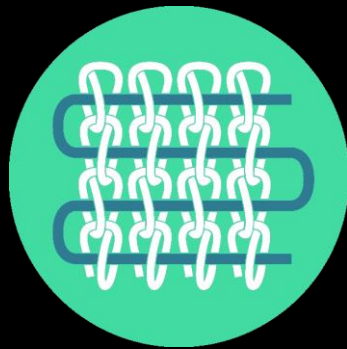


Morpheus Hotel

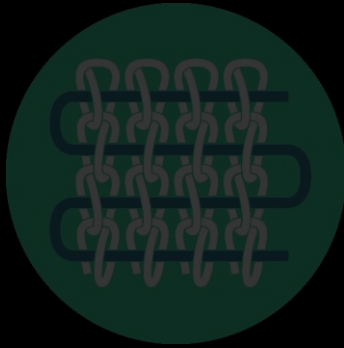


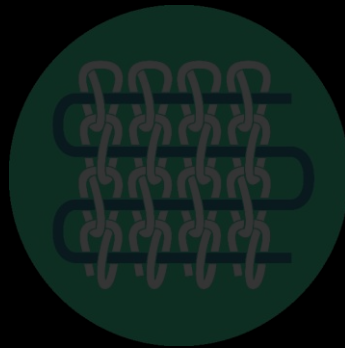


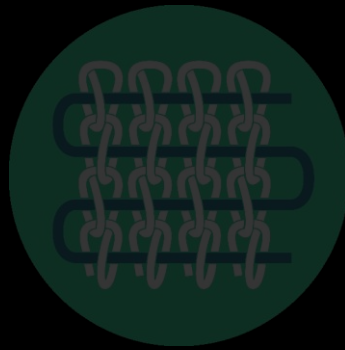


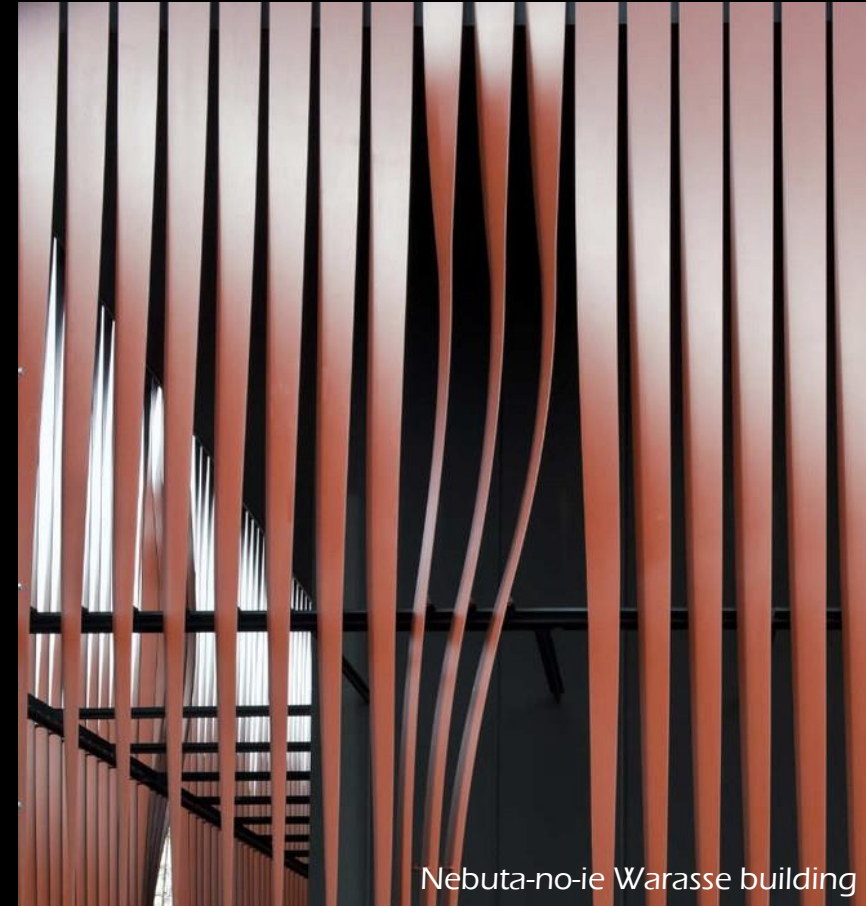
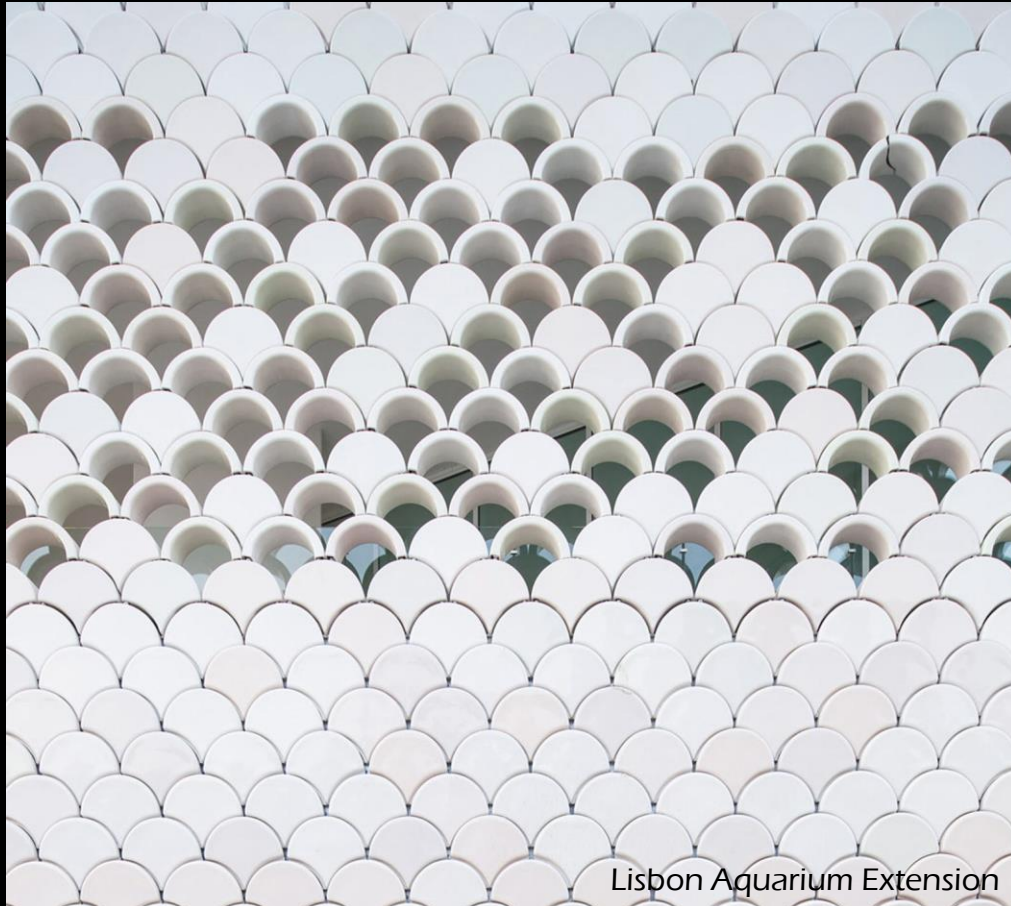


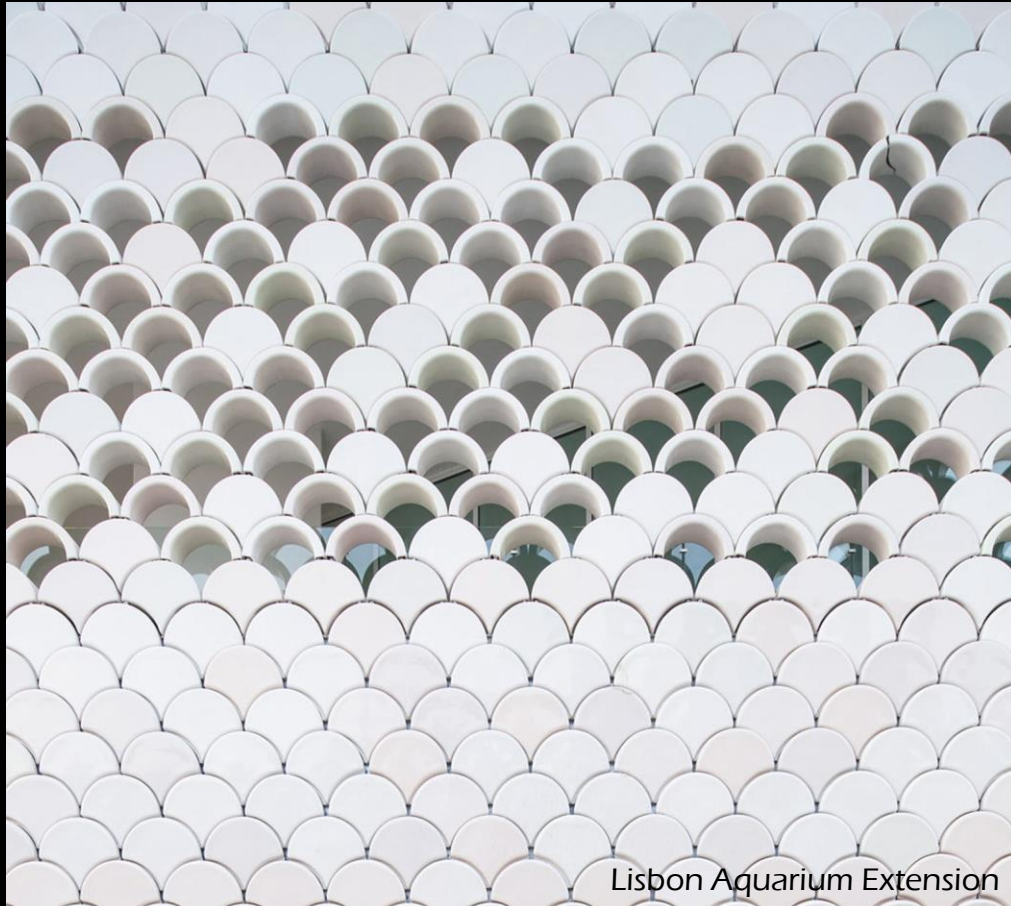


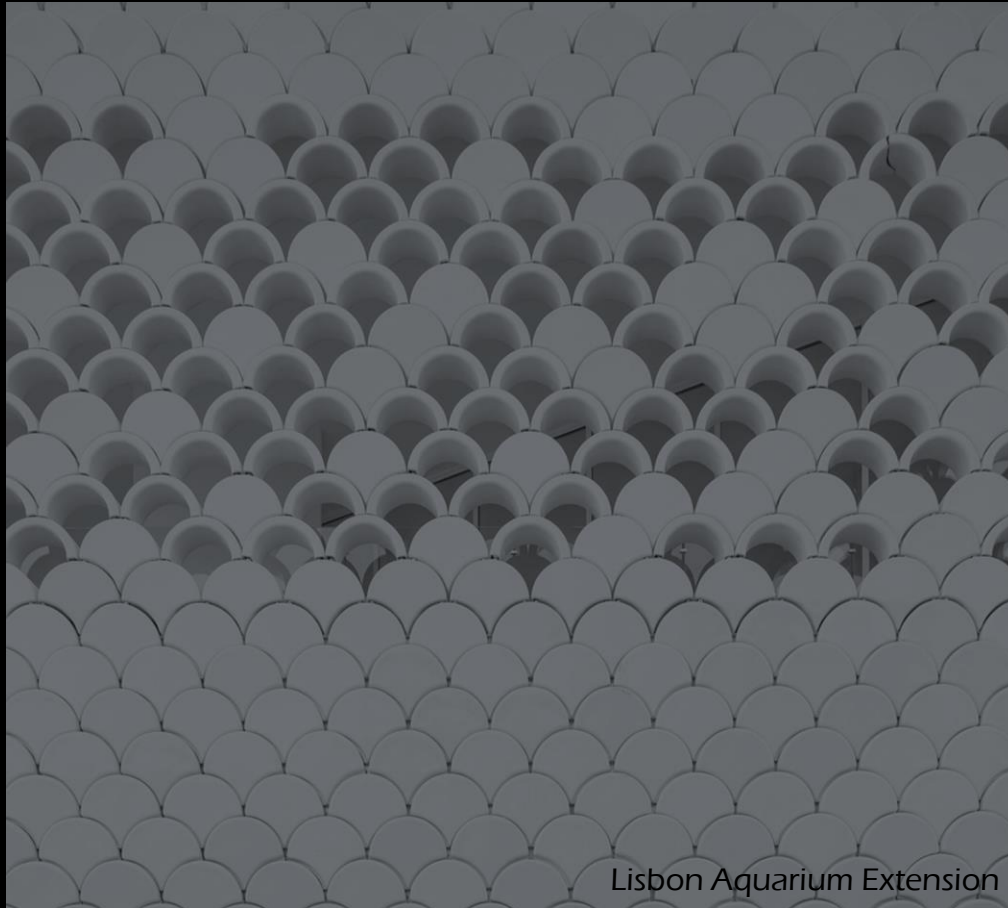












Stage

1. Creation of stripe-shaped elements



Stage

1. Creation of stripe-shaped elements



Nebuta-no-ie Warasse building

Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations



Nebuta-no-ie Warasse building

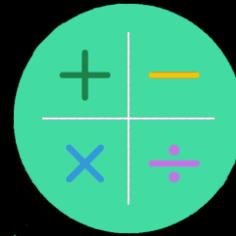
Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations



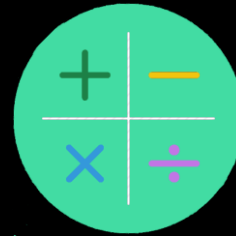
Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations



Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations



Function

$stripe(S_{axis}, S_{section}, S_{transformation})$

Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

stripe(S_{axis} , $S_{section}$, $S_{transformation}$)



Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

stripe(S_{axis} , $S_{section}$, $S_{transformation}$)

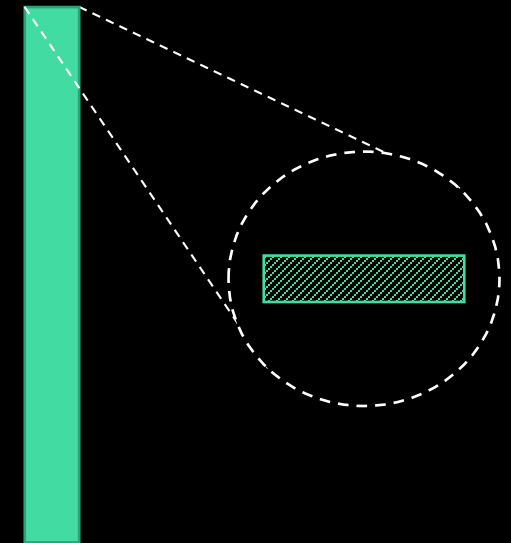


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

stripe(S_{axis} , $S_{section}$, $S_{transformation}$)

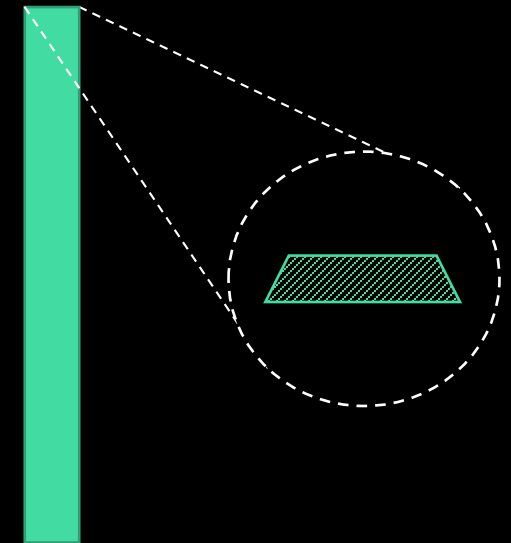


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$stripe(S_{axis}, S_{section}, S_{transformation})$

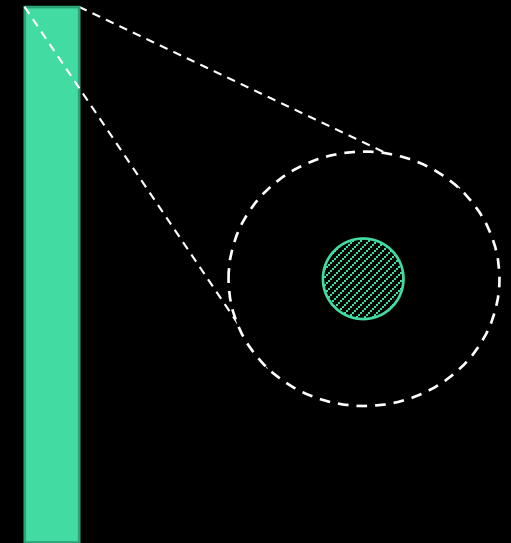


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$stripe(S_{axis}, S_{section}, S_{transformation})$

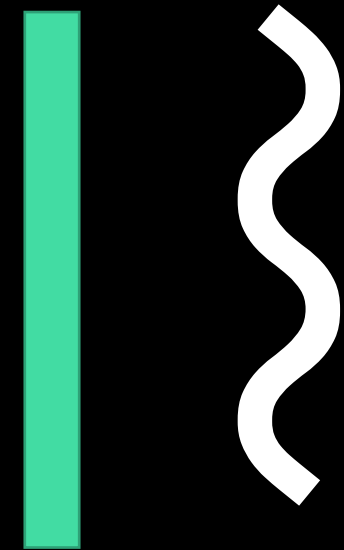


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

stripe(S_{axis} , $S_{section}$, $S_{transformation}$)

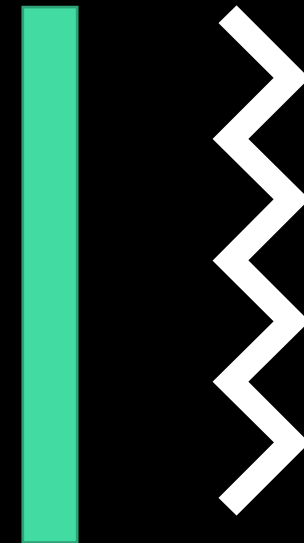


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

stripe(S_{axis} , $S_{section}$, $S_{transformation}$)



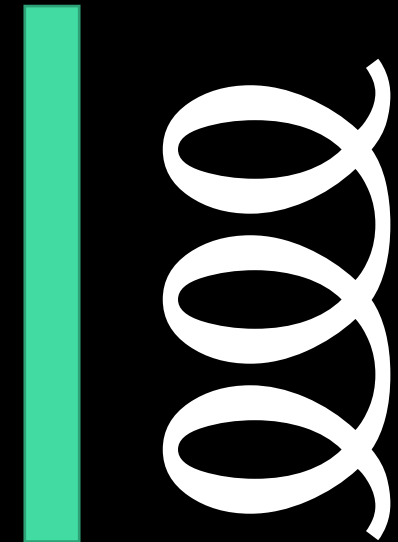
Stage

Function

$stripe(S_{axis}, S_{section}, S_{transformation})$

1. Creation of stripe-shaped elements

2. Apply geometric transformations



Stage

Function

1. Creation of stripe-shaped elements

$stripe(S_{axis}, S_{section}, S_{transformation})$

2. Apply geometric transformations

$striped \uparrow (Surf, n_{stripes}, stripe)$

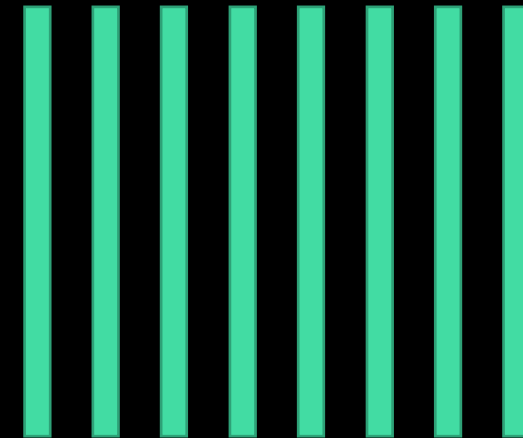
Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$stripe(S_{axis}, S_{section}, S_{transformation})$

$striped \uparrow (Surf, n_{stripes}, stripe)$



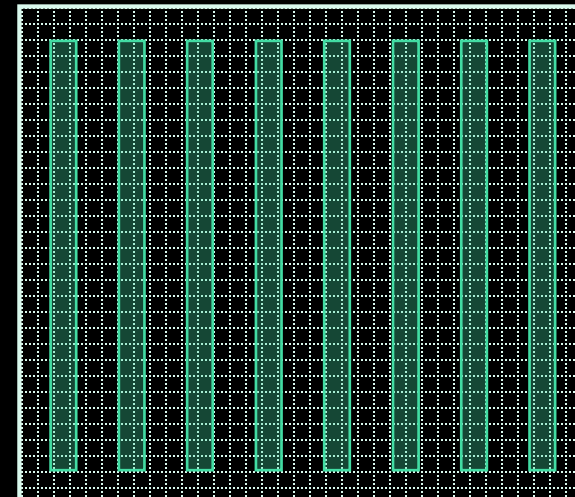
Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$stripe(S_{axis}, S_{section}, S_{transformation})$

$striped \uparrow (Surf, n_{stripes}, stripe)$

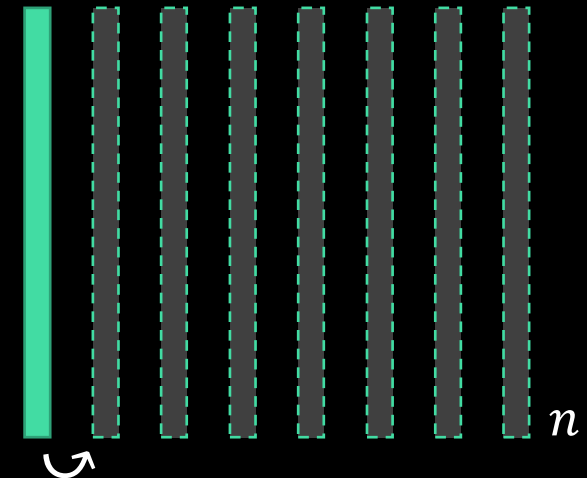


Stage

Function

1. Creation of stripe-shaped elements

2. Apply geometric transformations

 $stripe(S_{axis}, S_{section}, S_{transformation})$ $striped \uparrow (Surf, n_{stripes}, stripe)$ 

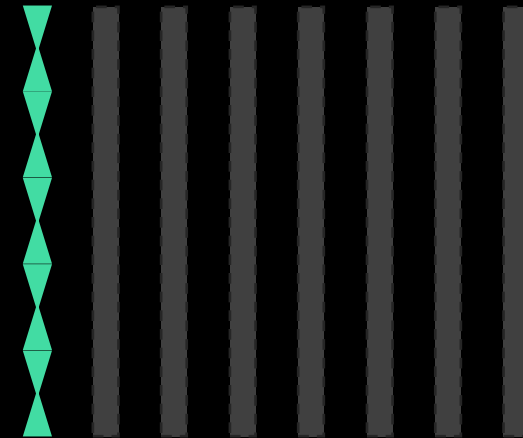
Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$stripe(S_{axis}, S_{section}, S_{transformation})$

