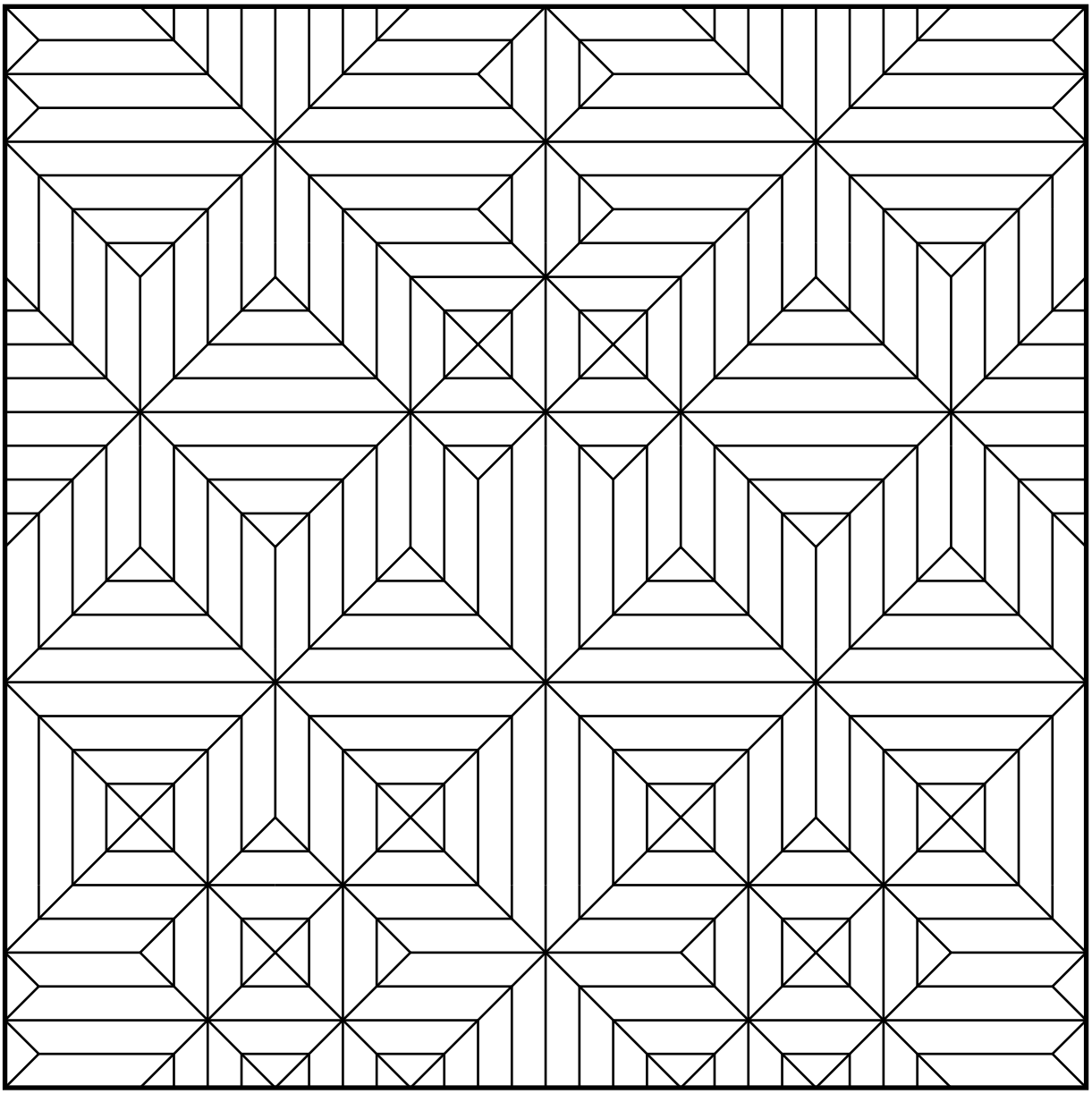
How to fold Box Pleated CPs

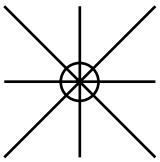
Part 1 – Understanding the CP

We'll start with a CP in the form which you will most likely encounter on the Internet, namely with no information included except for the creases.
This design of mine will become an (Old World) Porcupine and I chose it for this guide because it offers most of the challenges you will encounter in box pleated CPs while still being of an intermediate difficulty level.

