

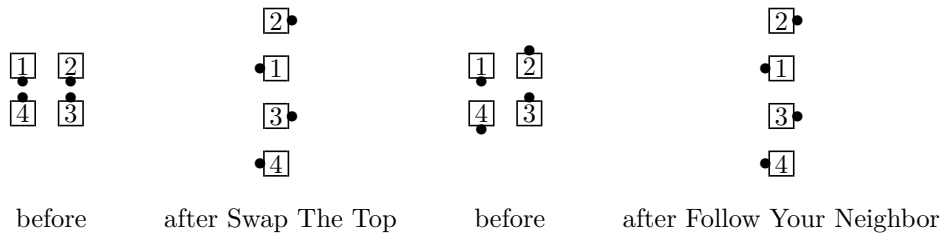
The Swap Concept

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1 Introduction

As motivation for the Swap concept, consider the relationship between Swap The Top and Follow Your Neighbor. For the belle, the dance action is identical, and for the beau, the dance action of Swap The Top feels very similar to the leads' part of a Follow Your Neighbor. In a sense, on a Swap The Top, the dancers wish they had a left-handed box to do a Follow Your Neighbor and do their best to pretend they do.¹



Similarly, a Swap Around is like a Box Circulate. Again, the dance action for the belle is the same, and the beau does something like the leads' part of a Box Circulate.

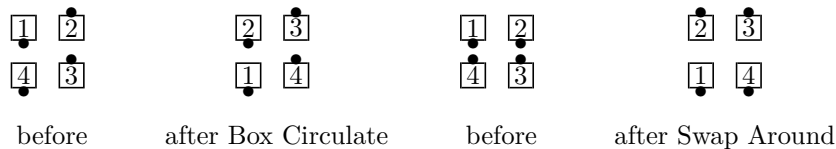
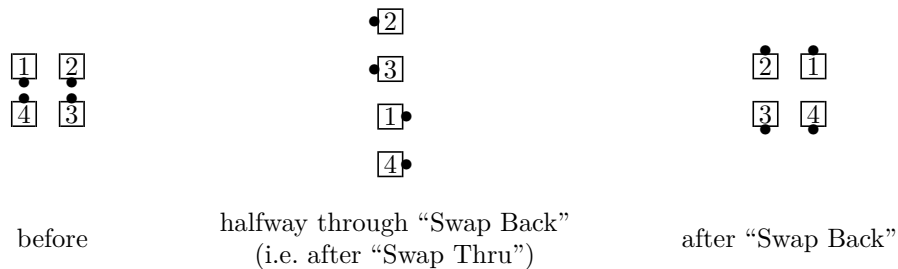


Table 1 asks us to extend this analogy to other calls. For example, Follow Your Neighbor is similar to Scoot Back, except everyone turns 3/4 instead. What happens if we apply the same transformation to Scoot Back?

¹Vic Ceder, on <https://www.ceder.net/def/swapthetop.php>, writes: “Perhaps Swap the Top should have been named Swap Your Neighbor.”

Table 1: A paradigm of related calls, with some entries missing.

base call	“swapped” call
Box Circulate	Swap Around
Scoot Back	?
Follow Thru	?
Follow Your Neighbor	Swap The Top
Scoot And Dodge	?



By analogy, on a “Swap Back,” the belle does an ordinary Scoot Back, as if they had a left-handed box. The beau, wishing there were a left-handed box, approximates the leads’ part of a Scoot Back, which happens to be the same as Box Circulate. As a whole, Swap Back is similar to Swap Around, except those walking forward interrupt after half with a Trade – just like how Scoot Back is similar to Box Circulate, except those walking forward interrupt after half with a Trade. If we stop halfway through, we get the transformed version of a Follow Thru, dubbed “Swap Thru” here.

There is no reason to stop here. Another Scoot Back variant is Scoot and Dodge, whose “swapped” version works just the same: the belle does a Scoot Back and the beau slides over without turning.



But there is no reason to stop here still!