$striped \uparrow (Surf, n_{stripes}, stripe)$



Stage

Function

1. Creation of stripe-shaped elements

$stripe(S_{axis}, S_{section}, S_{transformation})$

2. Apply geometric transformations

$striped \uparrow (Surf, n_{stripes}, stripe)$

$striped \rightarrow (Surf, n_{stripes}, stripe)$

Stage

Function

1. Creation of stripe-shaped elements

$stripe(S_{axis}, S_{section}, S_{transformation})$

2. Apply geometric transformations

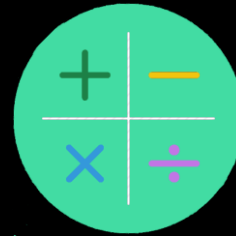
$striped \uparrow (Surf, n_{stripes}, stripe)$

$striped \rightarrow (Surf, n_{stripes}, stripe)$



Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations



Stage

Function

1. Creation of stripe-shaped elements

$$T_{bend}(M_{bend}, P_{bend})$$

2. Apply geometric transformations

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$

Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{bend}(M_{bend}, P_{bend})$$

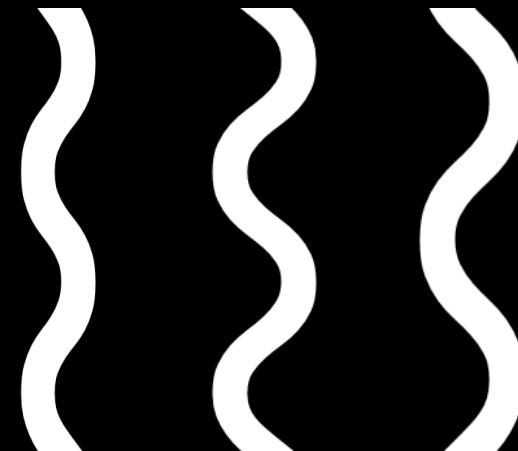


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{bend}(M_{bend}, P_{bend})$$



f_1

f_2

f_3

Stage

Function

1. Creation of stripe-shaped elements

$$T_{bend}(M_{bend}, P_{bend})$$

2. Apply geometric transformations

$$\{1 \ 2 \ 1\}$$

Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{bend}(M_{bend}, P_{bend})$$

$$\{f_1 f_2 f_3\} \{1 \ 2 \ 1\}$$



Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{bend}(M_{bend}, P_{bend})$$

$$\{f_1 \ f_2 \ f_3\} \{1 \ 2 \ 1\}$$



Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{bend}(M_{bend}, P_{bend})$$

$$\{f_1 f_2 f_3\} \{1 \ 2 \ 1\}$$



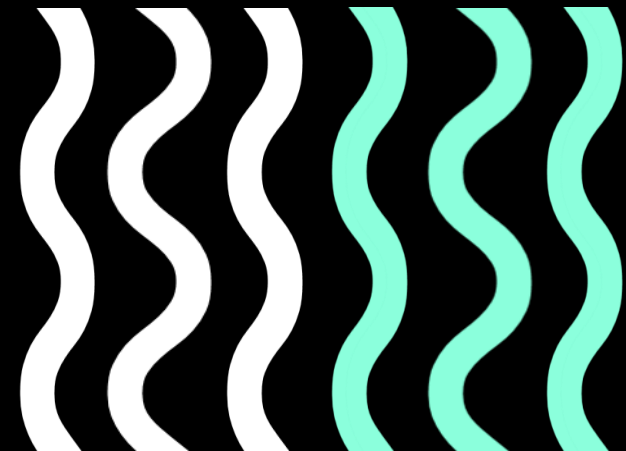
Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{bend}(M_{bend}, P_{bend})$$

$$\{f_1 f_2 f_3\} \{1 2 1\}$$



Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{bend}(M_{bend}, P_{bend})$$

$$\{f_1 f_2 f_3\} \{1 \ 2 \ 1\}$$



Stage

Function

1. Creation of stripe-shaped elements

$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$

2. Apply geometric transformations

Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$

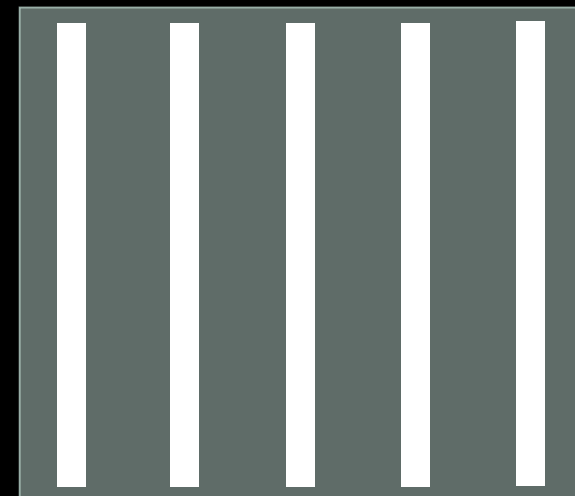


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$

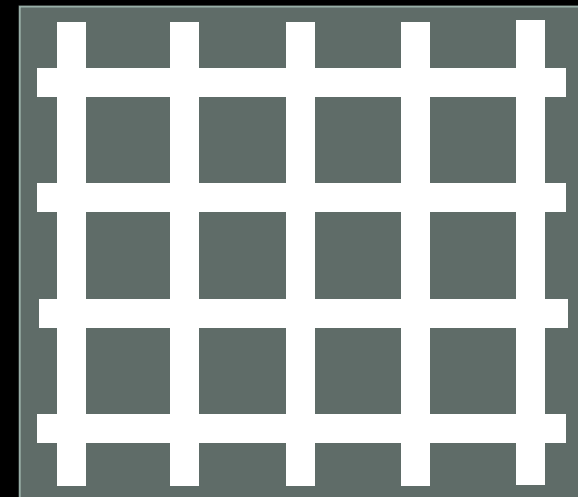


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$



Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$

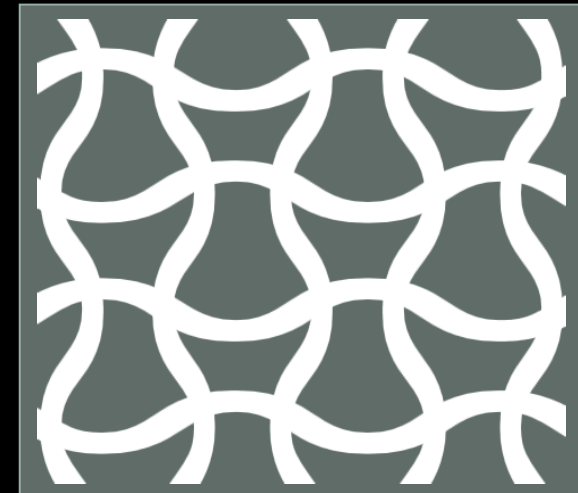


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$

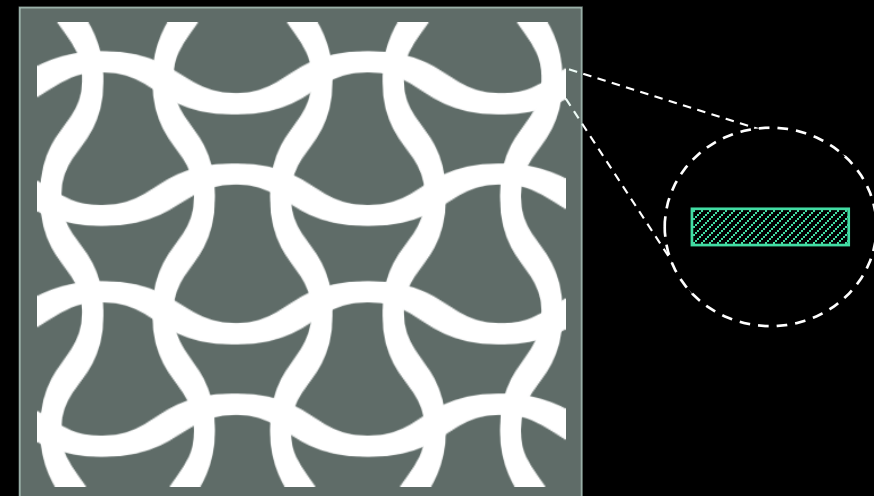


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$



Stage

Function

1. Creation of stripe-shaped elements

$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$

2. Apply geometric transformations



Stage

Function

1. Creation of stripe-shaped elements

$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$

2. Apply geometric transformations

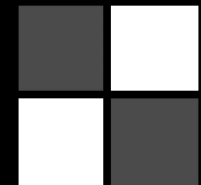


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$



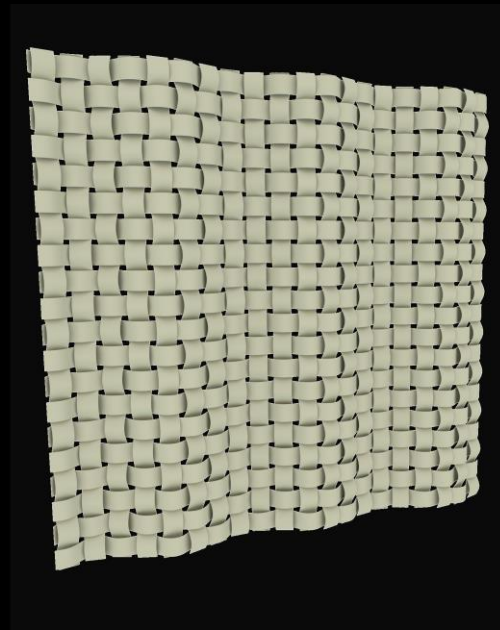
Stage

Function

1. Creation of stripe-shaped elements

2. Apply geometric transformations

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$



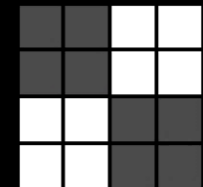
Stage

Function

1. Creation of stripe-shaped elements

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$

2. Apply geometric transformations



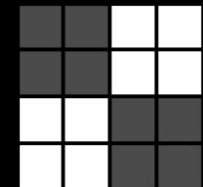
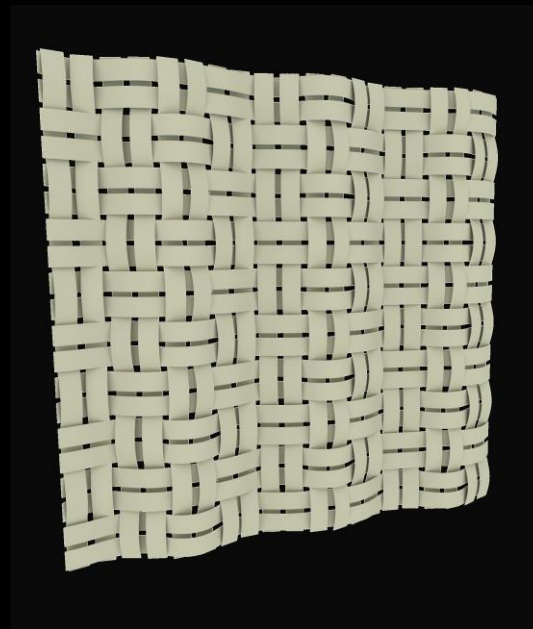
Stage

Function

1. Creation of stripe-shaped elements

2. Apply geometric transformations

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$

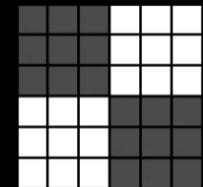


Stage

1. Creation of stripe-shaped elements
2. Apply geometric transformations

Function

$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$



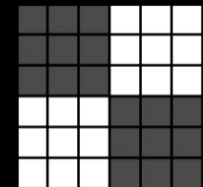
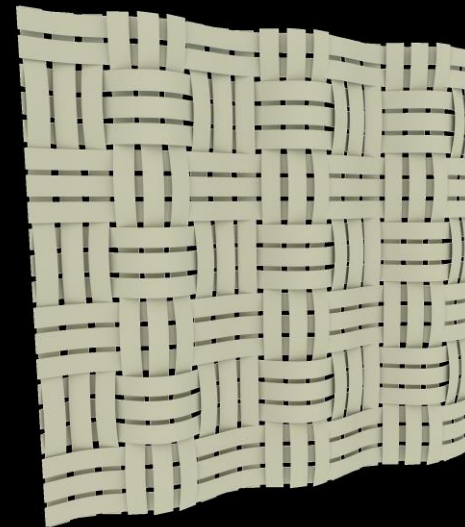
Stage

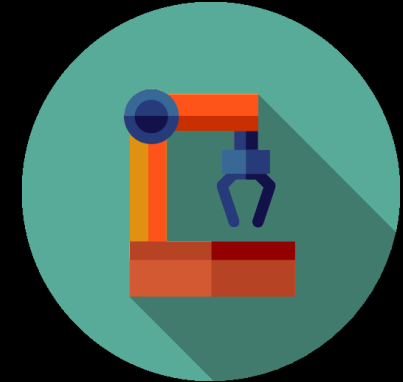
Function

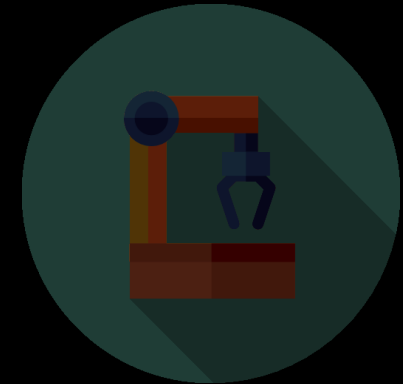
1. Creation of stripe-shaped elements

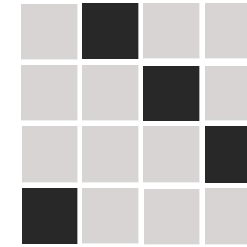
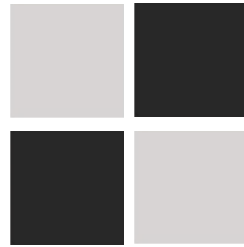
2. Apply geometric transformations

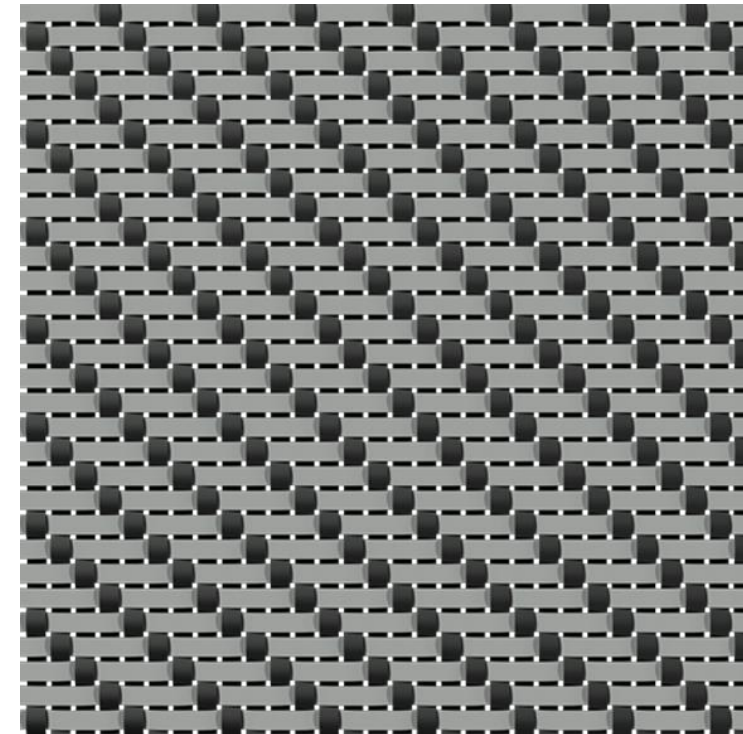
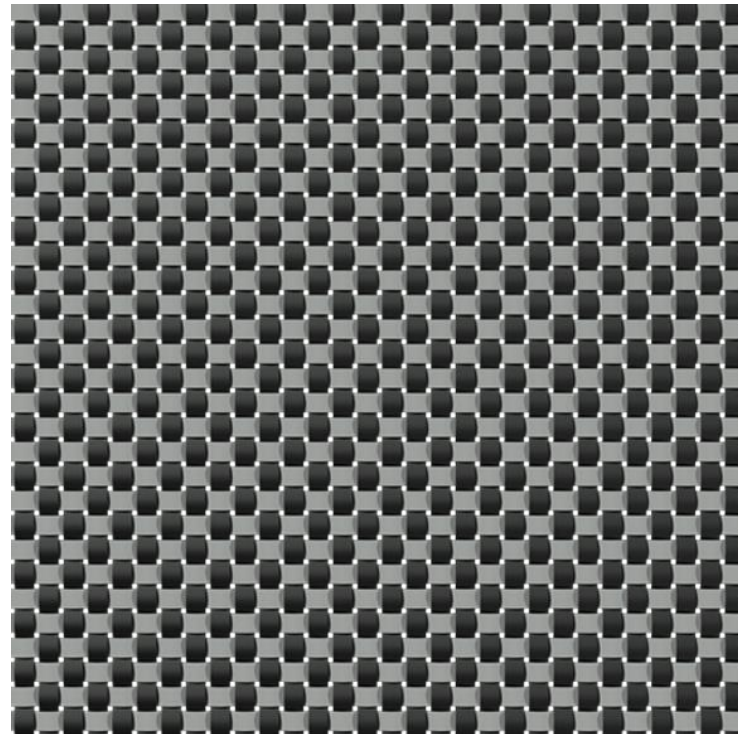
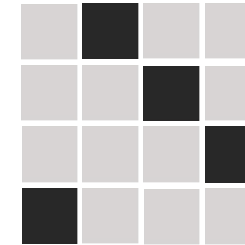
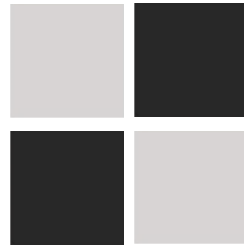
$$T_{weaved}(surf, n_{stripe}, m_{stripe}, U_{amp}, M_{weaved}, S_{section})$$

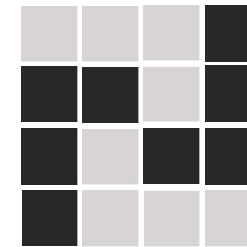
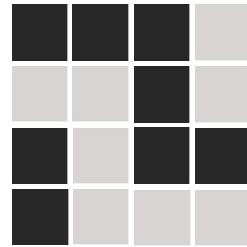


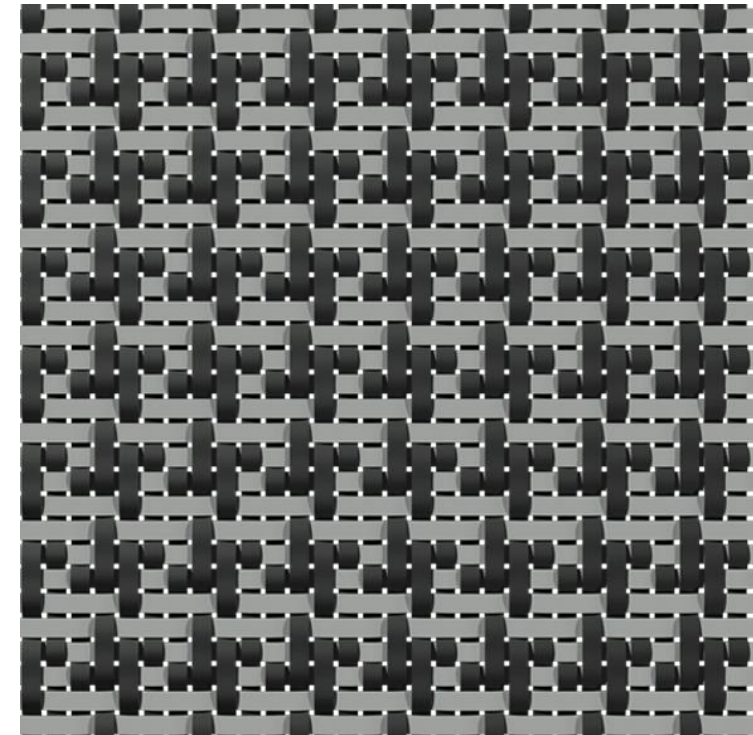
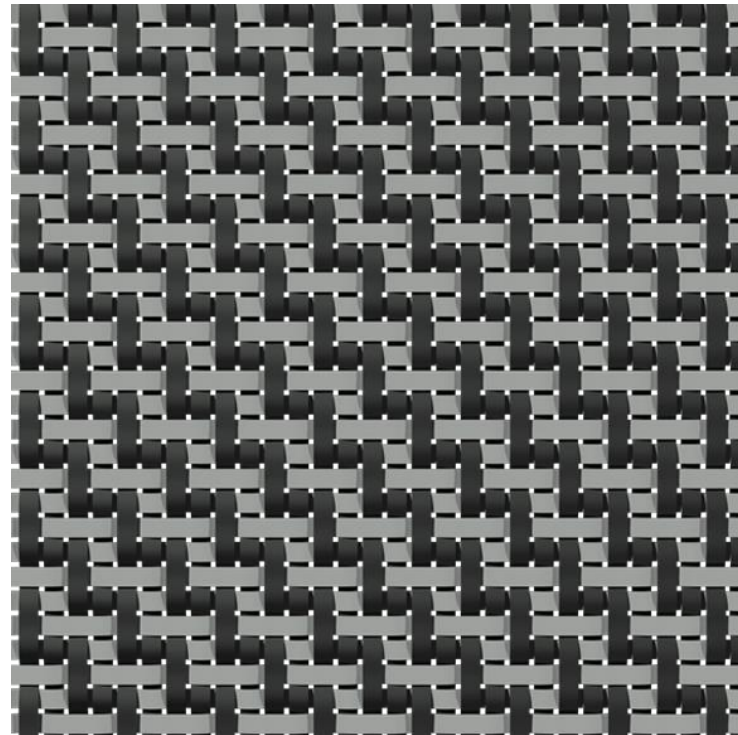
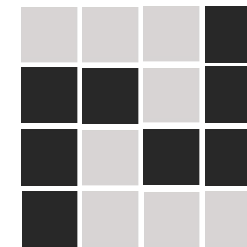
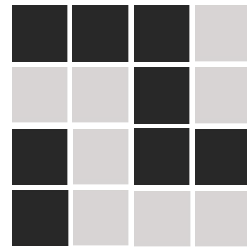