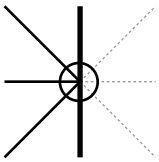


Before we start folding we will need to understand this CP a bit better.
How many flaps are there? Where are the flaps? How long are the flaps?

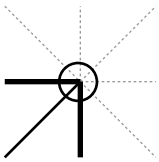
The end points of the flaps can be determined very easily in the CP. They are the points where both horizontals and both diagonals come together. For points on the edge of the paper you will have to add the missing lines that would be outside of the paper in thought.



centre flap



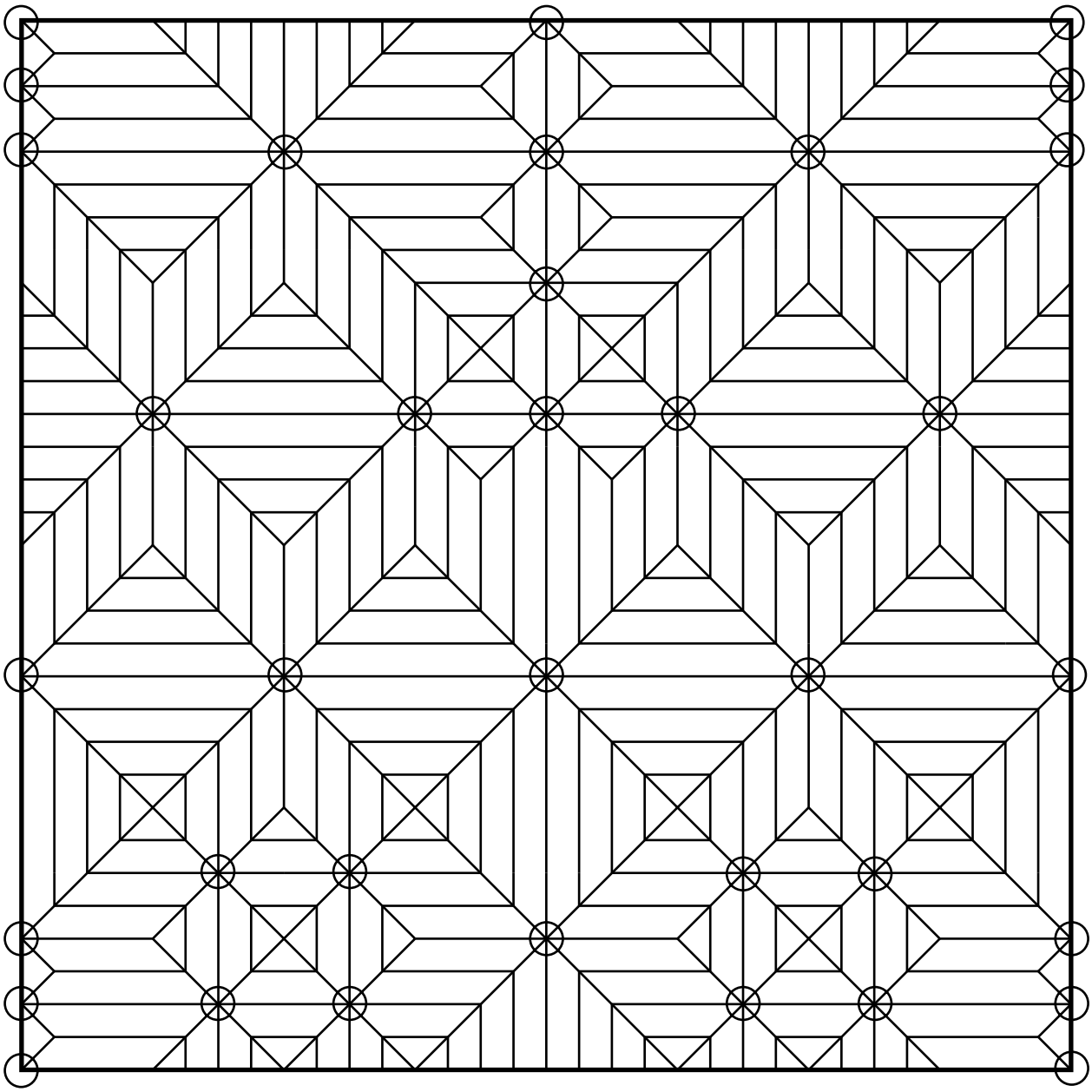
edge flap



corner flap

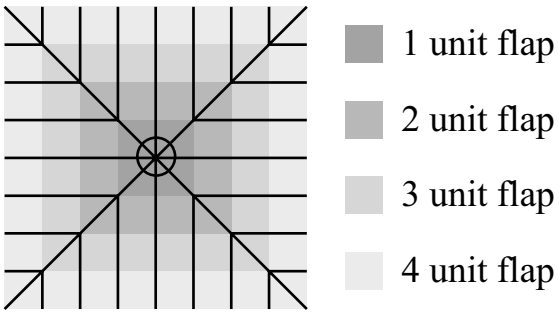
Guide by Gerwin Sturm (2007/01)
Porcupine 1.2 designed by Gerwin Sturm (2007/01/23)

Let’s apply this knowledge to the CP at hand.



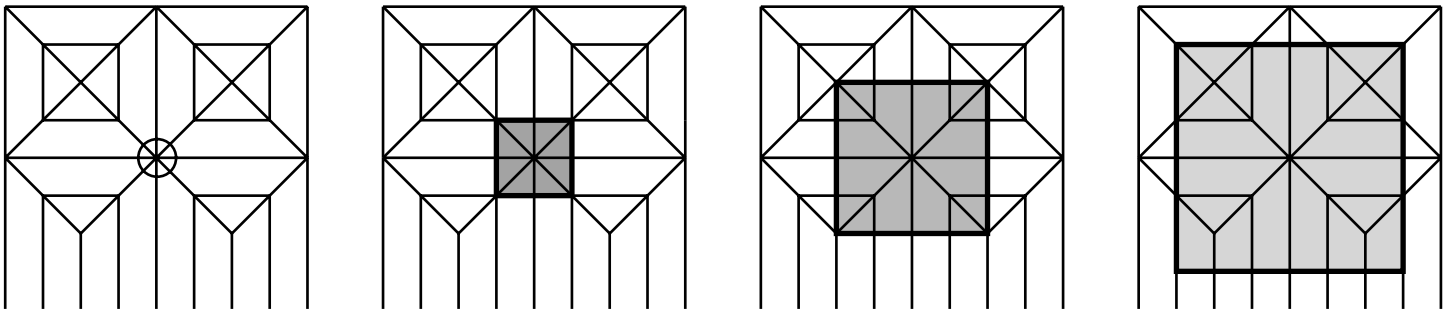
You should find 36 flaps in this CP which is quite a lot.
To determine the length of the flaps we first have to know how a flap looks like in the CP.

A flap will always have the form of a square in varying sizes with the just found end points as centre. An exception are edge flaps which might seem to be rectangles because a part of the square is outside of the paper.