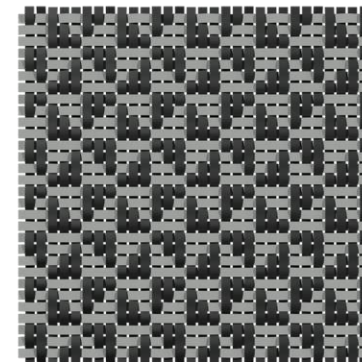
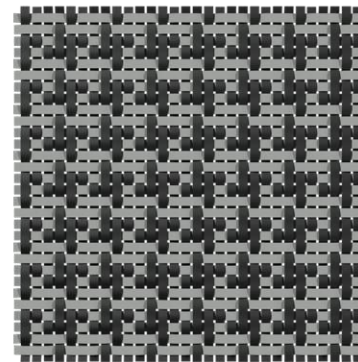
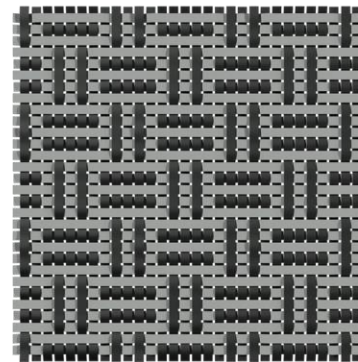
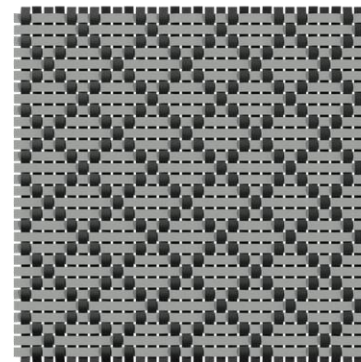
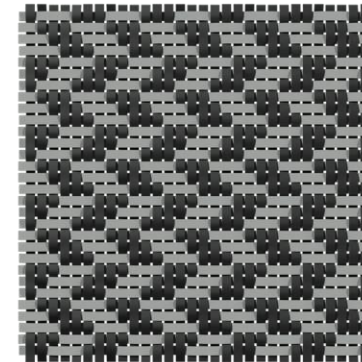
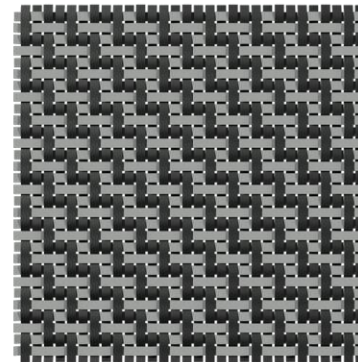
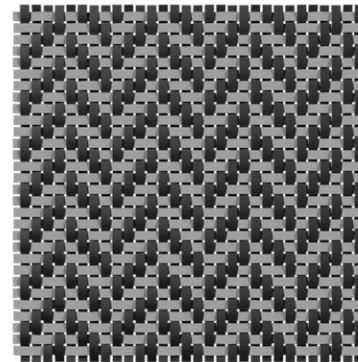
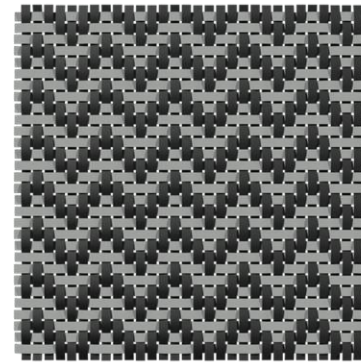
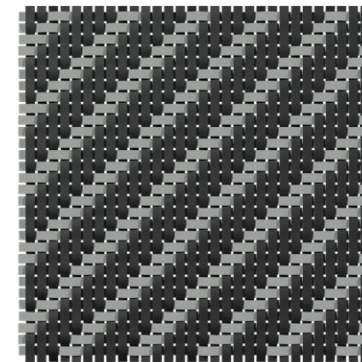
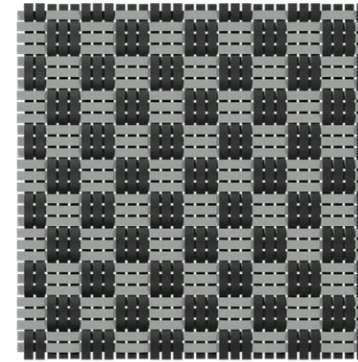
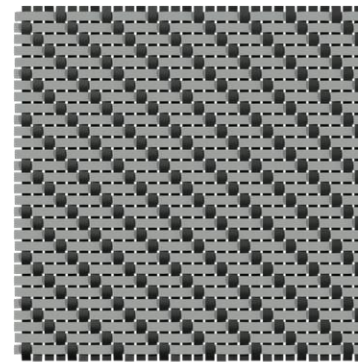
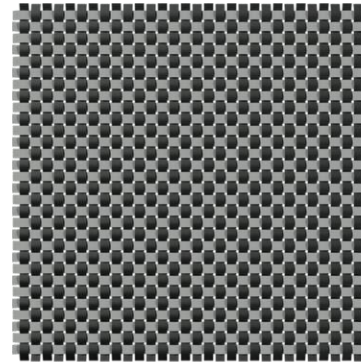


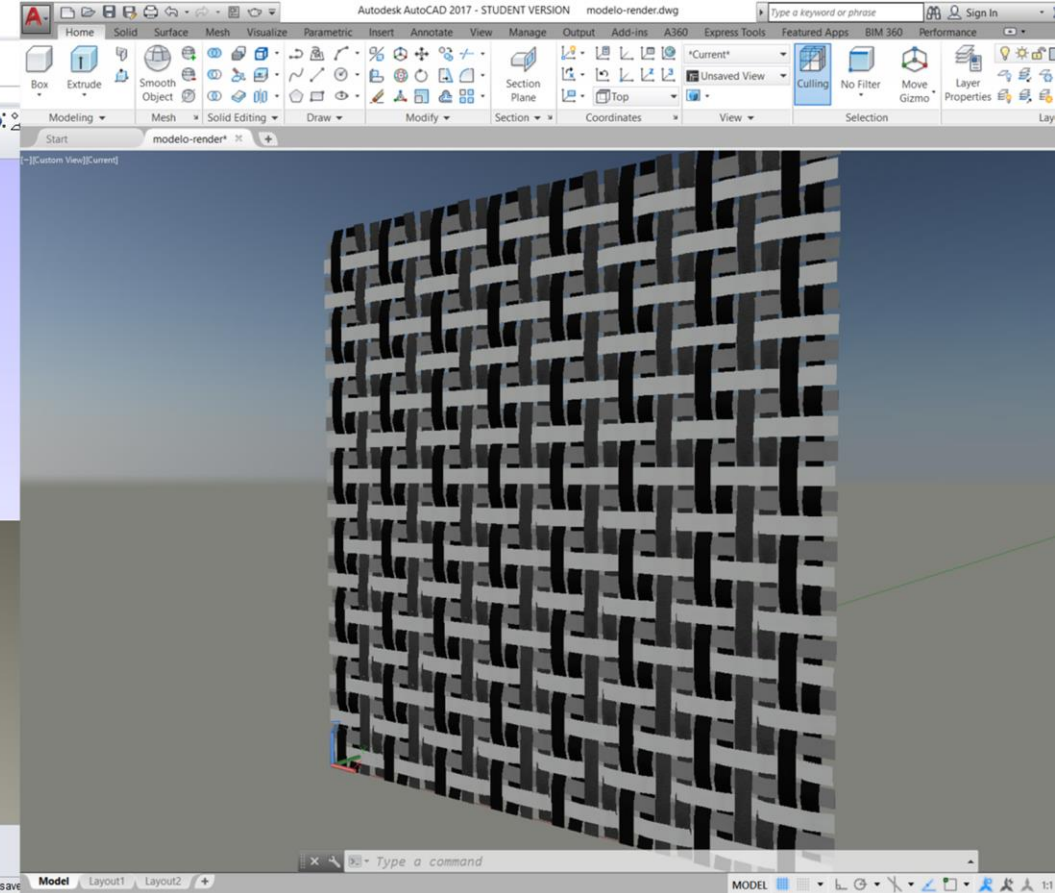
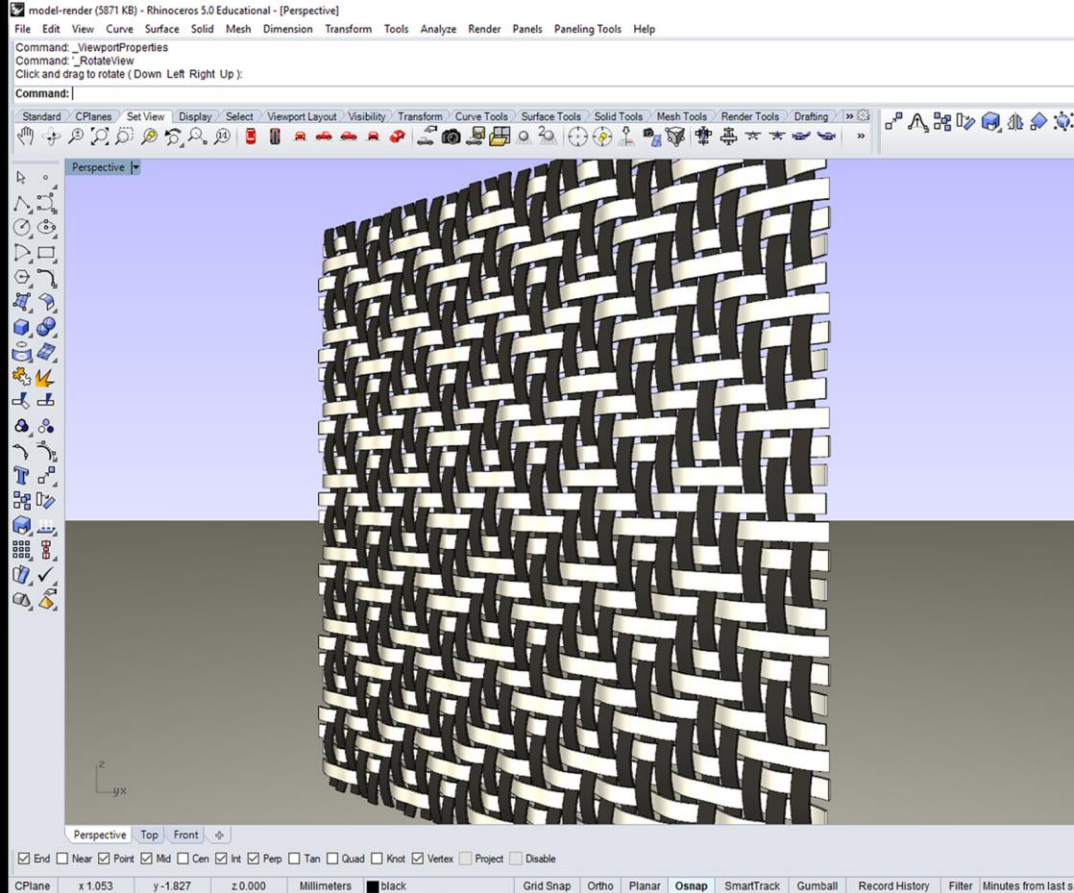


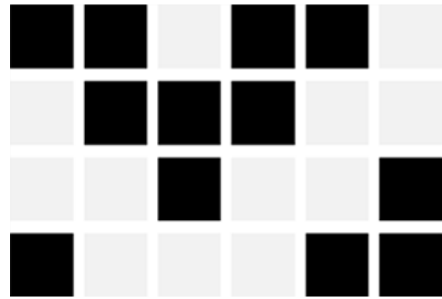






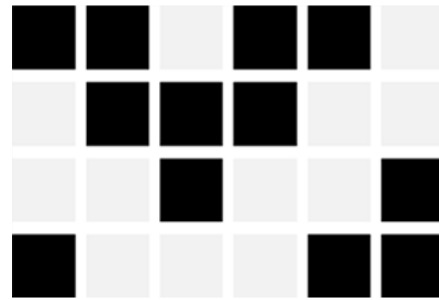




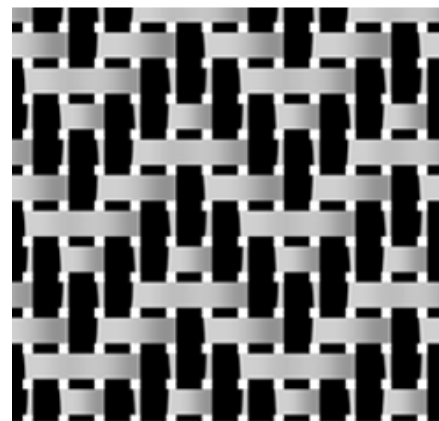


Pattern selected





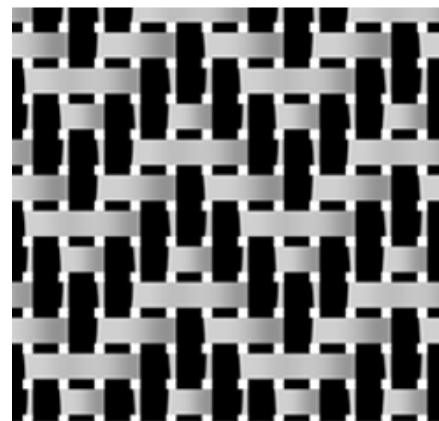
Pattern selected



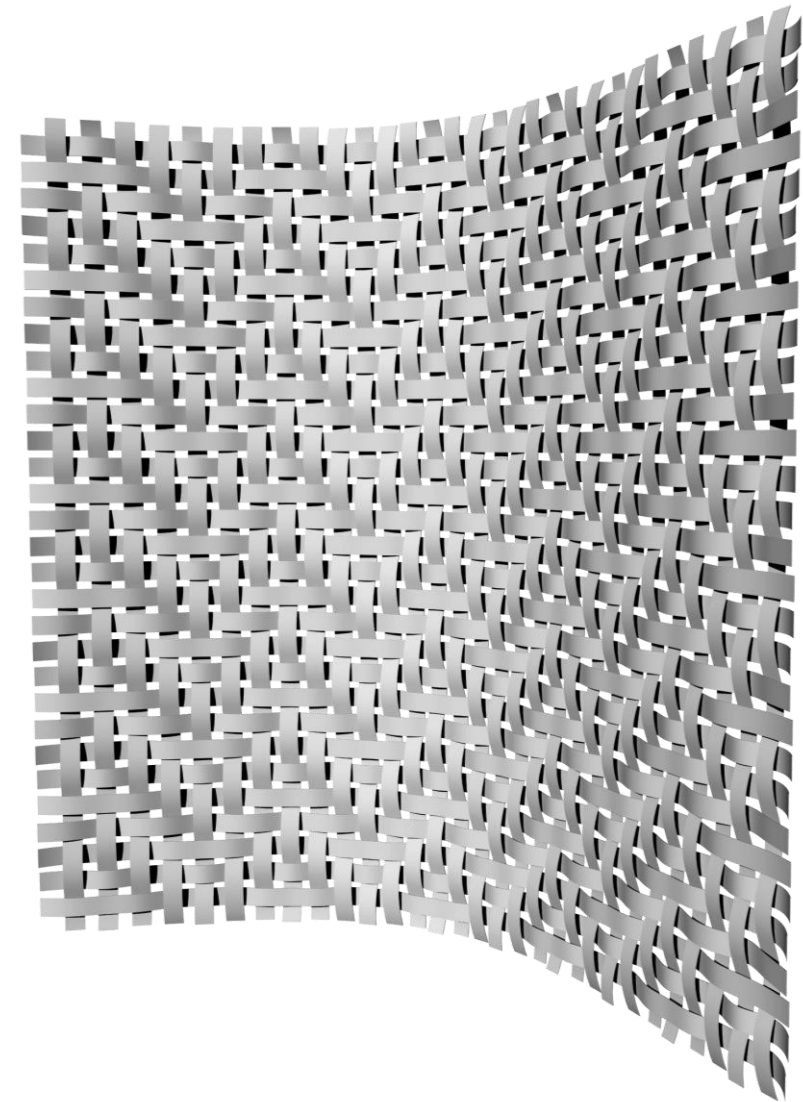
Pattern visualization

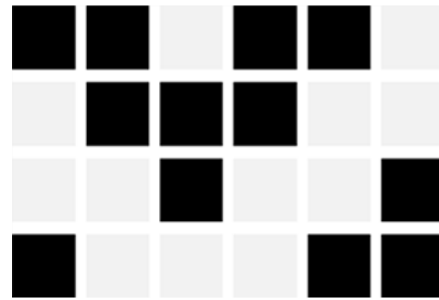


Pattern selected

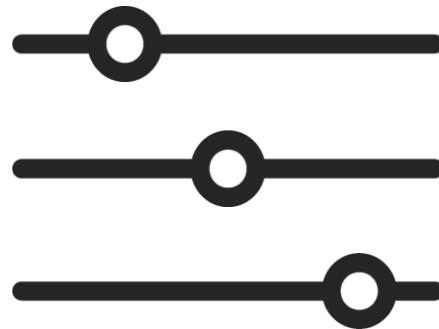


Pattern visualization

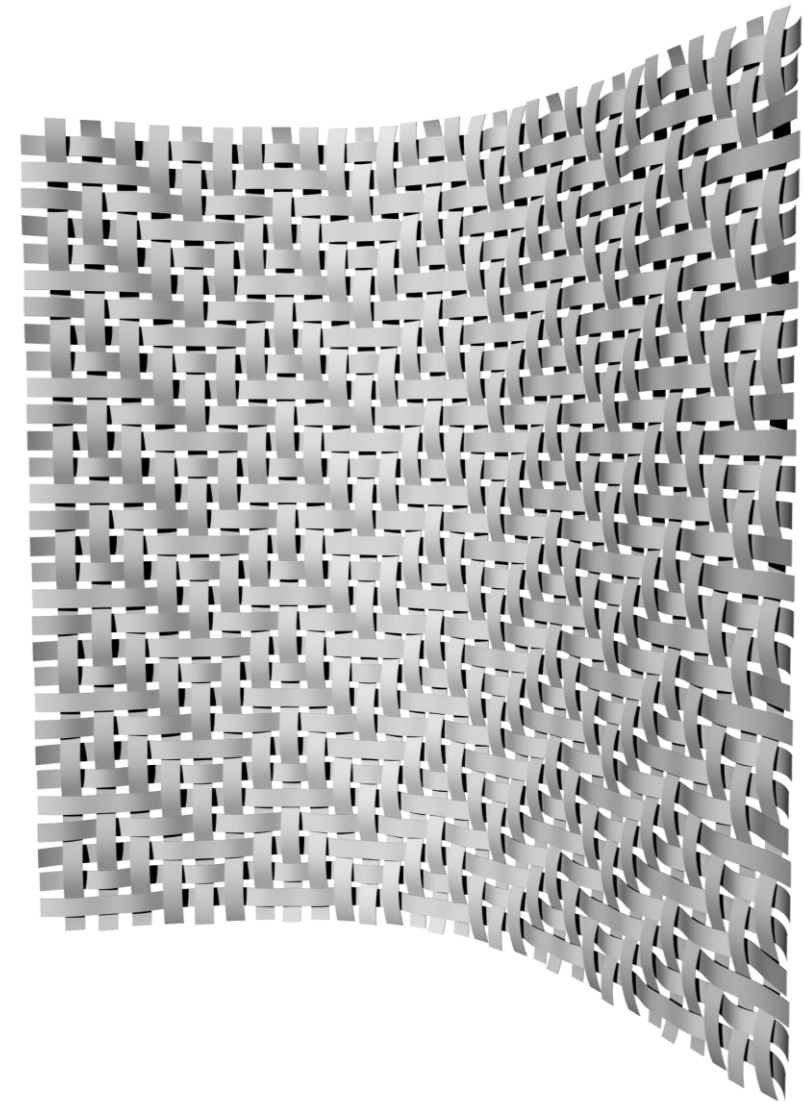




Pattern selected

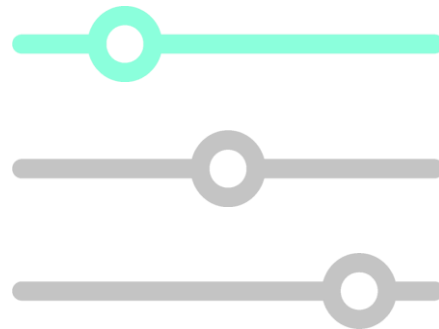


Number of stripes

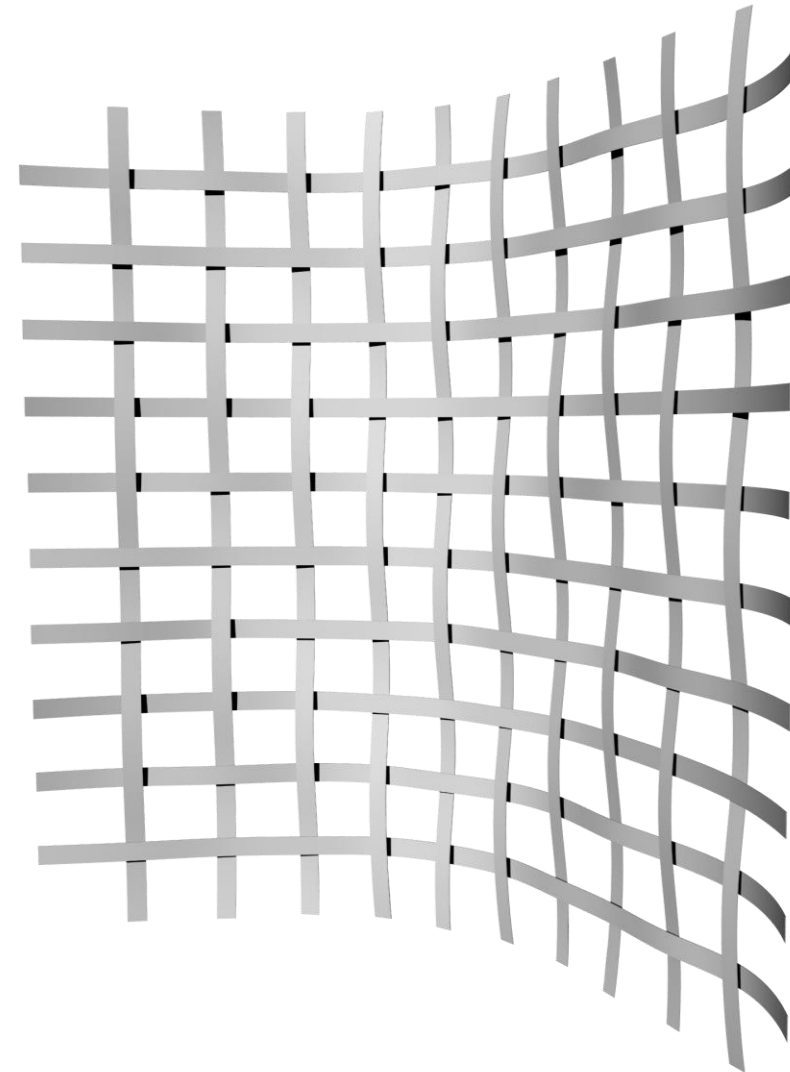




Pattern selected

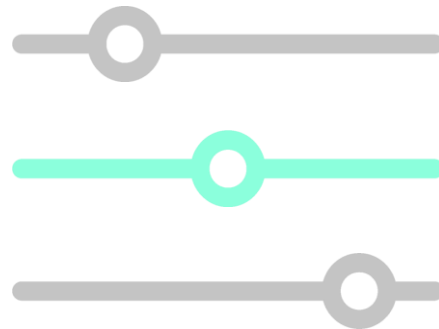


Number of stripes

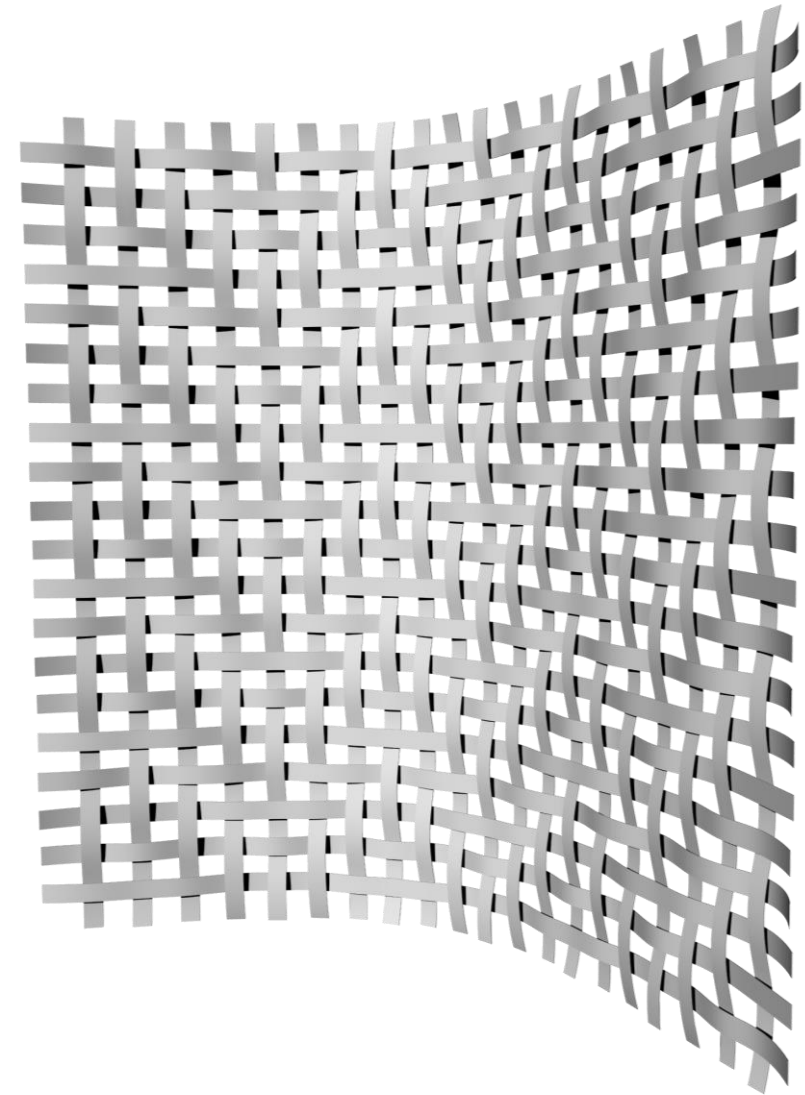




Pattern selected

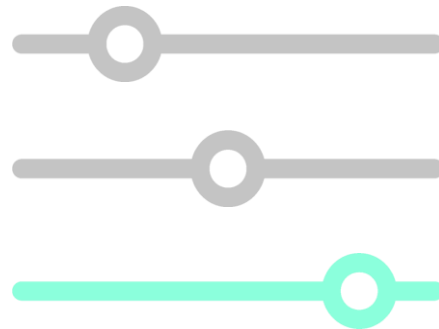


Number of stripes

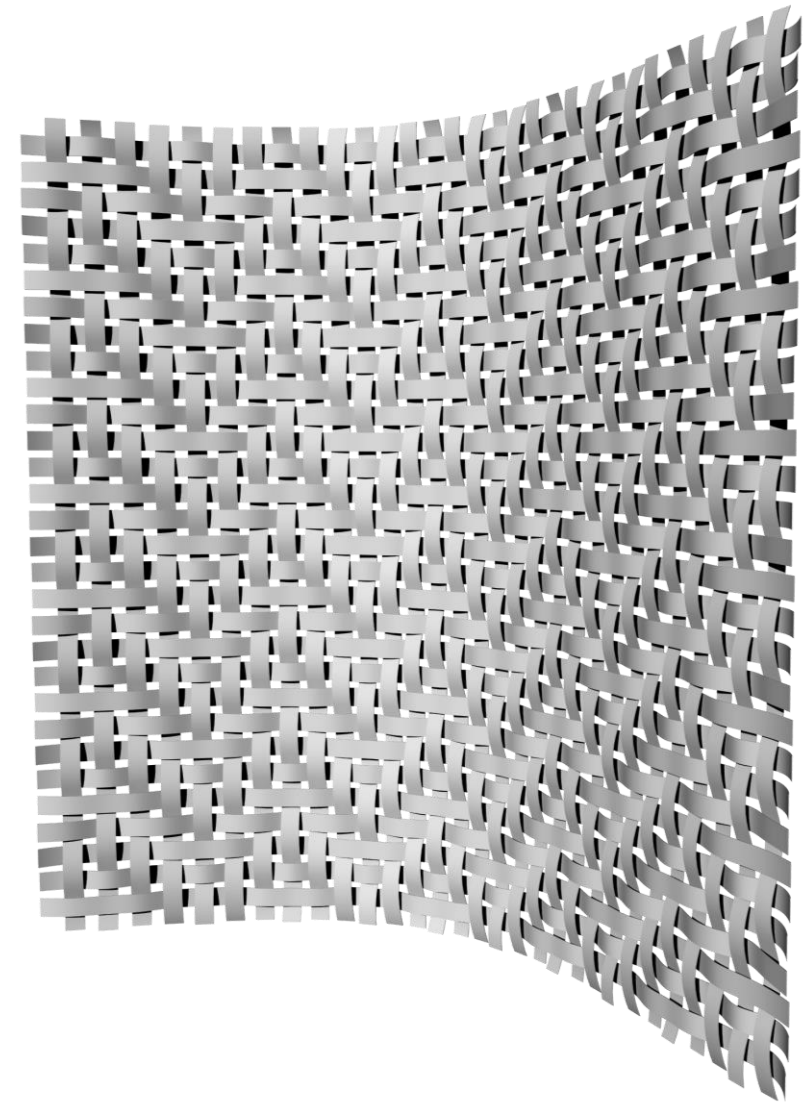


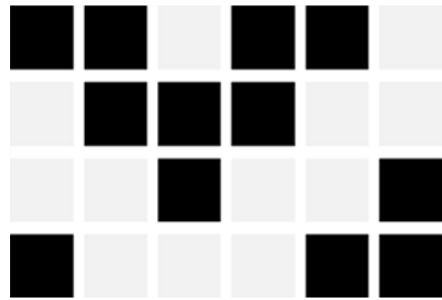


Pattern selected

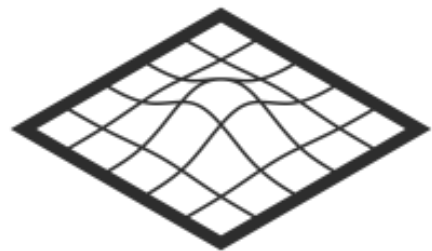


Number of stripes





Pattern selected



Surface shape

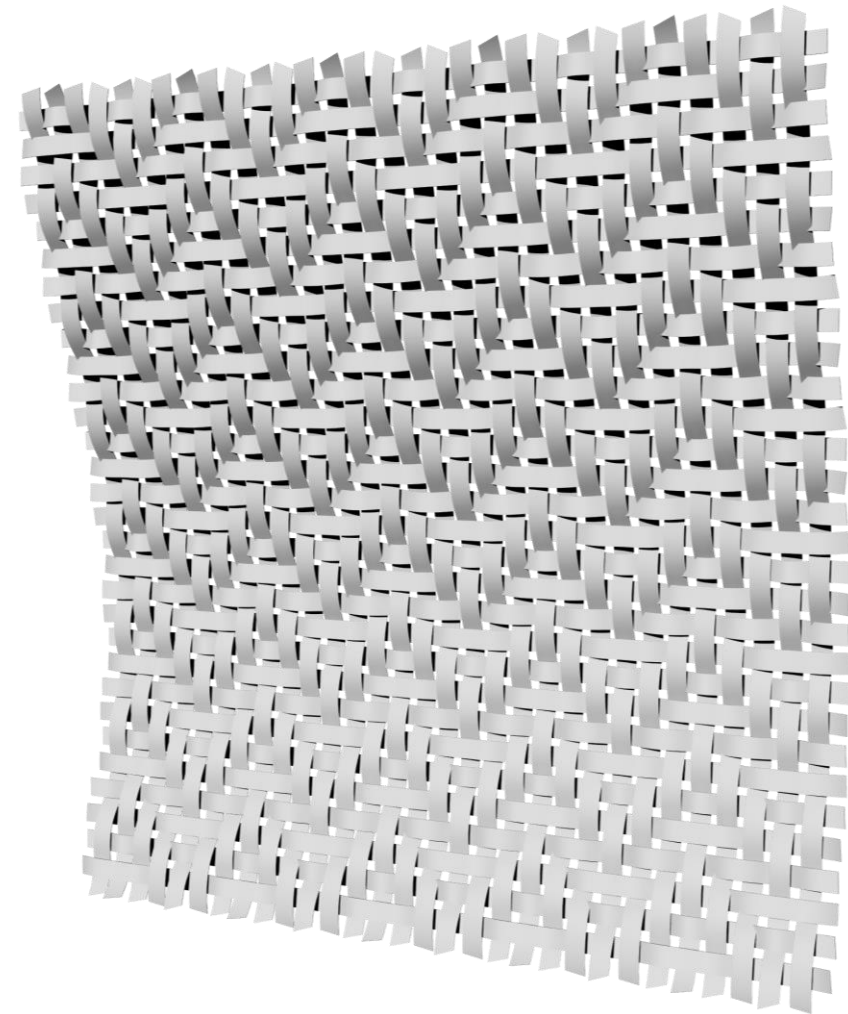


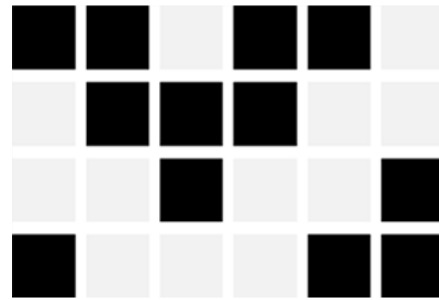


Pattern selected



Surface shape

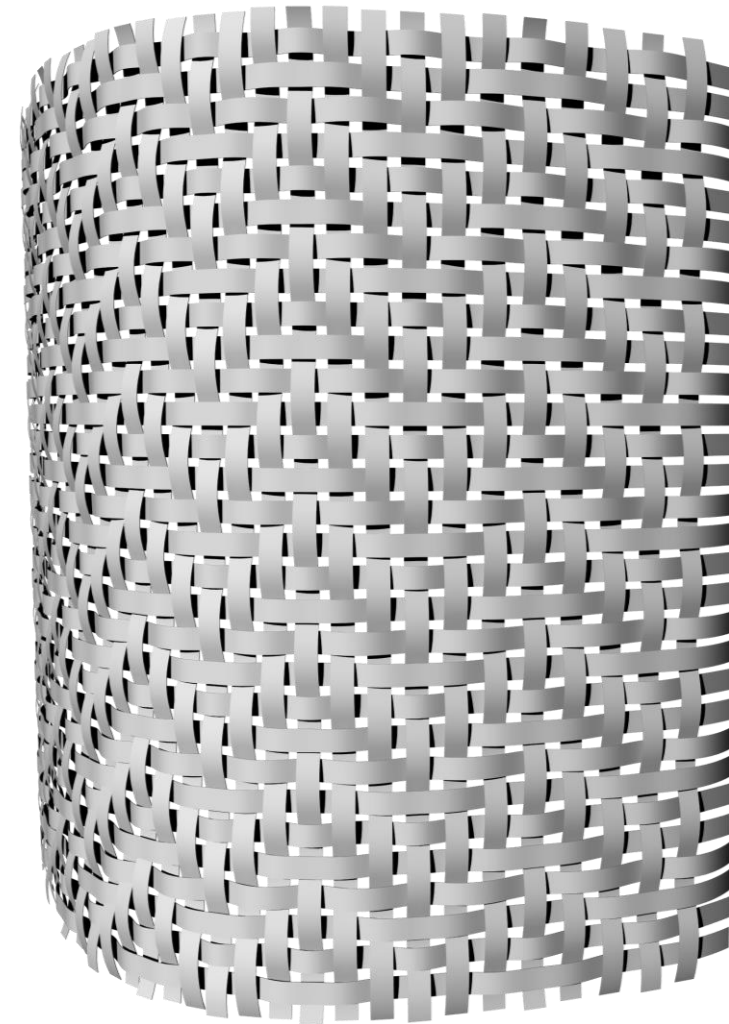




Pattern selected



Surface shape

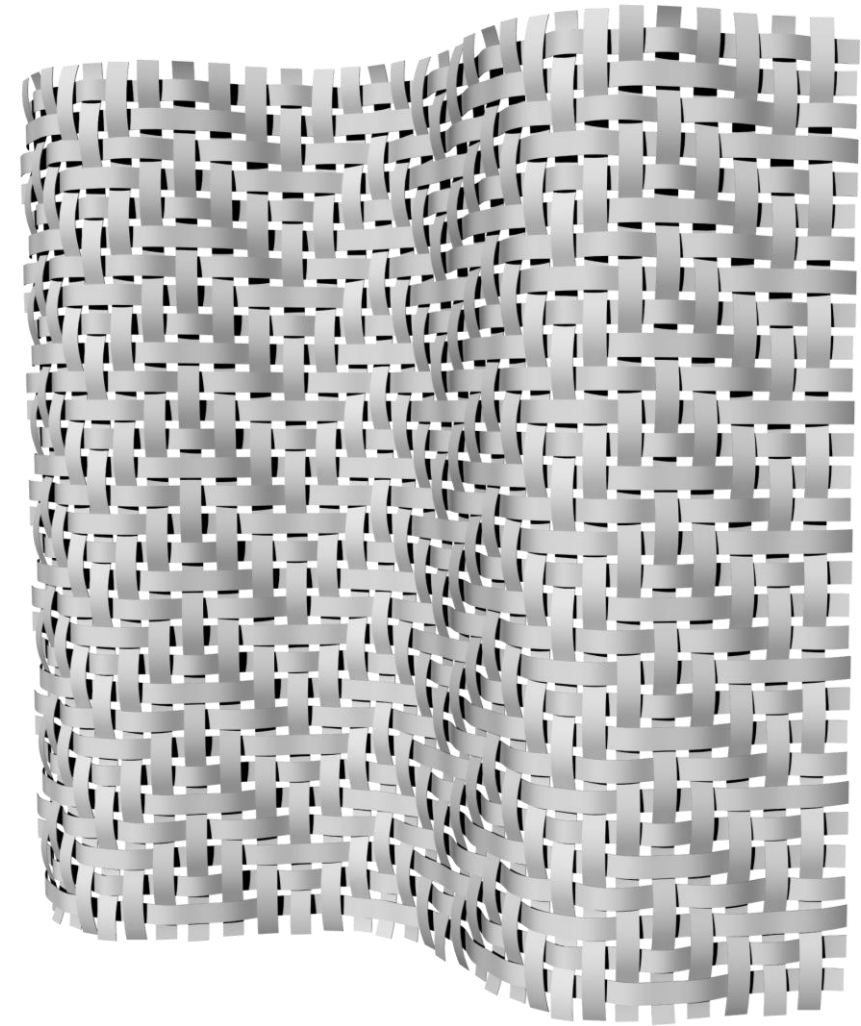


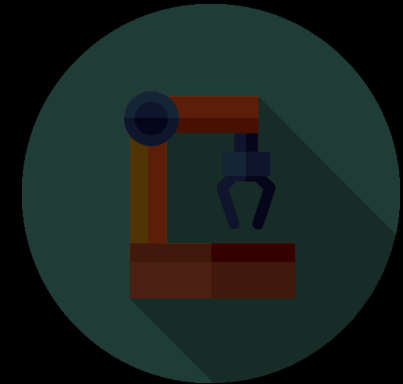


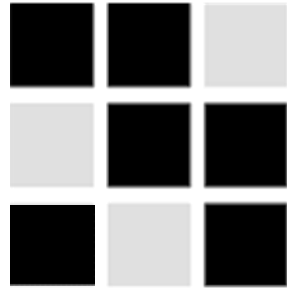
Pattern selected



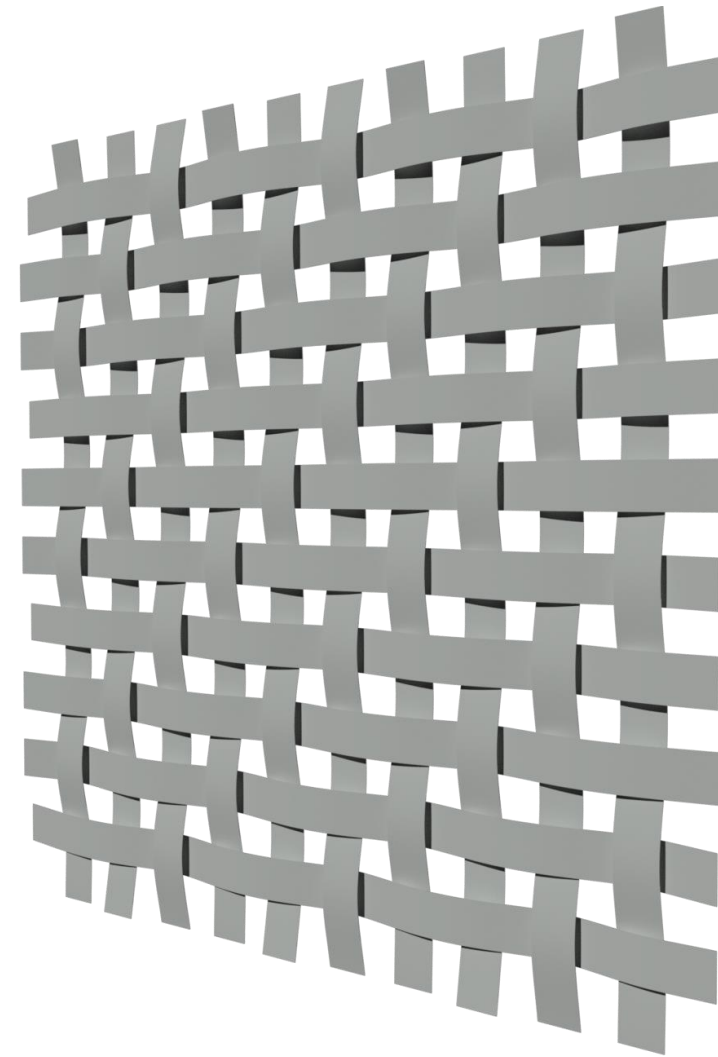
Surface shape

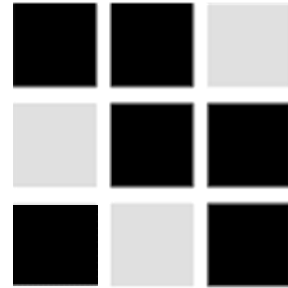




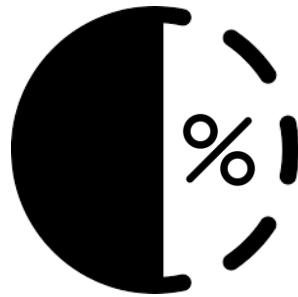


Pattern selected

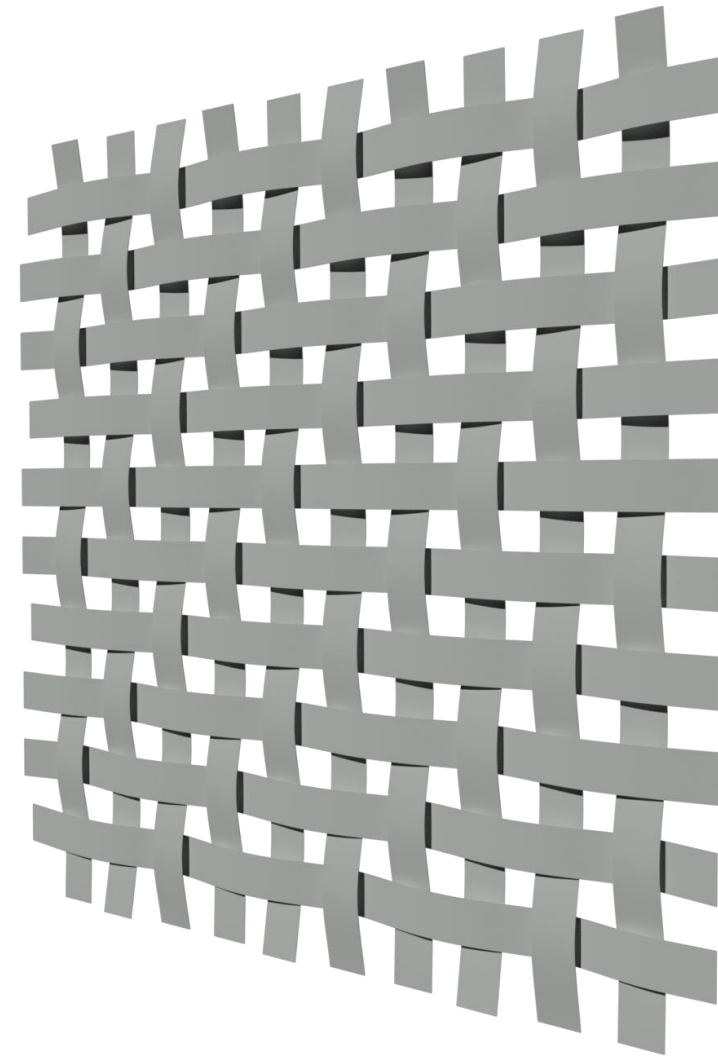


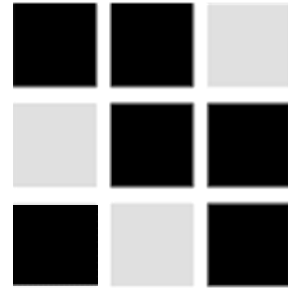


Pattern selected

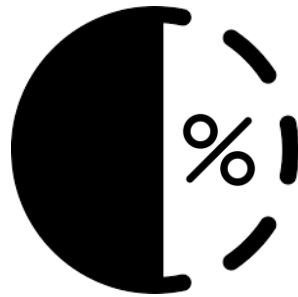


Opaque area percentage

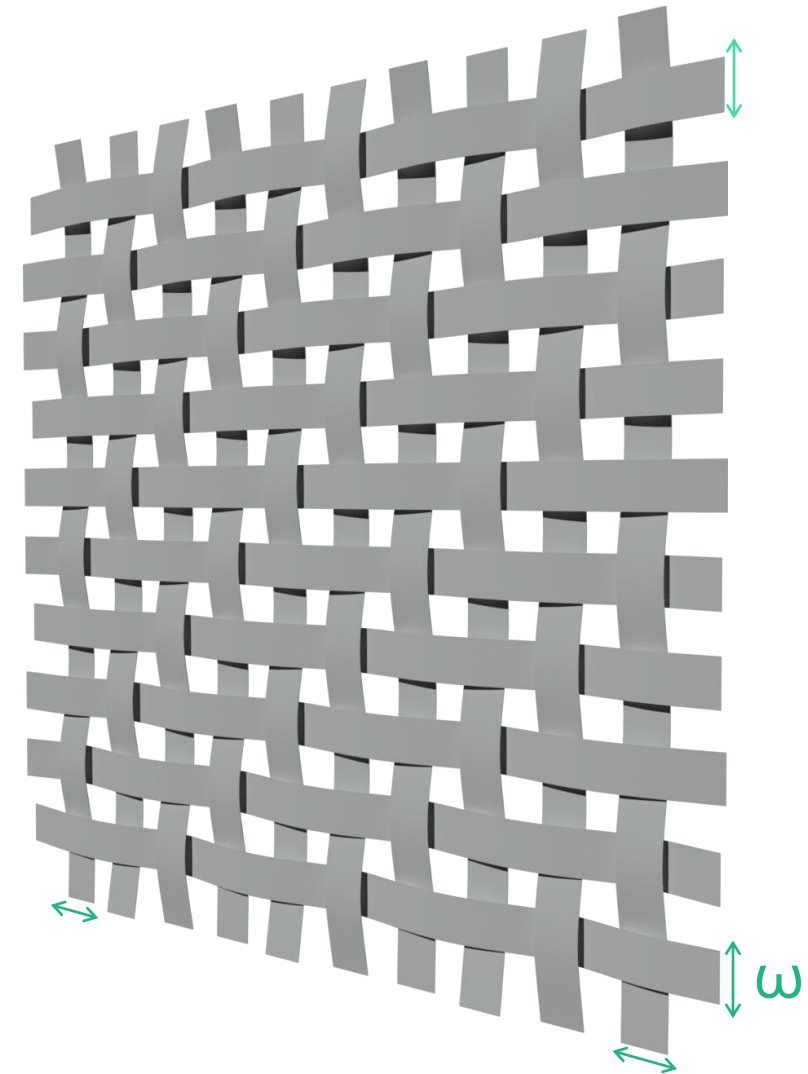


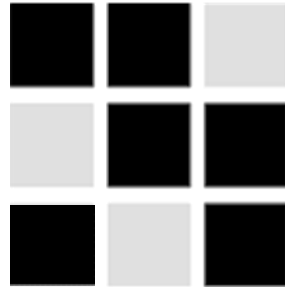


Pattern selected

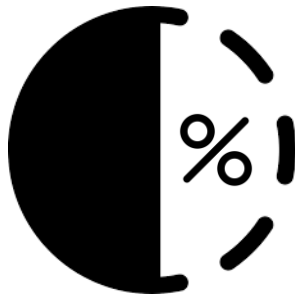


Opaque area percentage



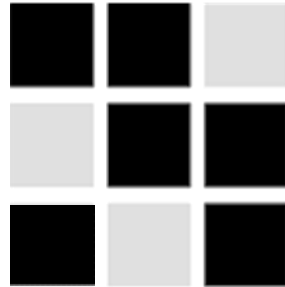


Pattern selected

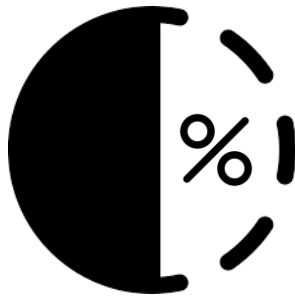


Opaque area percentage

$T_{weaved}(\dots)$



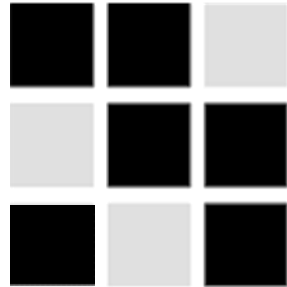
Pattern selected



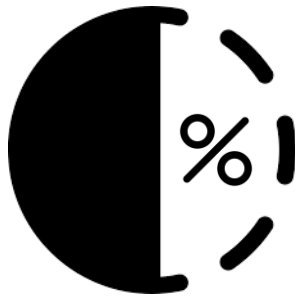
Opaque area percentage

$$T_{weaved}(\dots)$$

$$f_{opaque}(T_{weaved})$$



Pattern selected

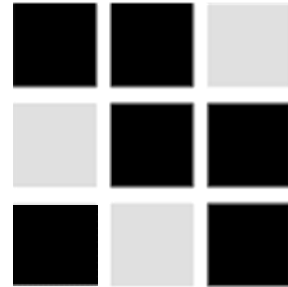


Opaque area percentage

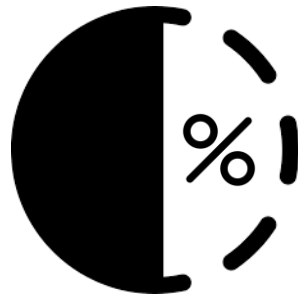
$T_{weaved}(\dots)$



$f_{opaque}(T_{weaved})$



Pattern selected