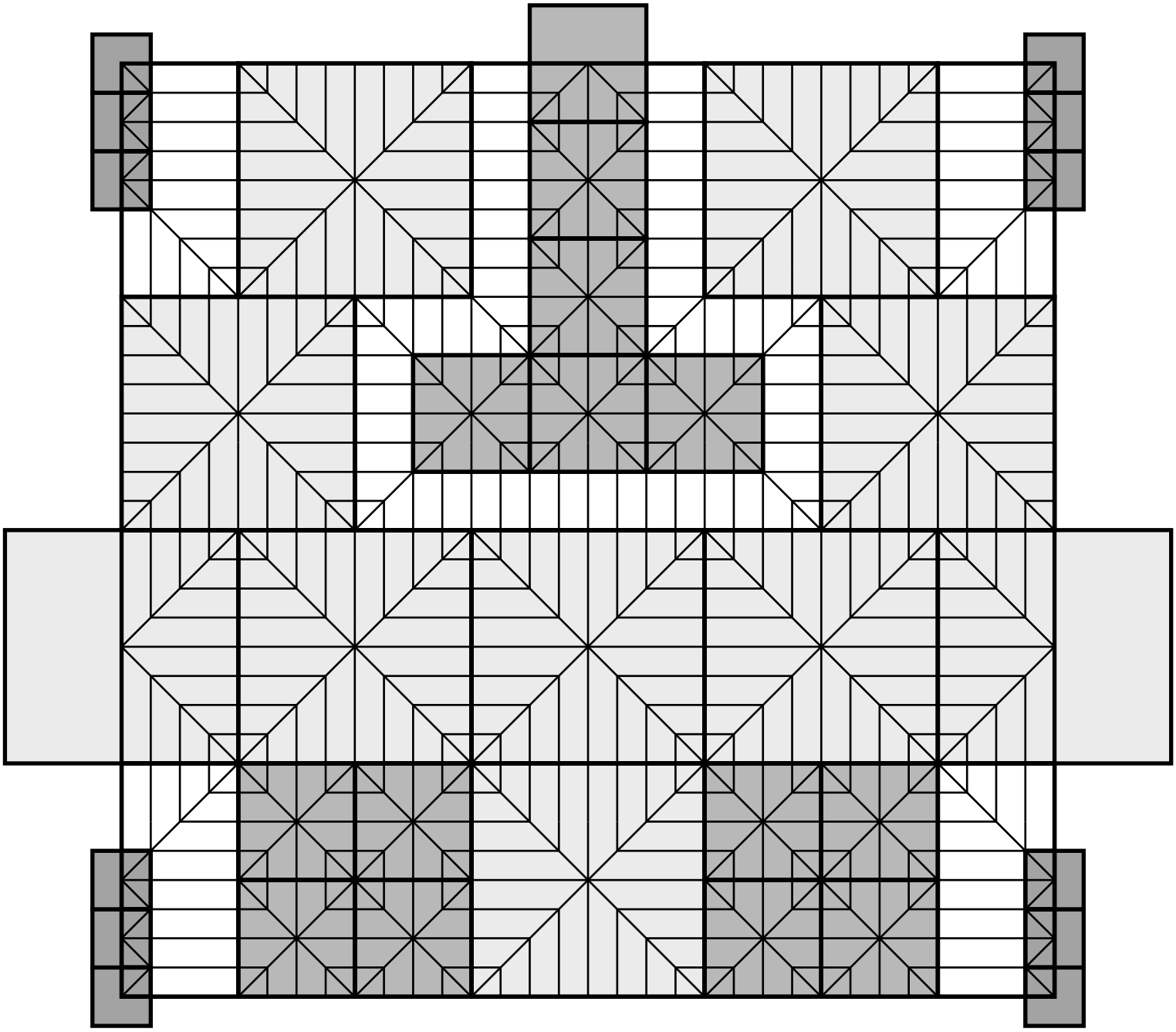
The crease distribution inside a flap square will always look exactly the same, so when trying to find the length of a flap we are looking for the largest possible square around the flap end point which looks like in the picture above.

Let’s try this for one point in the CP.



1 unit flap - ok 2 unit flap - ok 3 unit flap - fail

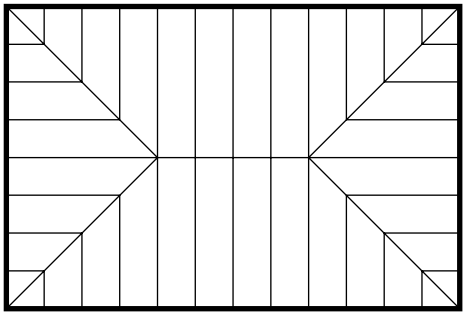
We see that this flap is 2 units long. Let’s do this for the rest of the CP.



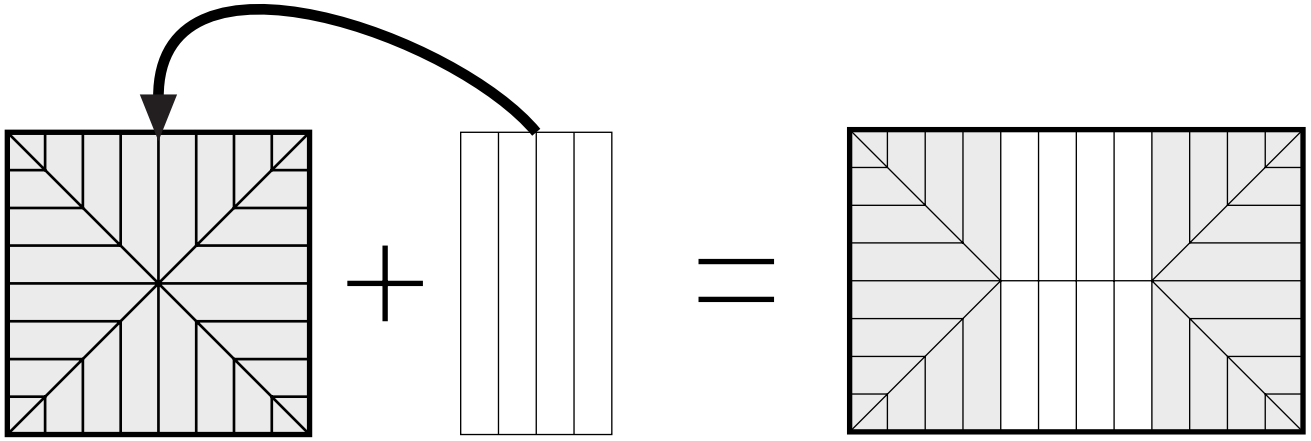
What is left between the squares are so called rivers, which will separate the flaps from each other. Those might for example be arms that separate the fingers from the rest of the model, a neck that separates the head from the rest of the model, a body that separates the arms from the legs, etc.

All of what I have explained so far works well for what I like to call “perfect” square packings, i.e. each flap only takes up the space it needs without any “wasted” space. In such cases the square packing only consists of squares and rivers.

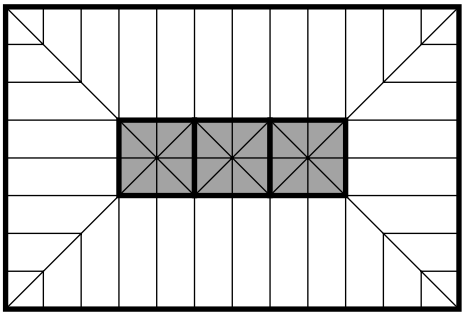
But there are several reasons when the designer needs to put more paper into a flap, f.e. so that the paper can be spread in the finishing process to create broader flaps for wings, clothes etc, or because a perfect square packing is not possible at all. A flap like this would look like the following drawing



When you look at this part closely you will notice that it actually is just a normal flap square with some pleats added in the middle.