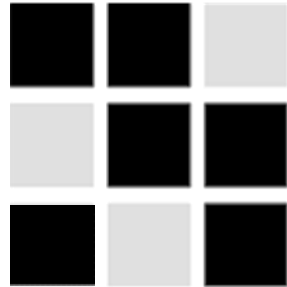


Opaque area percentage

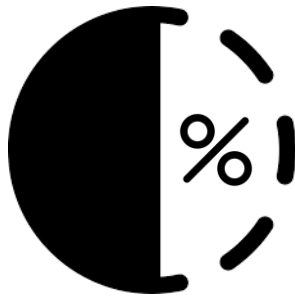
$T_{weaved}(\dots)$



$f_{opaque}(T_{weaved})$



Pattern selected



Opaque area percentage

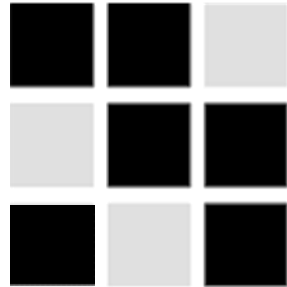
$T_{weaved}(\dots)$

+

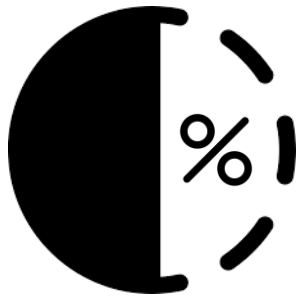
$f_{opaque}(T_{weaved})$

=

$\%_{opaque}(surf, n_{stripes}, m_{stripes}, U_{amp}, M_{weaved}, f_{opaque})$



Pattern selected



Opaque area percentage

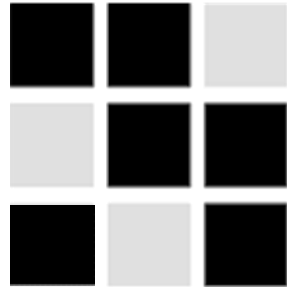
$T_{weaved}(\dots)$

+

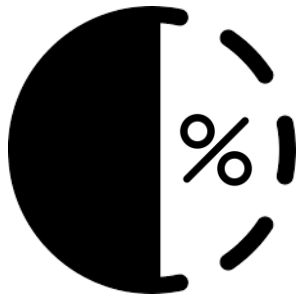
$f_{opaque}(T_{weaved})$

=

$\%_{opaque}(surf, n_{stripes}, m_{stripes}, U_{amp}, M_{weaved}, f_{opaque})$



Pattern selected



Opaque area percentage

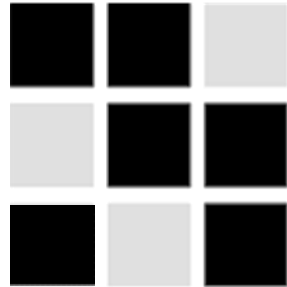
$T_{weaved}(\dots)$

+

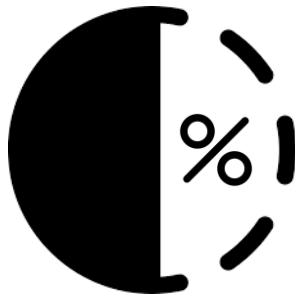
$f_{opaque}(T_{weaved})$

=

$\%_{opaque}(surf, n=10, m=10, U_{amp}, M_{weaved}, f_{opaque})$



Pattern selected



Opaque area percentage

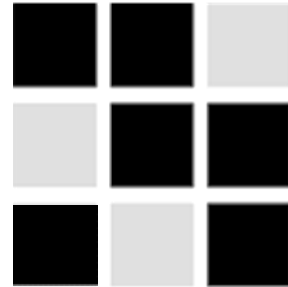
$T_{weaved}(\dots)$

+

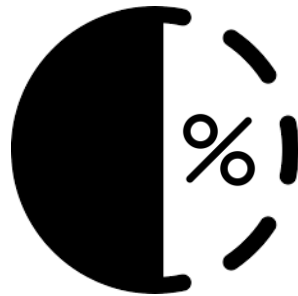
$f_{opaque}(T_{weaved})$

=

$\%_{opaque}(surf, n=10, m=10, U_{amp}, M_{weaved}, f_{opaque})$



Pattern selected



Opaque area percentage

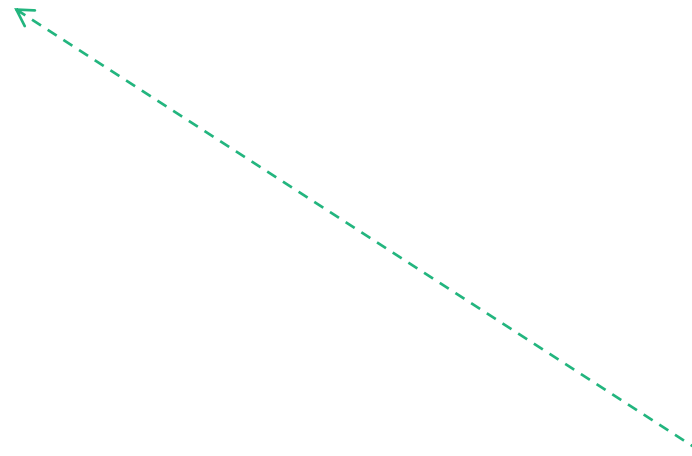
$T_{weaved}(\dots)$

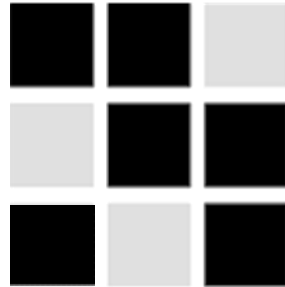
+

$f_{opaque}(T_{weaved})$

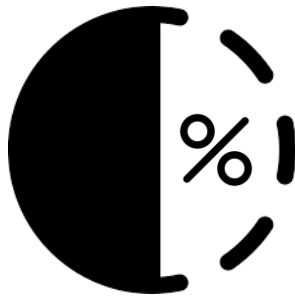
=

$\%_{opaque}(surf, n=10, m=10, U_{amp}, M_{weaved}, f_{opaque})$





Pattern selected



Opaque area percentage

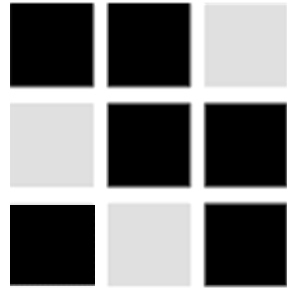
$T_{weaved}(\dots)$

+

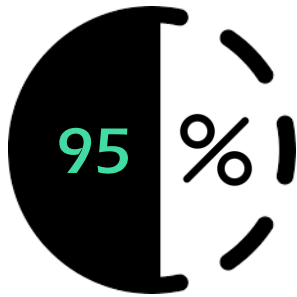
$f_{opaque}(T_{weaved})$

=

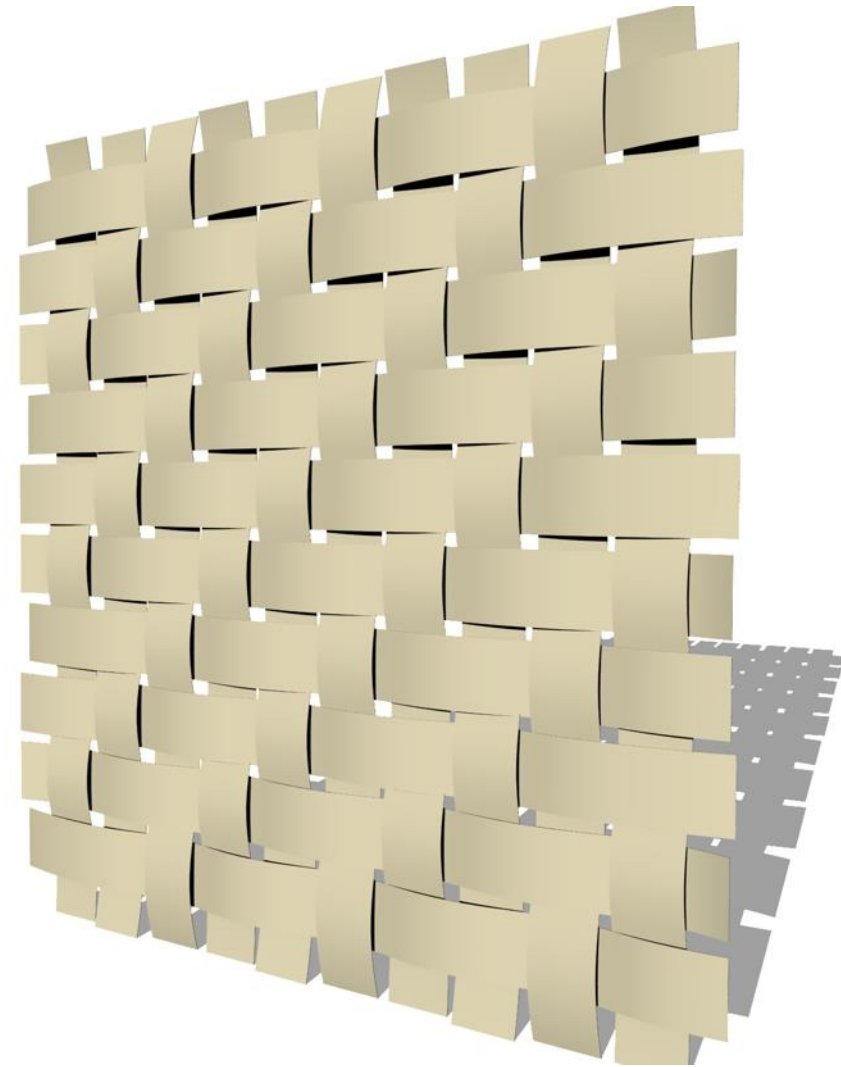
$\%_{opaque}(surf, n=10, m=10, U_{amp}, M_{weaved}, f_{opaque})$

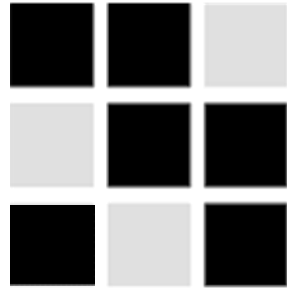


Pattern selected

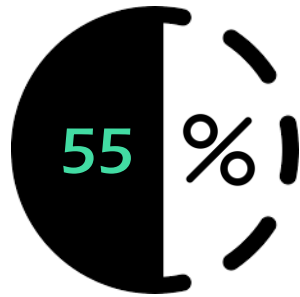


Opaque area percentage

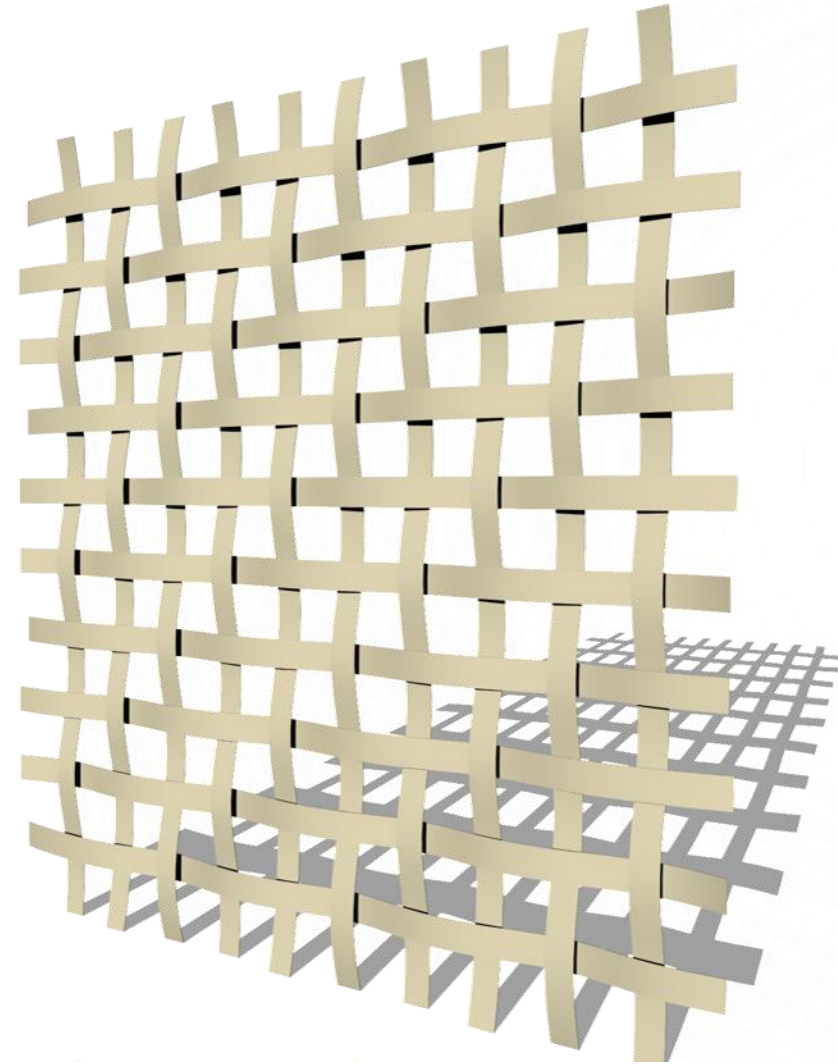


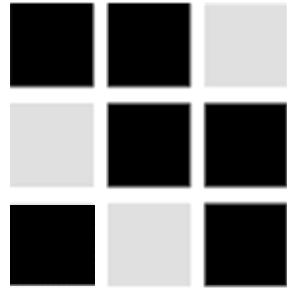


Pattern selected

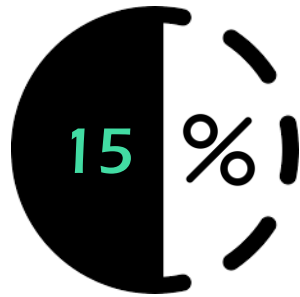


Opaque area percentage

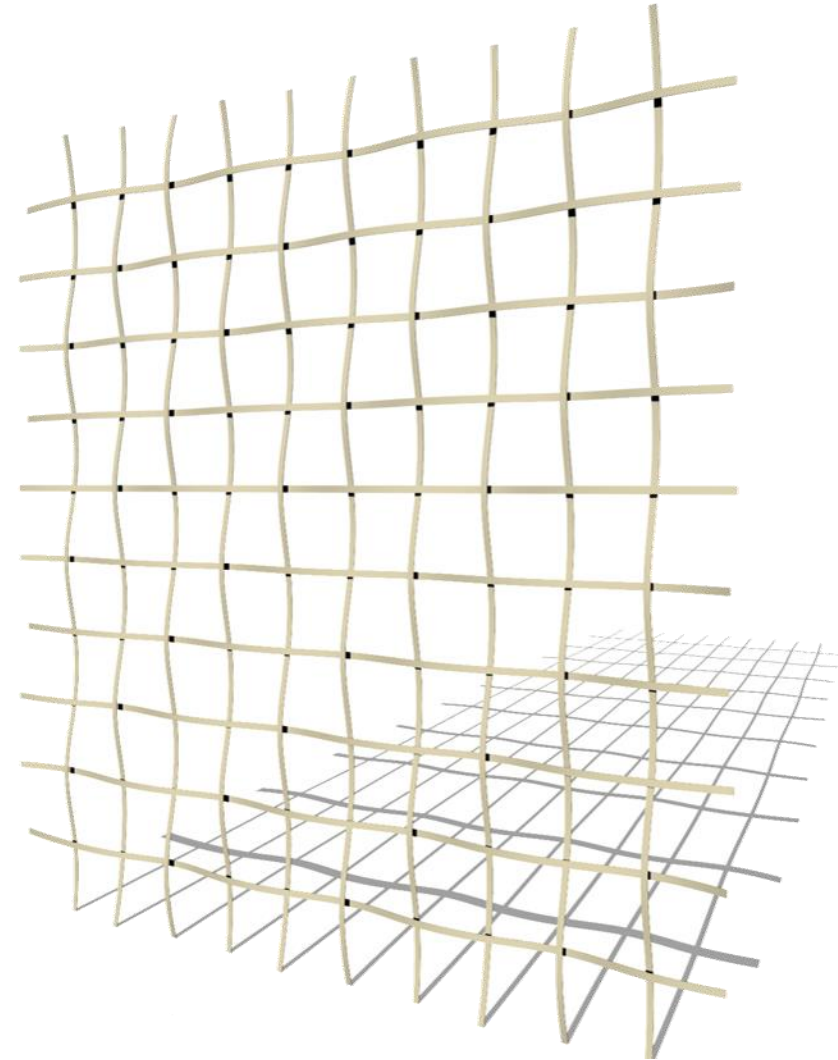


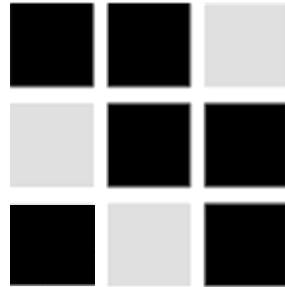


Pattern selected

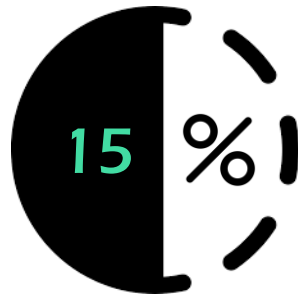


Opaque area percentage

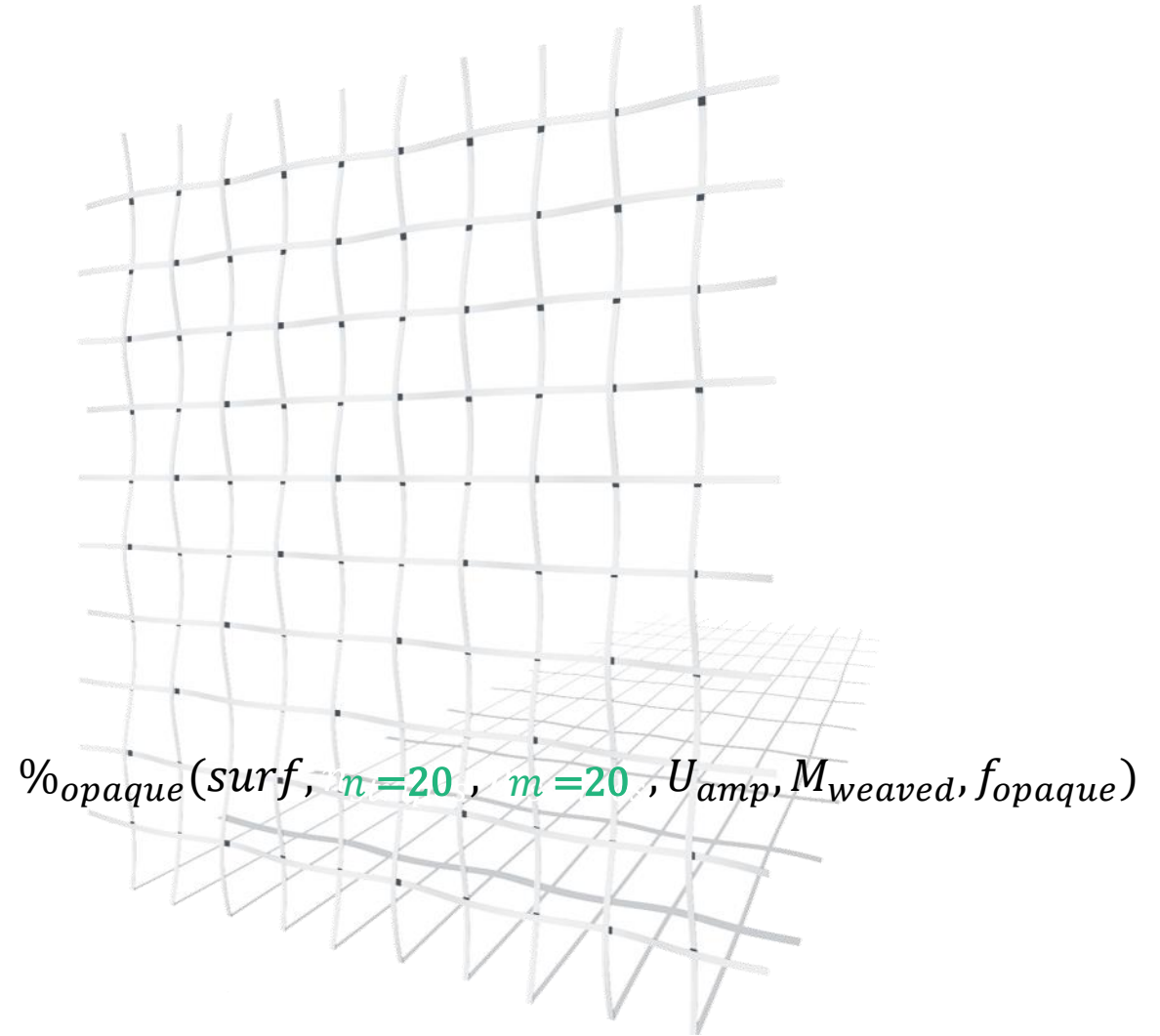


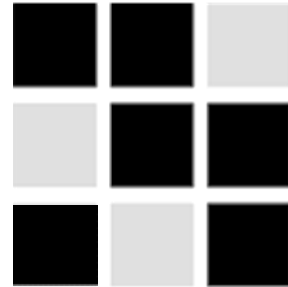


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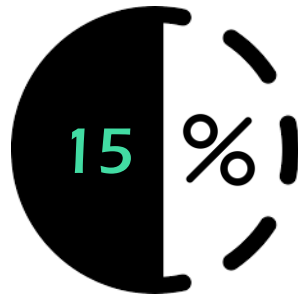