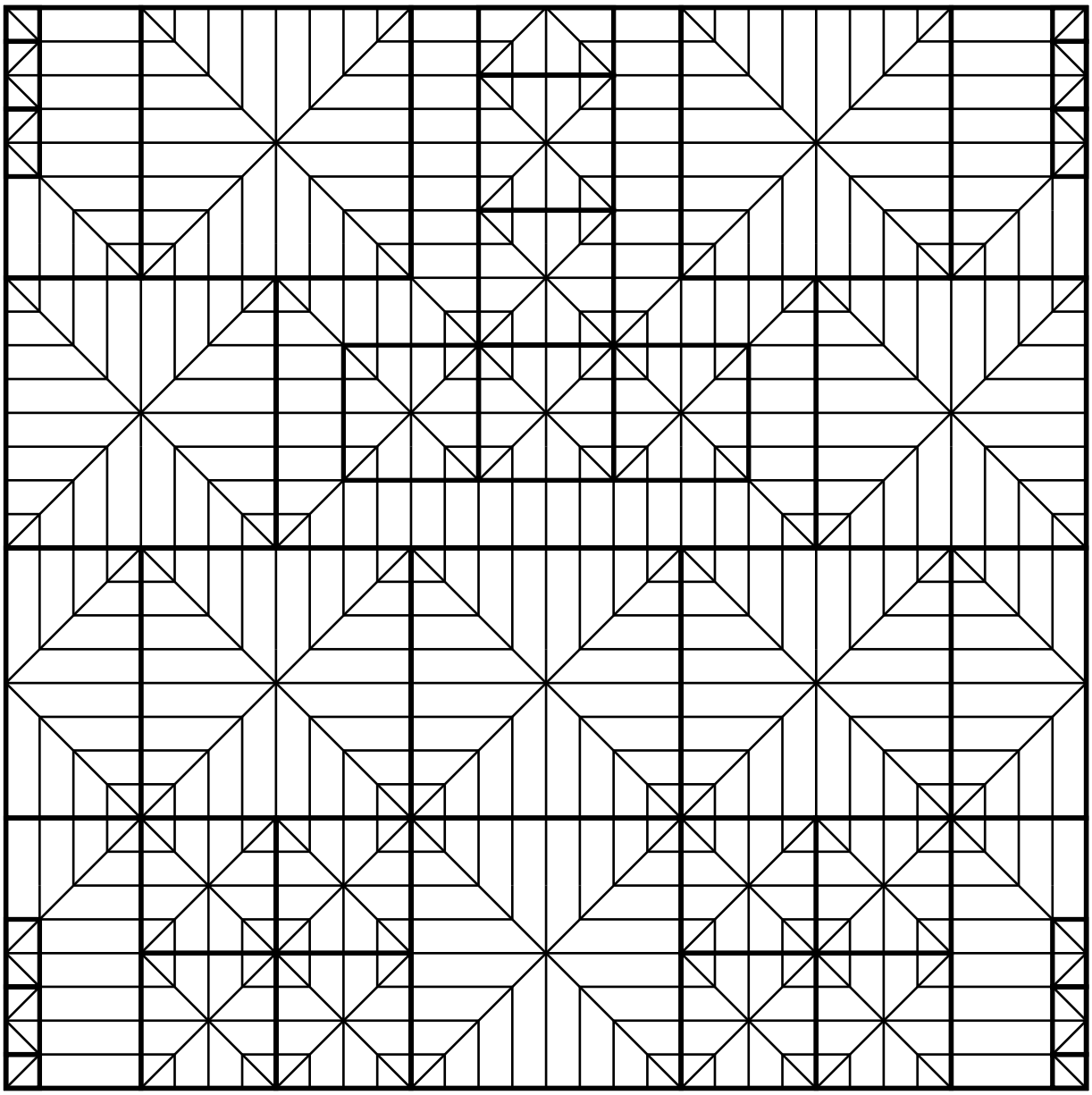


The four white pleats in the above drawing represent the extra paper you will have in this flap. How and if this extra paper will be used depends on the intended function of the flap.
One interpretation that always works and has the advantage to create a perfect square packing as described above is to turn the extra paper into several small 1 unit flaps.
The resulting CP would look as follows with several small flap squares surrounded by a river. A structure like this could for example be used as a leg with claws on the paws.



So after you have assigned squares to the CP you will have to look out for rectangles like this as well to complete the flap assignment. In the case of my porcupine this is not necessary since my CP uses a perfect square packing (by my own definition).

With this assignment of squares to the CP we have arrived at the form of CP I usually use when publishing CPs for my models, i.e. showing the CP together with the square packing.

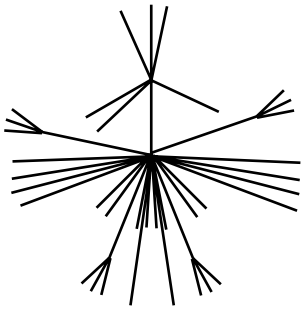


When it comes to specifying, which flap will become which part of the model there is no generic method to do this but you will learn from experience.
For example in the corners of this model you see some small flaps next to each other. Structures like this will in most cases become fingers or toes, which implies that the surrounding rivers will be arms or legs.

Using the information we gathered, you could also create a stick-figure of the model to get a better understanding of how the base will look like and to get an idea of what the different flaps might be used for.