Opaque area percentage

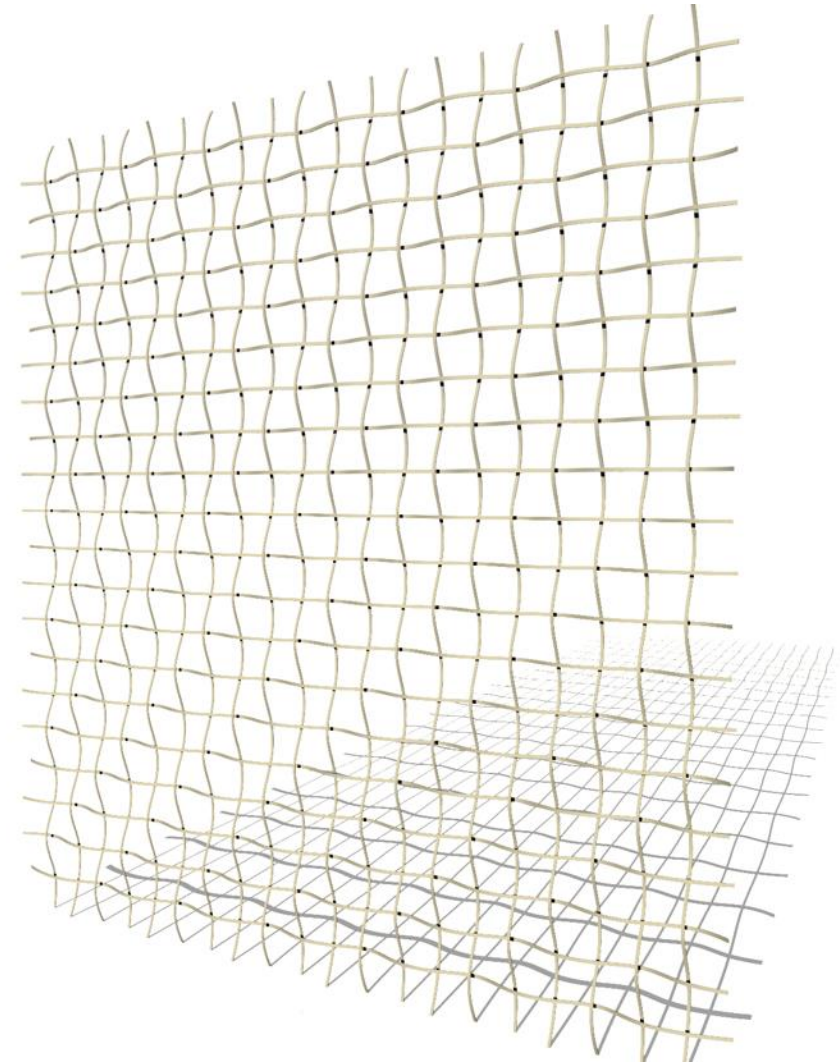


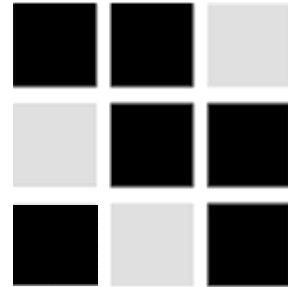


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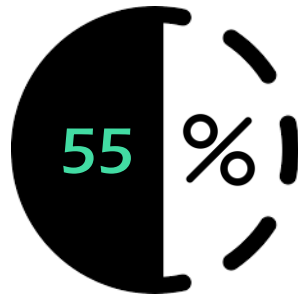


Opaque area percentage

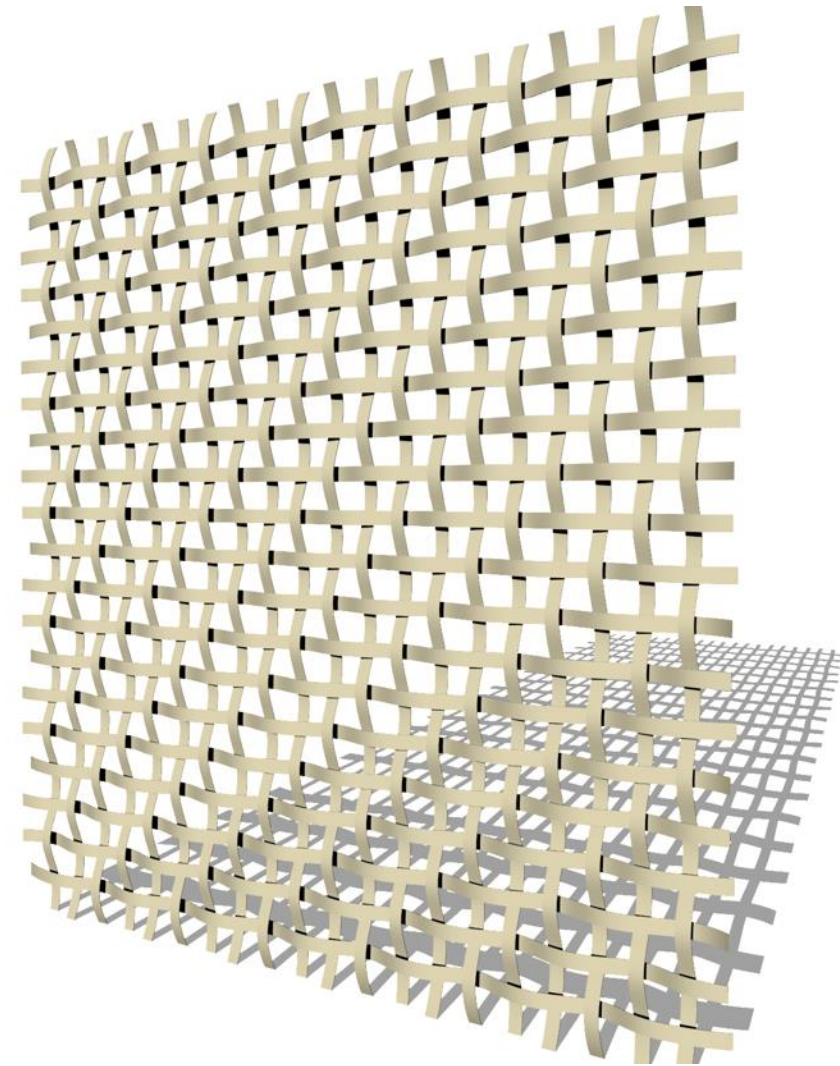


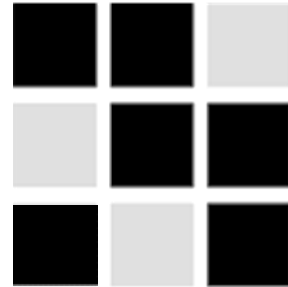


Pattern selected

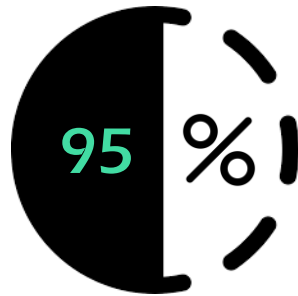


Opaque area percentage

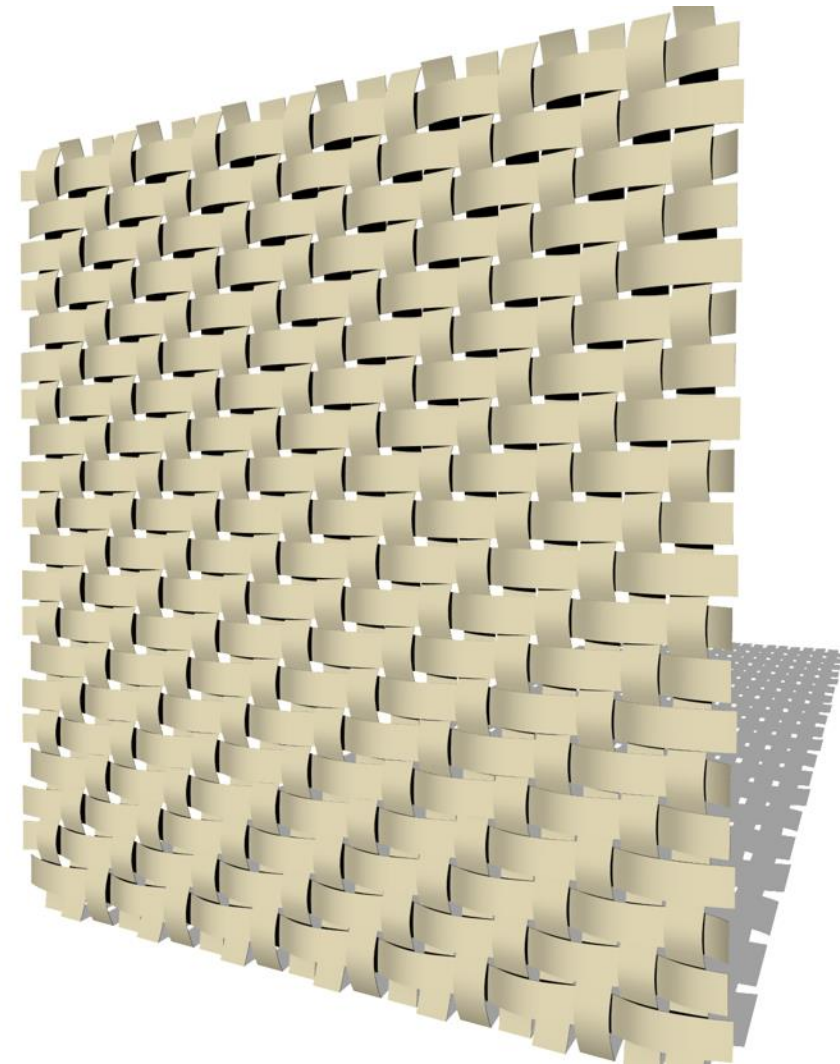


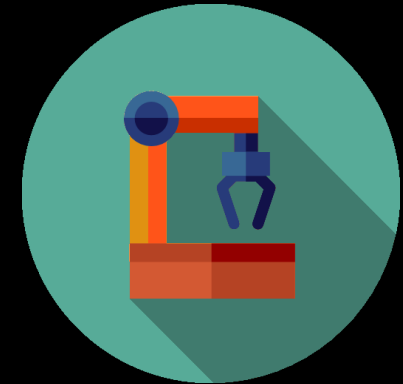


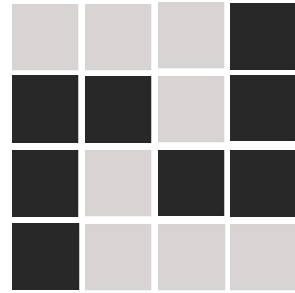
Pattern selected



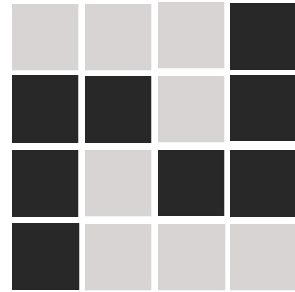
Opaque area percentage



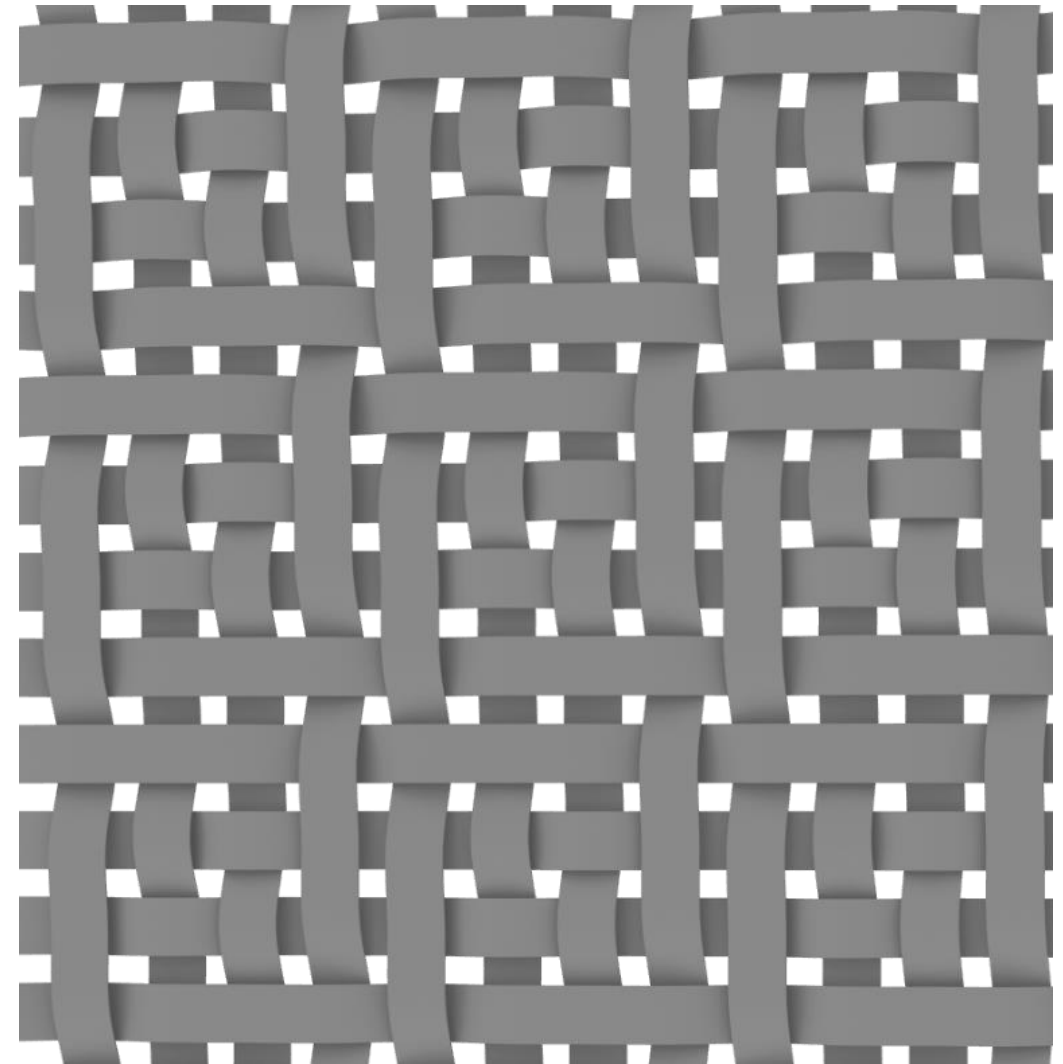


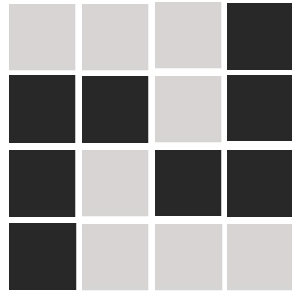


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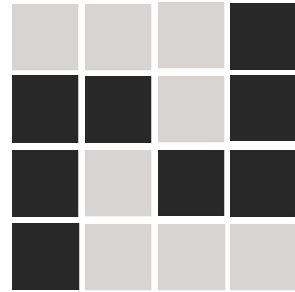
Pattern selected