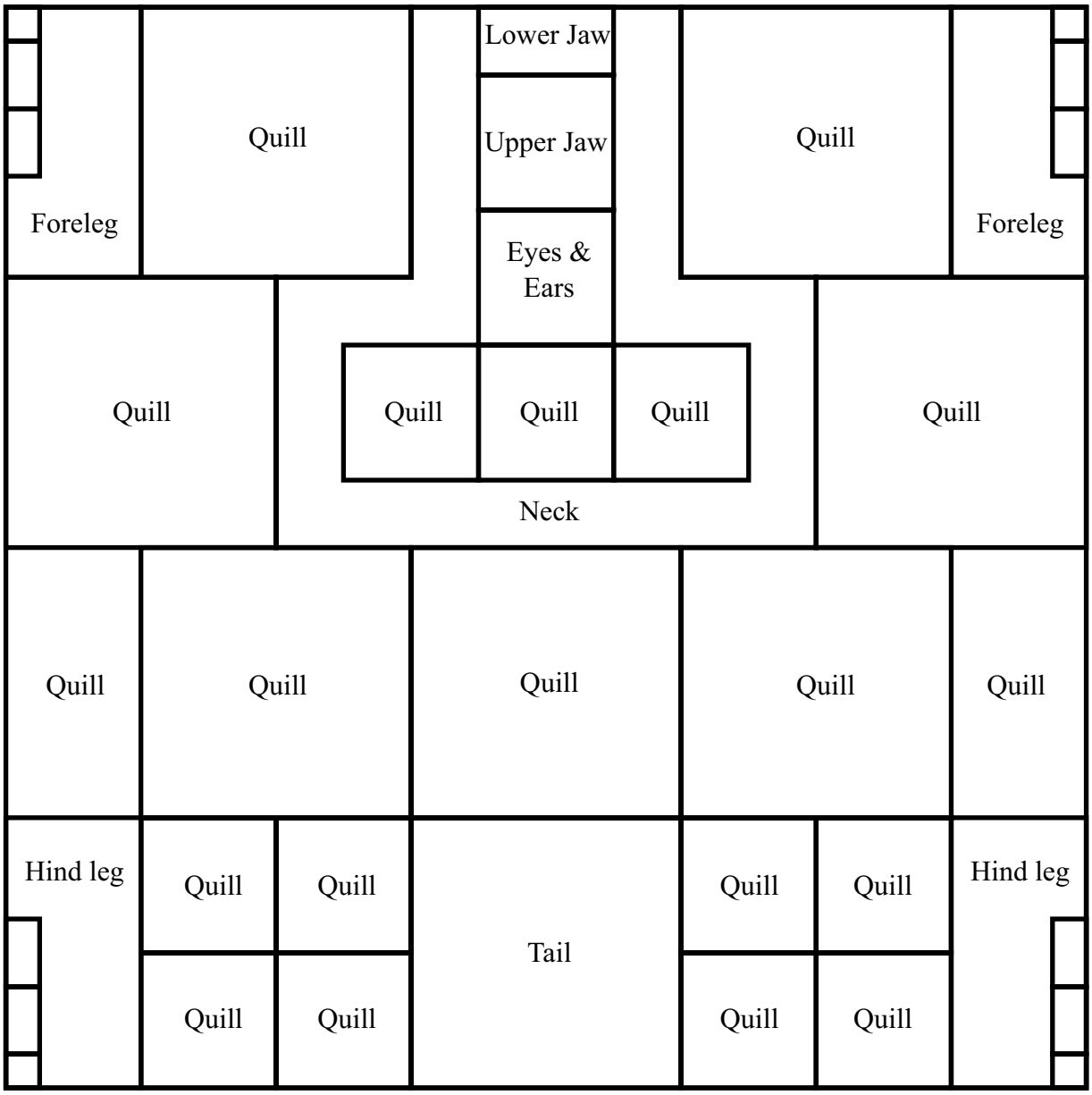
For constructing the stick-figure there are some simple rules to follow.
The length of a line in the stick-figure equals the lenght of the flap in the CP.
Flaps that are not separated by a river will start at the same point.
If two flaps are separated by a river the distance between their starting points equals the width of the river.

The stick figure for this CP will look like this.



For this specific model the stick figure doesn't really tell that much, because the model also makes use of the fact that due to paper thickness the flaps (which theoretically are all coming from the same point in the stick figure) will be spread apart and create a voluminous 3D body.
But at least theoretically the collapsed base will look similar to the stick figure.

To make things easier for the folder I usually show the meaning of the flaps in a separate drawing along with the CPs I publish.
When designing a box pleated model, the main challenge is to create such a square packing to fit the intended stick figure by arranging squares of different size into a square.



With this we have gathered the most important information from the CP and can commence with the folding.