Pattern selected

$T_{weaved}(\dots)$

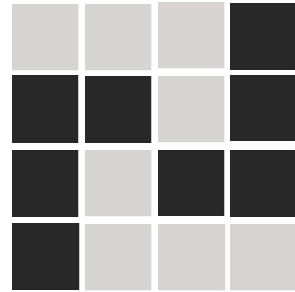


Pattern selected

$T_{weaved}(\dots)$



$f_{discretize}(T_{weaved})$



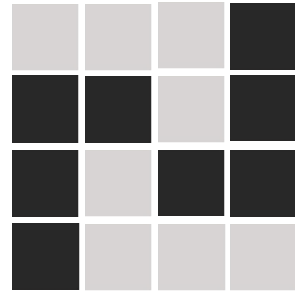
Pattern selected

$T_{weaved}(\dots)$

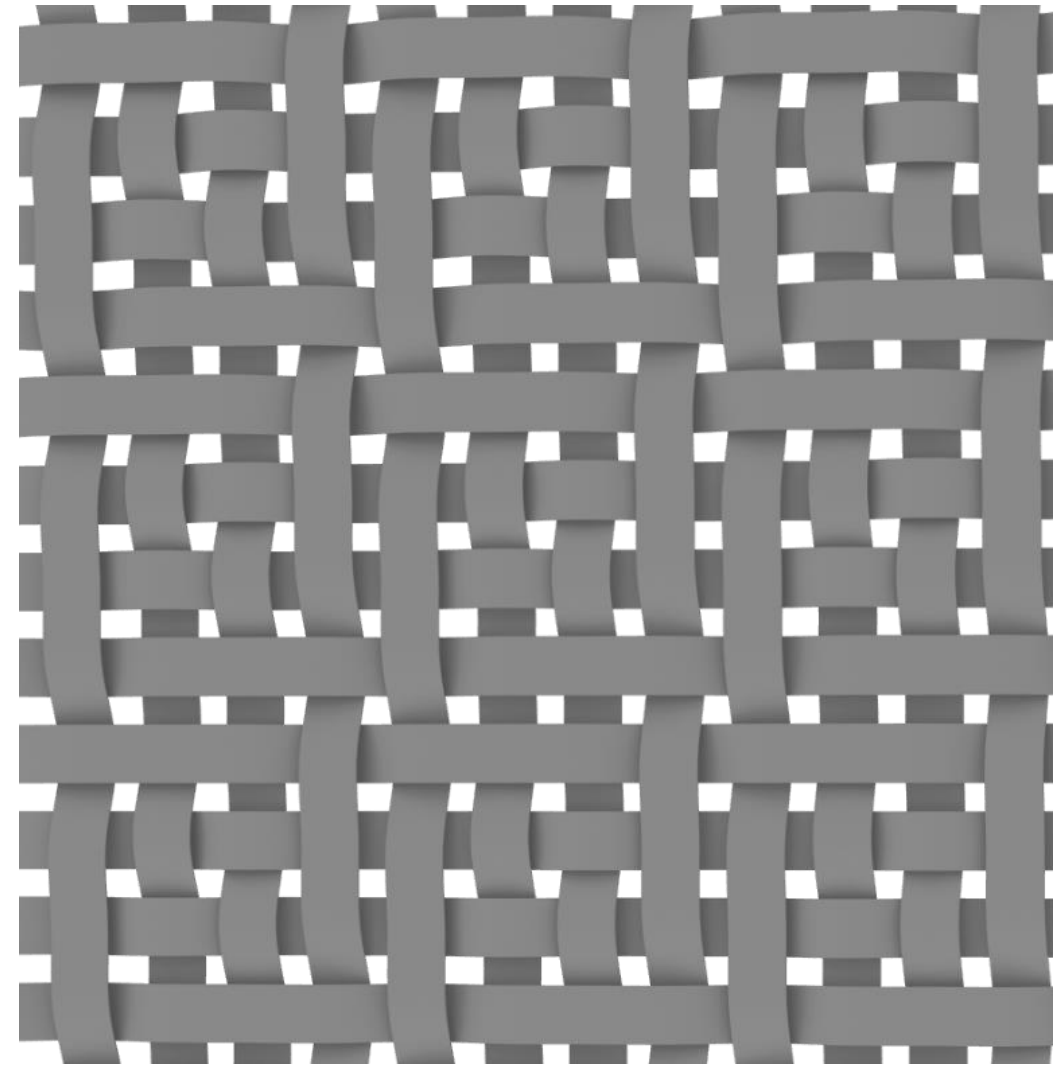


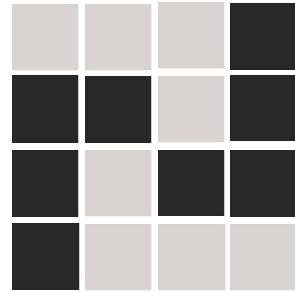
$f_{discretize}(T_{weaved})$



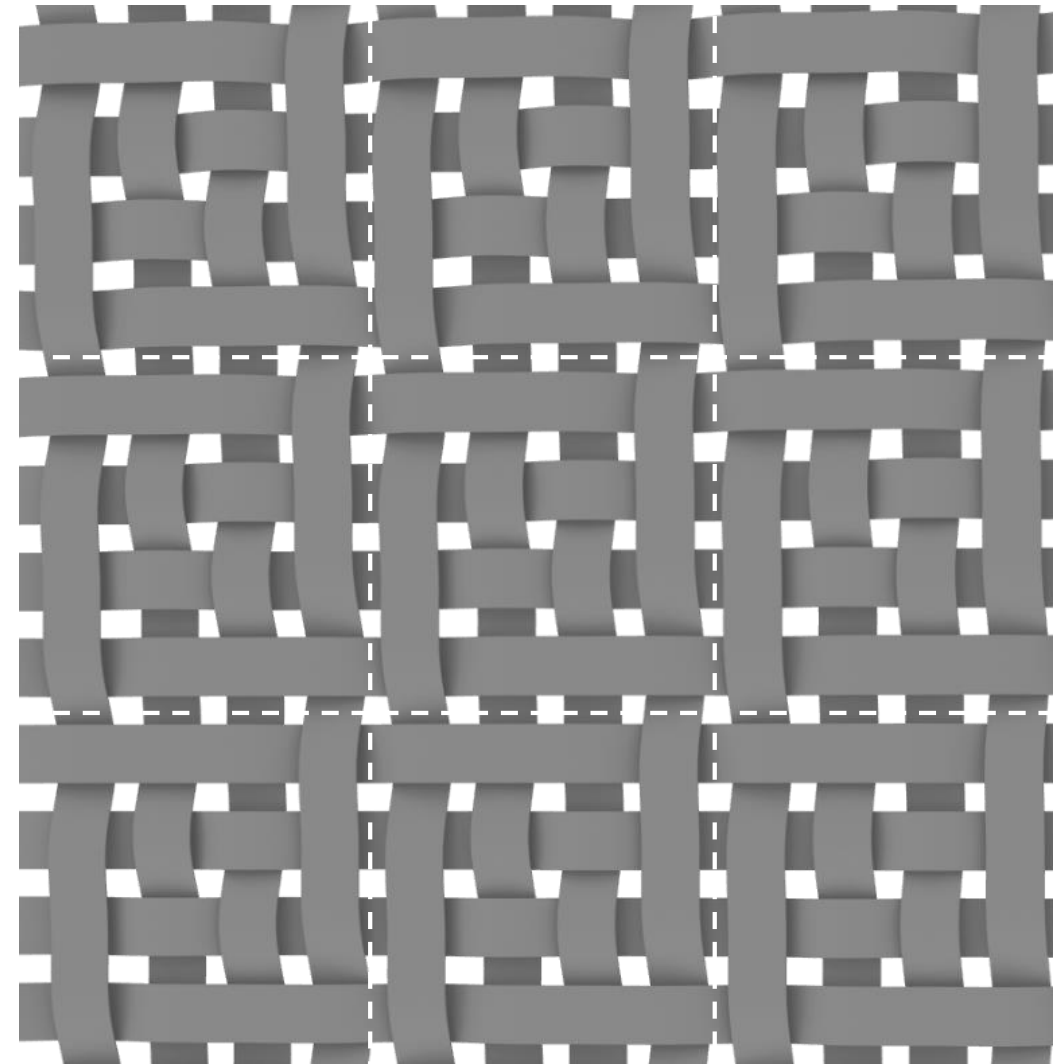


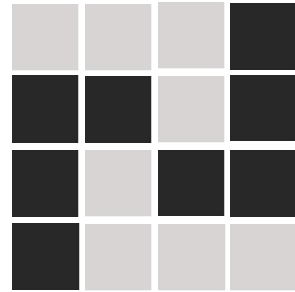
Pattern selected



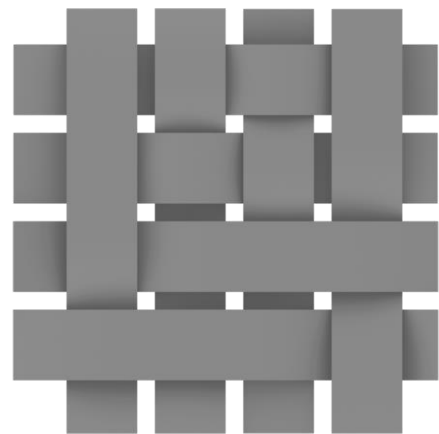


Pattern selected

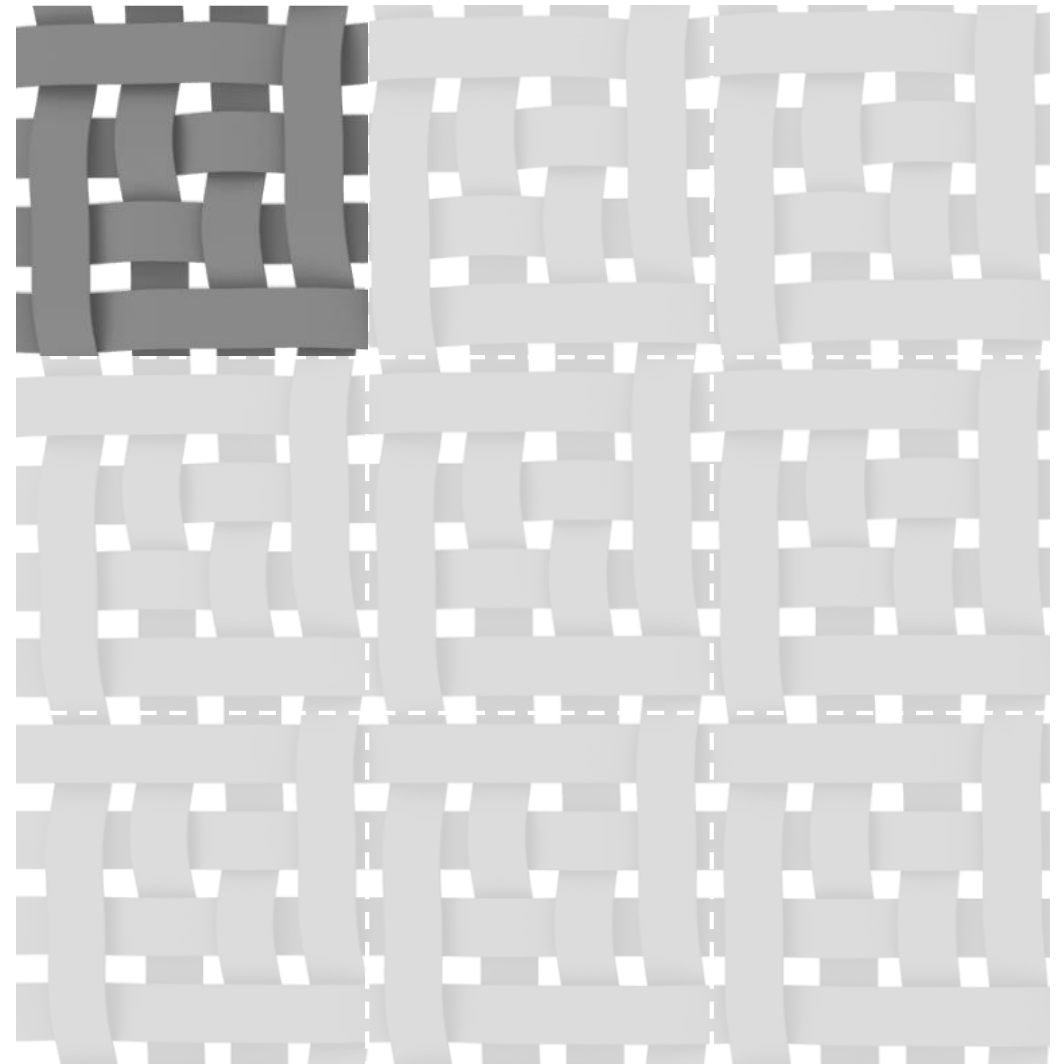




Pattern selected

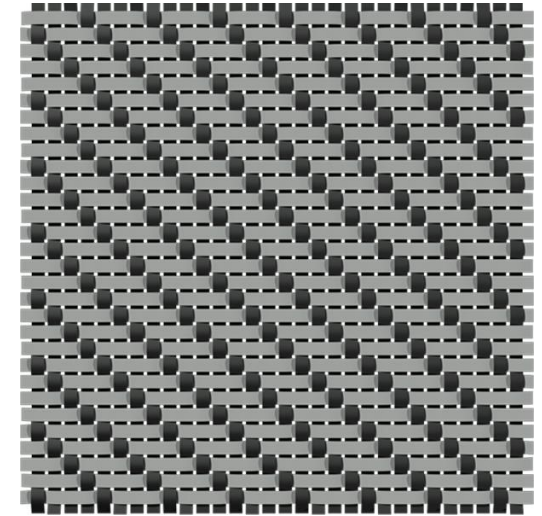
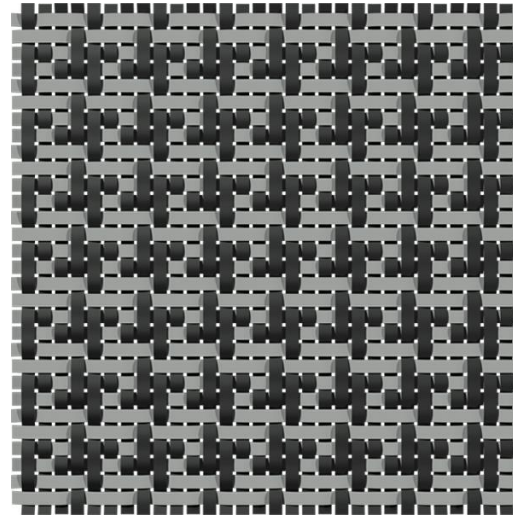


Selected pattern module

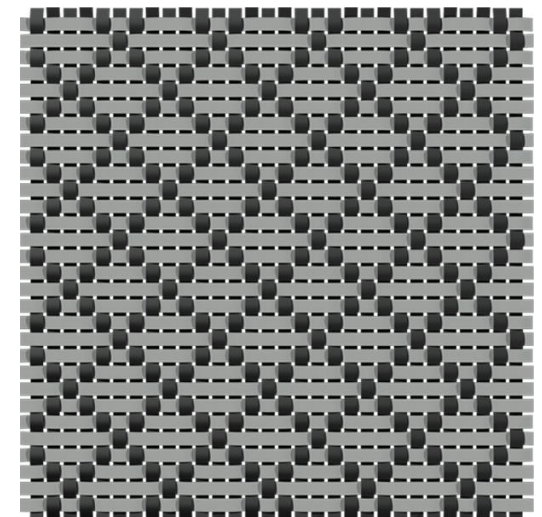
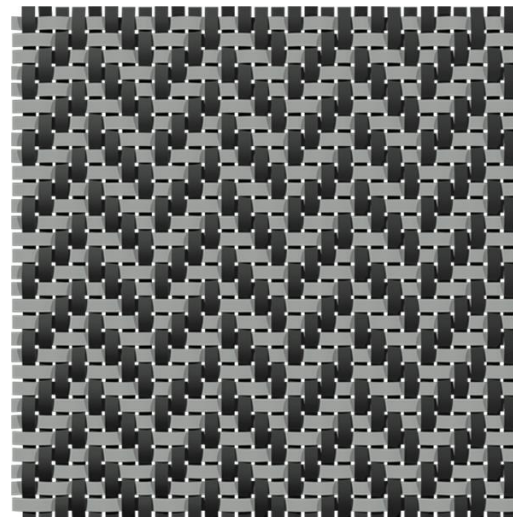




Patterns selected

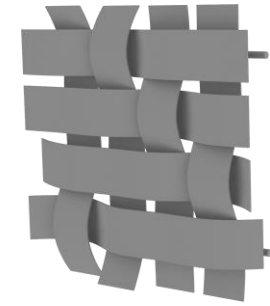
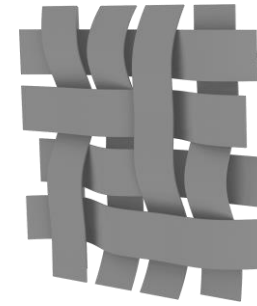


Corresponding modules

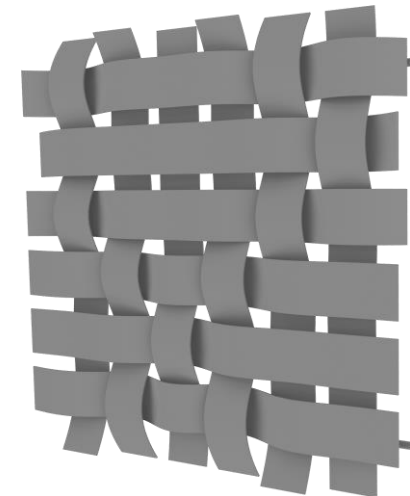
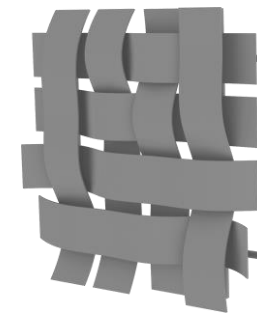


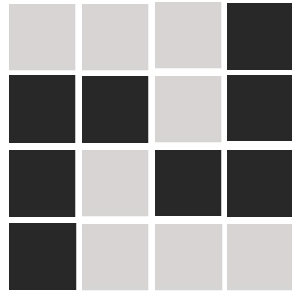


Patterns selected

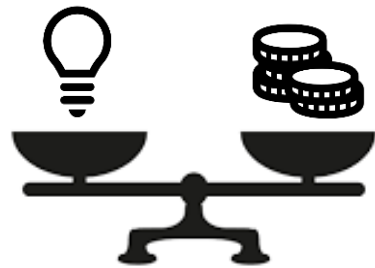


Corresponding modules

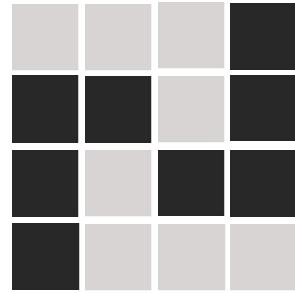




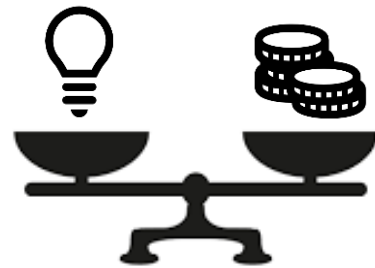
Pattern selected



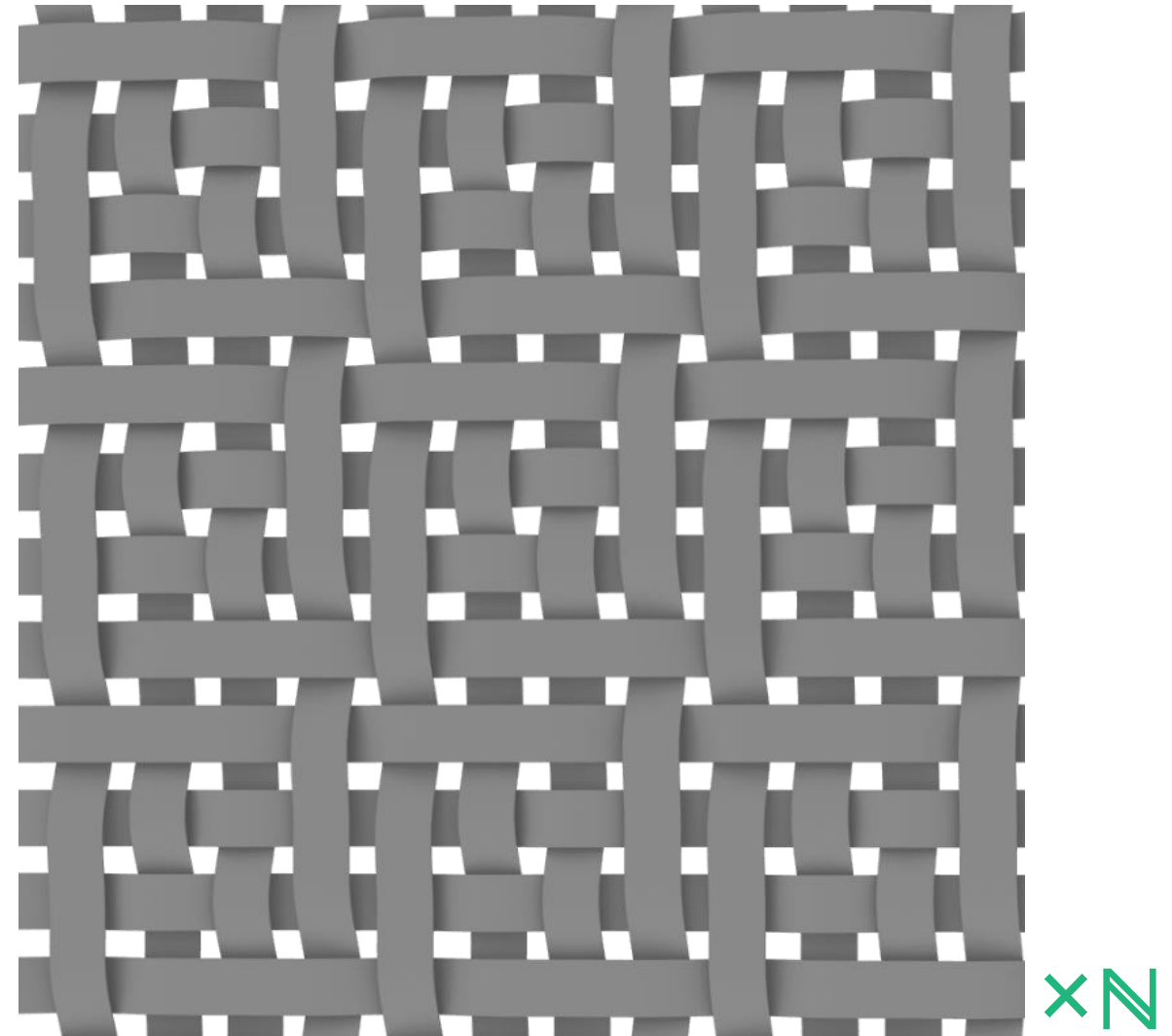
Pattern rationalization

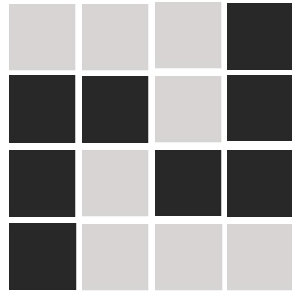


Pattern selected



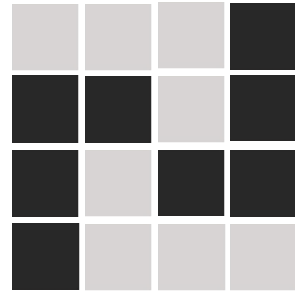
Pattern rationalization





Pattern selected

$T_{weaved}(\dots)$

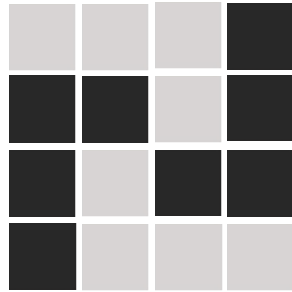


Pattern selected

$T_{weaved}(\dots)$



$R_{weaved}(T_{weaved})$

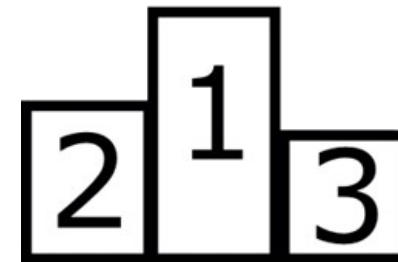


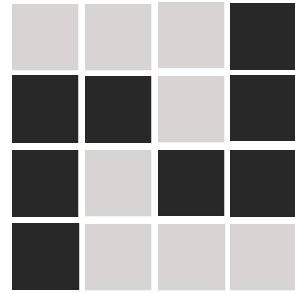
Pattern selected

$T_{weaved}(\dots)$

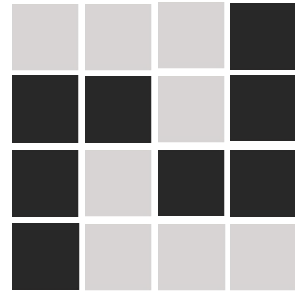


$R_{weaved}(T_{weaved})$

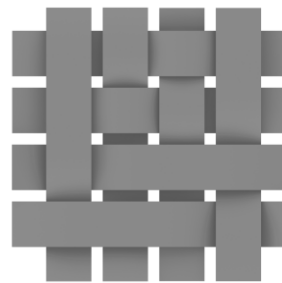




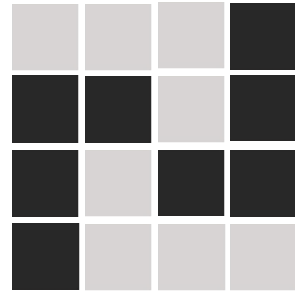
Pattern selected



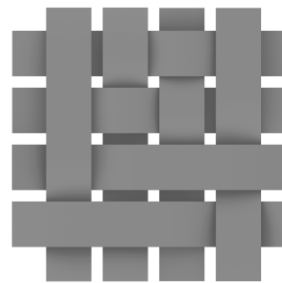
Pattern selected



Selected pattern module

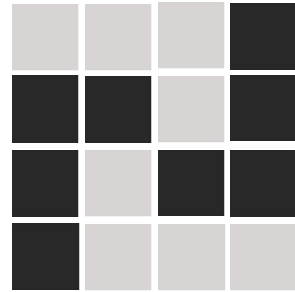


Pattern selected



Selected pattern module

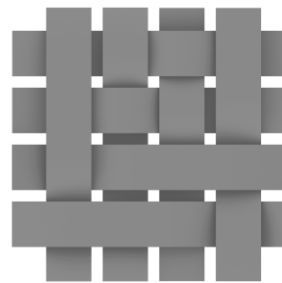
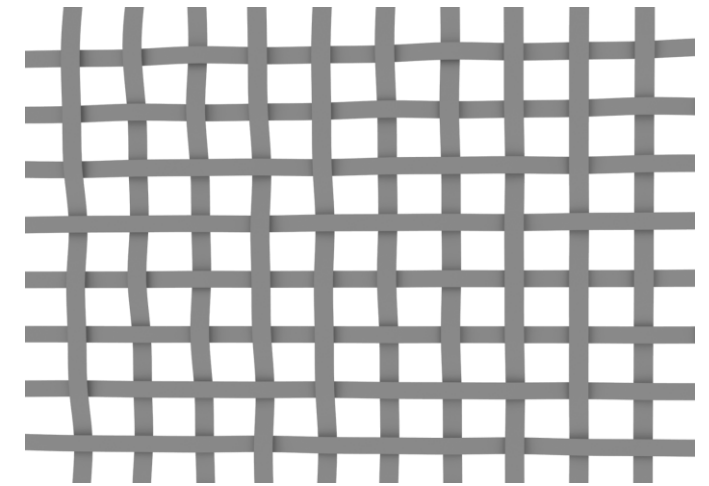
4X4



Pattern selected

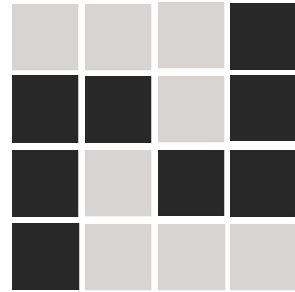
$$N_{stripes} = 10$$

$$M_{stripes} = 8$$



Selected pattern module

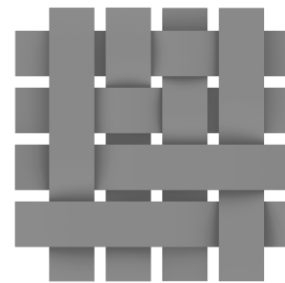
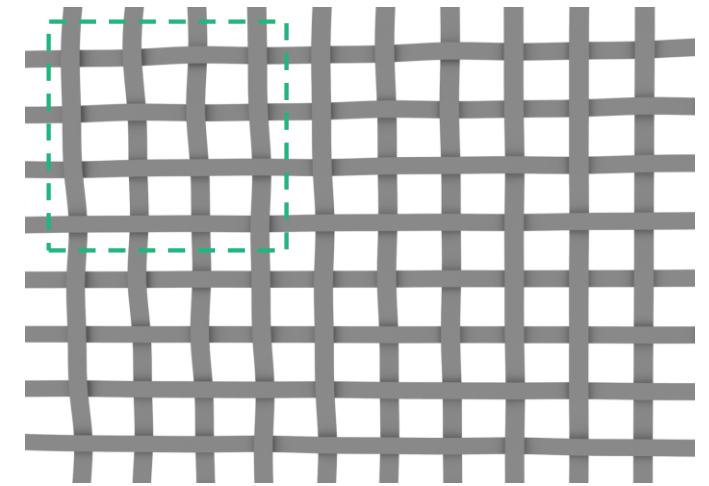
4X4



Pattern selected

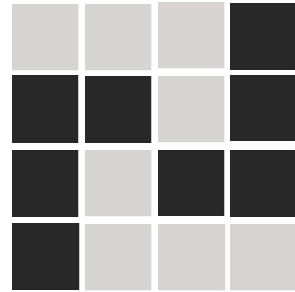
$$N_{strips} = 10$$

$$M_{strips} = 8$$



Selected pattern module

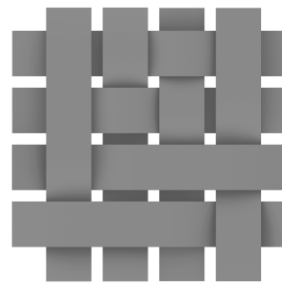
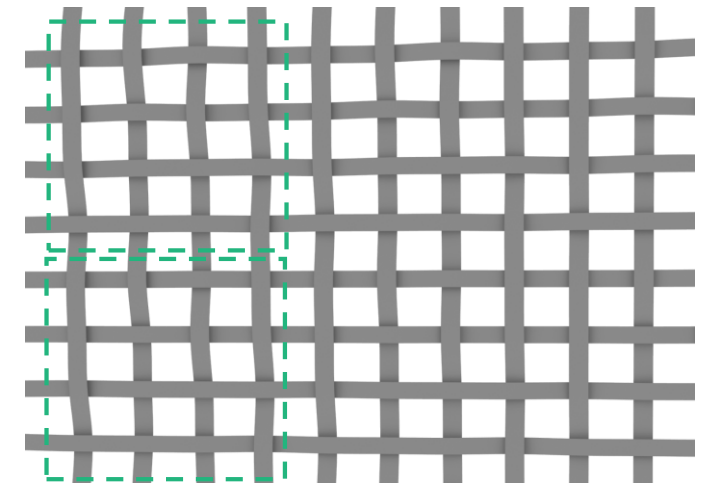
4X4



Pattern selected

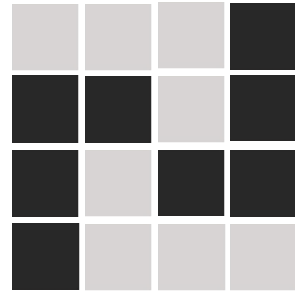
$$N_{strips} = 10$$

$$M_{strips} = 8$$



Selected pattern module

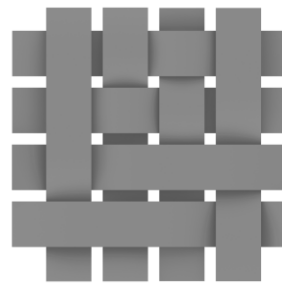
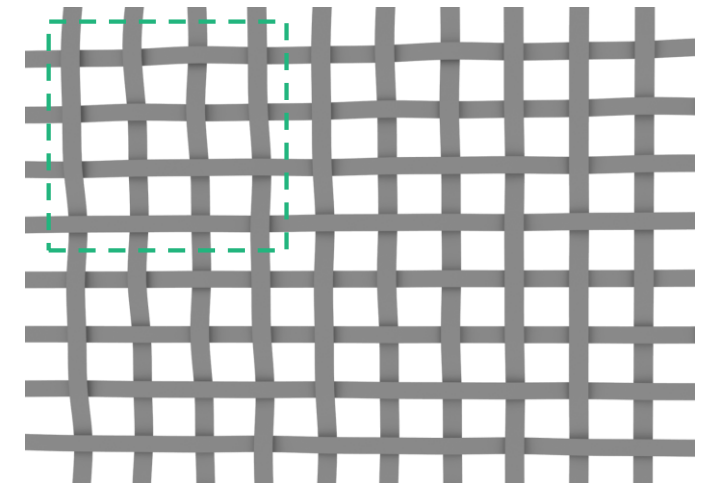
4X4



Pattern selected

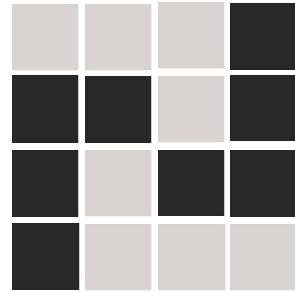
$$N_{stripes} = 10$$

$$M_{stripes} = 8$$



Selected pattern module

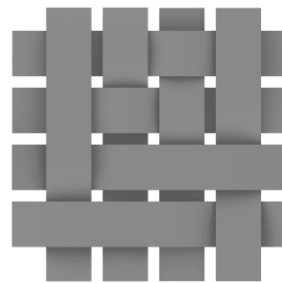
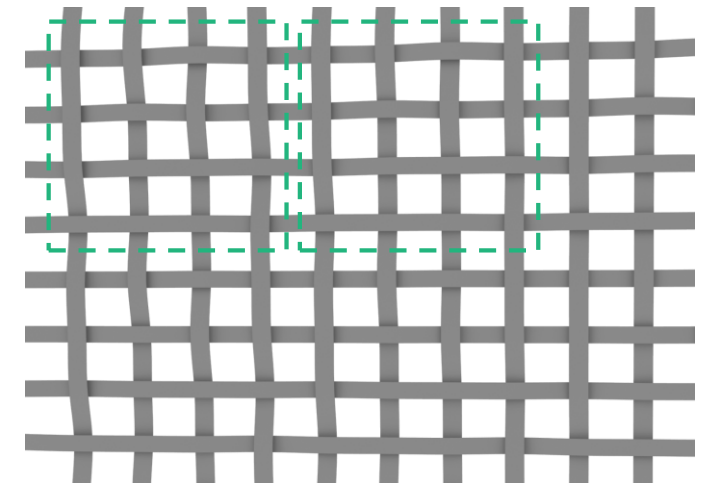
4X4



Pattern selected

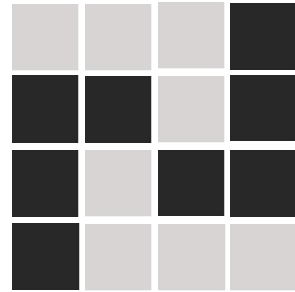
$$N_{strips} = 10$$

$$M_{strips} = 8$$



Selected pattern module

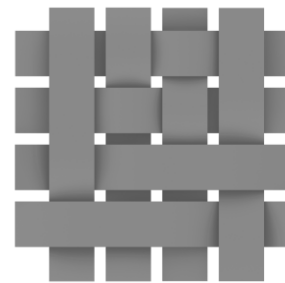
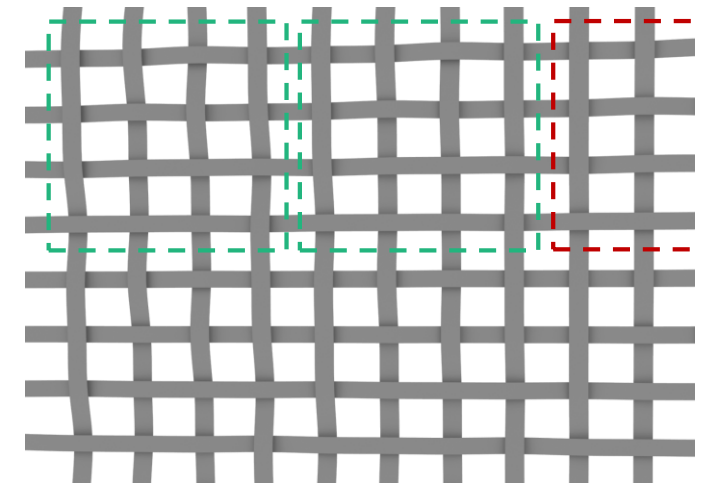
4X4



Pattern selected

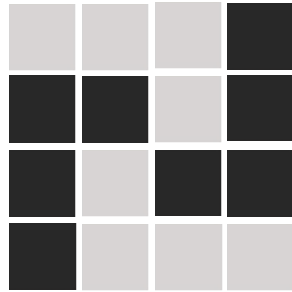
$$N_{stripes} = 10$$

$$M_{stripes} = 8$$



Selected pattern module

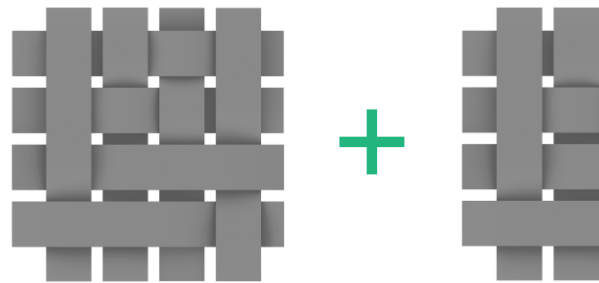
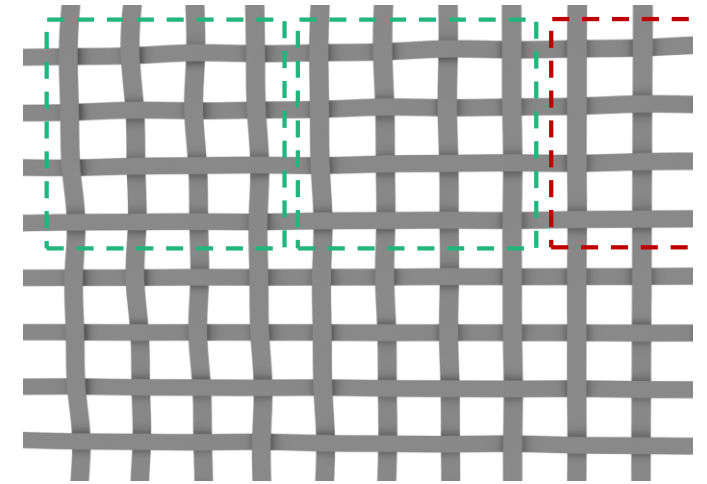
4X4



Pattern selected

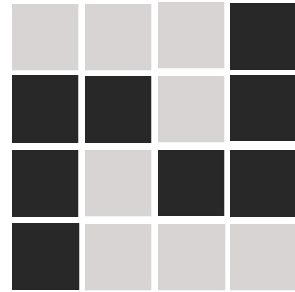
$$N_{stripes} = 10$$

$$M_{stripes} = 8$$



Selected pattern module

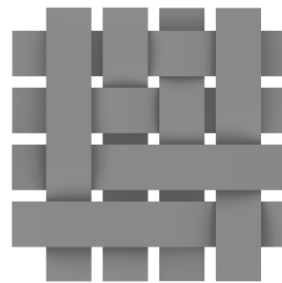
4X4



Pattern selected

$$N_{strips} = 10$$

$$M_{strips} = 8$$

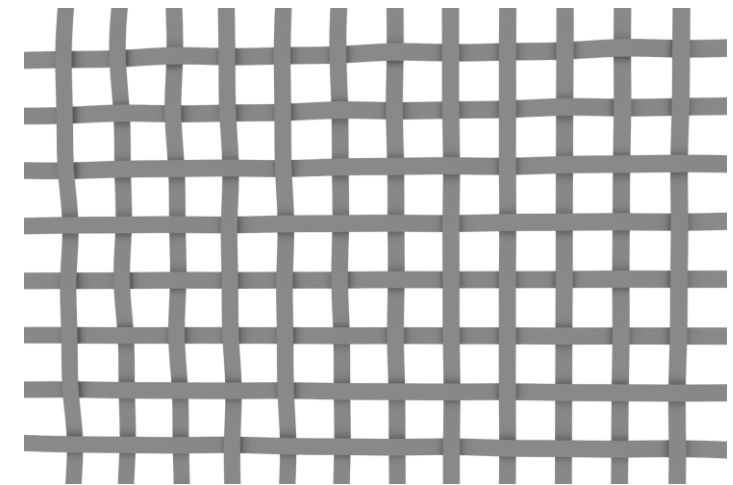
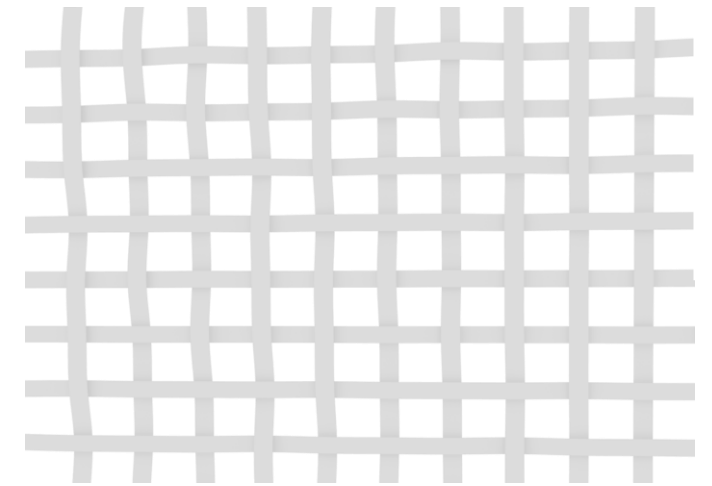


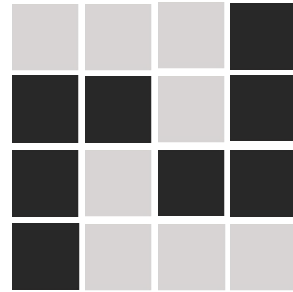
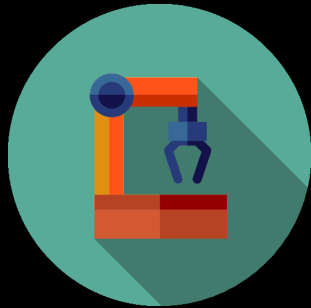
Selected pattern module

4X4

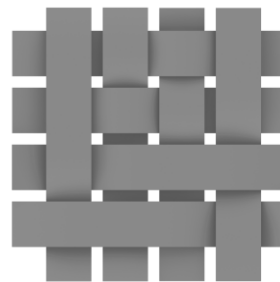
$$N_{strips} = 12$$

$$M_{strips} = 8$$





Pattern selected



Selected pattern module

4X4

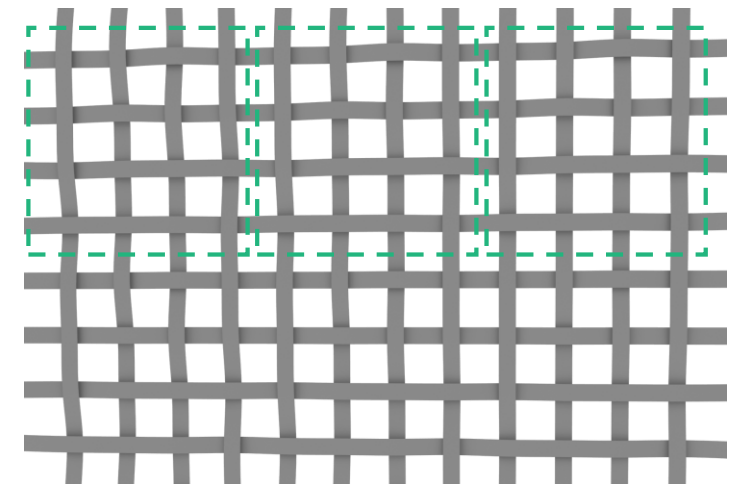
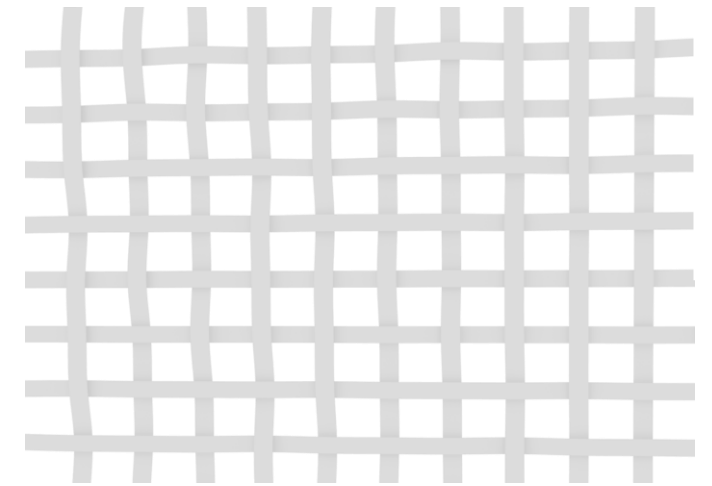
$$N_{strips} = 10$$

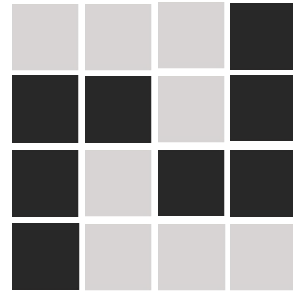
$$M_{strips} = 8$$



$$N_{strips} = 12$$

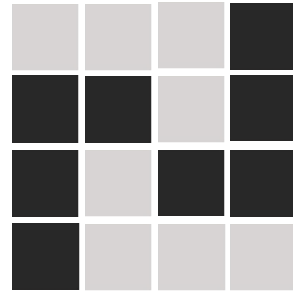
$$M_{strips} = 8$$





Pattern selected

$$N_{stripes} = \{10\ 11\ 12\ 13\}$$

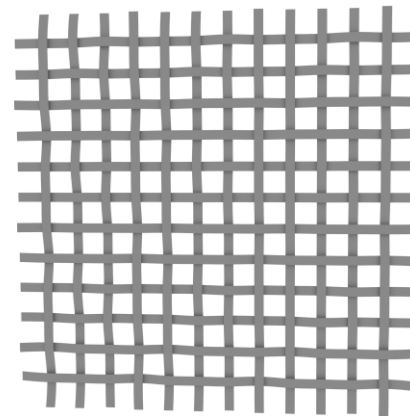


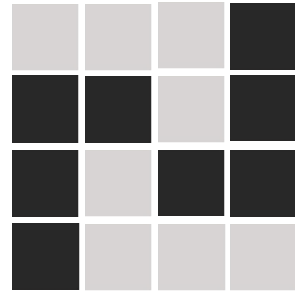
Pattern selected

$$N_{stripes} = \{10\ 11\ 12\ 13\}$$



$$N_{stripes} = 3 \times 4 = 12$$





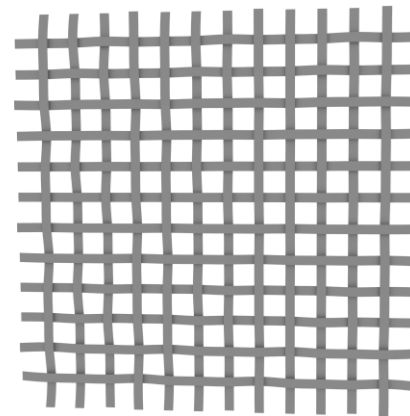
Pattern selected

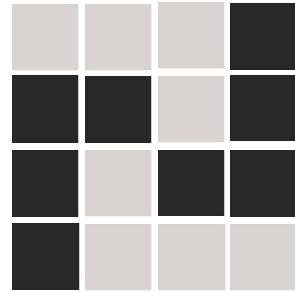
$$N_{stripes} = \{10\ 11\ 12\ 13\}$$

$$N_{stripes} = \{14\ 15\ 16\ 17\}$$



$$N_{stripes} = 3 \times 4 = 12$$



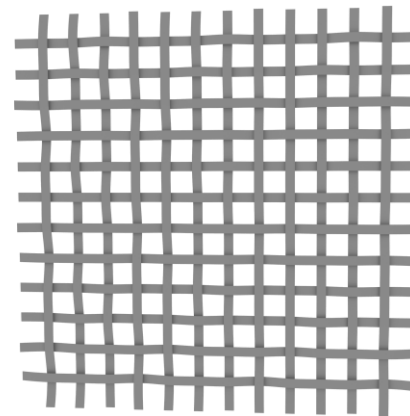


Pattern selected

$$N_{stripes} = \{10\ 11\ 12\ 13\}$$



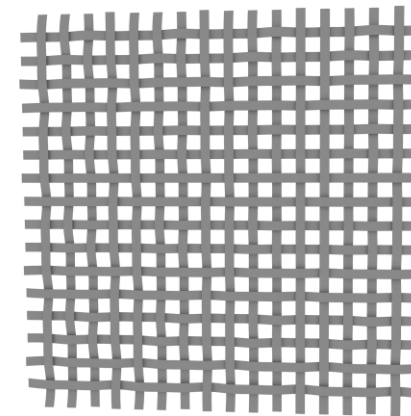
$$N_{stripes} = 3 \times 4 = 12$$

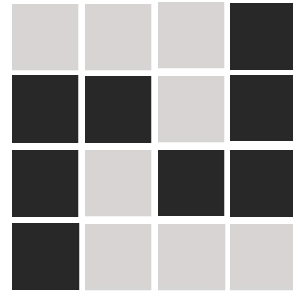


$$N_{stripes} = \{14\ 15\ 16\ 17\}$$



$$N_{stripes} = 4 \times 4 = 16$$





Pattern selected

$$N_{strips} = \{10\ 11\ 12\ 13\}$$

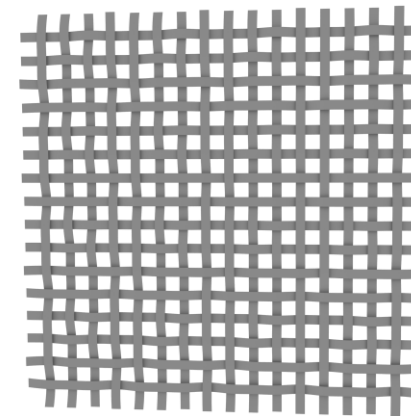
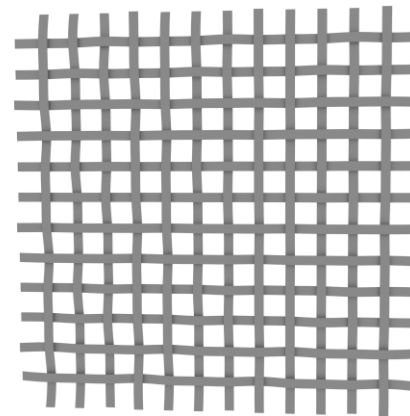
$$N_{strips} = \{14\ 15\ 16\ 17\}$$

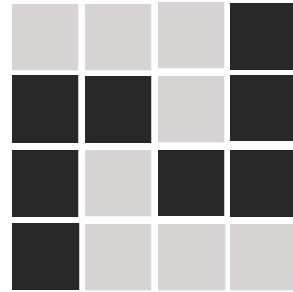
$$N_{strips} = \{18\ 19\ 20\ 21\}$$



$$N_{strips} = 3 \times 4 = 12$$

$$N_{strips} = 4 \times 4 = 16$$



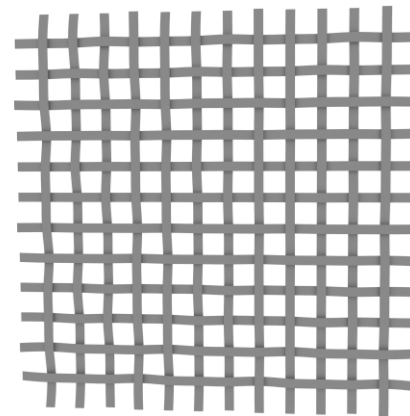


Pattern selected

$$N_{strips} = \{10\ 11\ 12\ 13\}$$



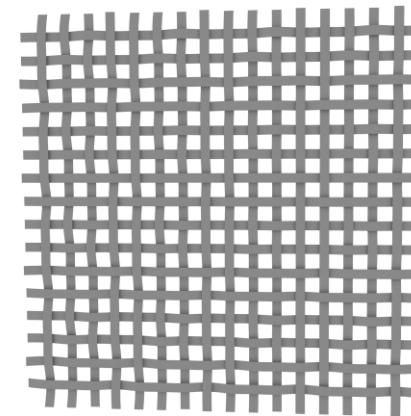
$$N_{strips} = 3 \times 4 = 12$$



$$N_{strips} = \{14\ 15\ 16\ 17\}$$



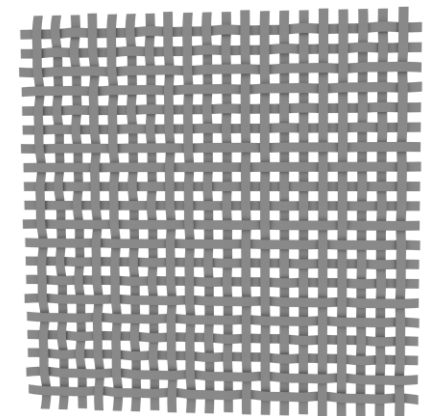
$$N_{strips} = 4 \times 4 = 16$$



$$N_{strips} = \{18\ 19\ 20\ 21\}$$



$$N_{strips} = 5 \times 4 = 20$$



1. Flexibility
2. Ease of use
3. Reduces time and effort
4. Facilitates the algorithmic problems resolution
5. Combines geometric and optimization algorithms
6. Integrates rationalization

1. Extend the range of weaving patterns
2. Implement more optimization algorithms
3. Further explore different fabrication strategies

Thank you

Questions?

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