In section 2, we give a simplified initial definition of the Swap concept, along with plenty of examples. In section 3, we fill in some necessary formal details of this definition, and in section 4, we add a mechanism to help dancers dance these calls smoothly. In section 5, we complete the definition by describing a number of natural extensions, and in section 6, we introduce some new calls and designators.

2 Definition

We now present a principled preliminary definition that produces the calls in the second column of Table 1 from the corresponding calls in the first column, including the missing entries. Note that we do not present the full definition of Swap at once; rather, we start with the simplest cases and gradually expand the definition over the course of this paper.

All of our definitions of the Swap concept instruct the dancers to make an adjustment, do the call, and then undo the adjustment. Much like similar distorted-formation concepts described in the same way, such as Parallelogram or Mimic, we expect that dancers will in practice dance many of these examples smoothly, without physically making the adjustment. However, we describe the concept in these terms both in service of providing a fully rigorous definition, and because dancers may still wish to perform the adjustment when first learning the concept or on particularly challenging usages.

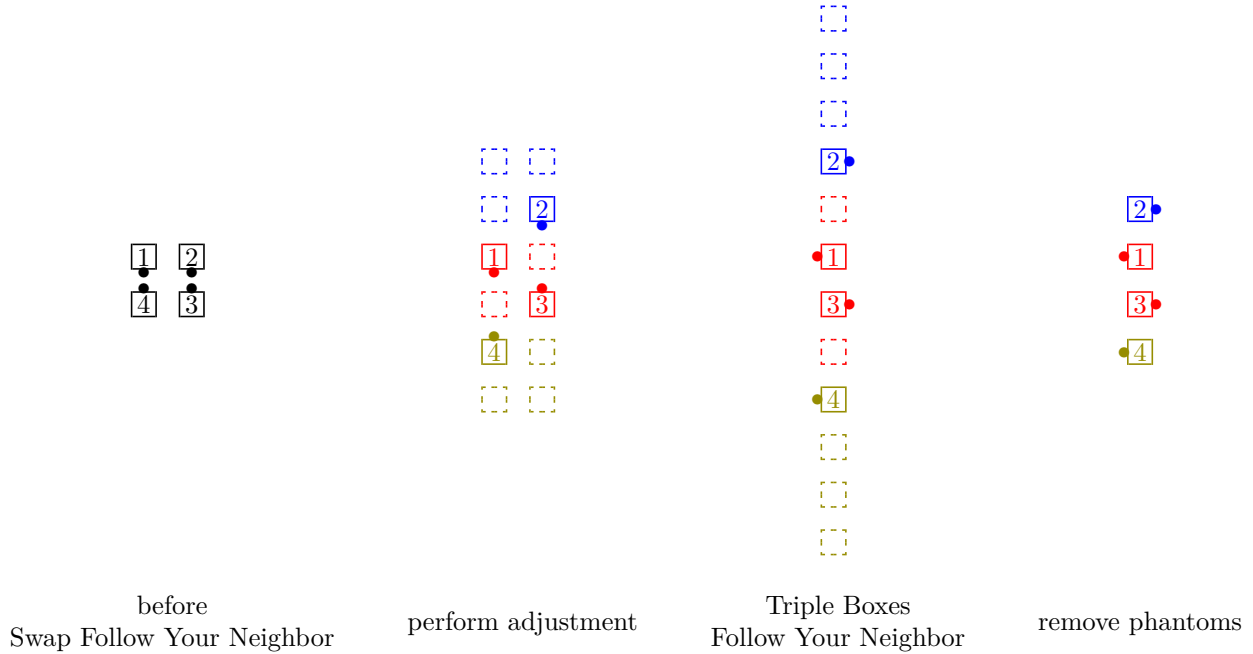
2.1 Swap from facing boxes

We start by defining the Swap concept restricted to the most natural case: facing couples. This case was the original inspiration for the concept – all entries in Table 1 involve doing a call from facing couples that is normally done from a mini-wave box.

From a facing box, to perform a Swap <anything>:

1. Expand the formation into a 2×6 by elongating along the axis that the dancers are facing.
2. Move the beaus one matrix spot backwards.
3. Do the call in Triple Boxes.
4. Collapse the formation by removing phantoms as appropriate.

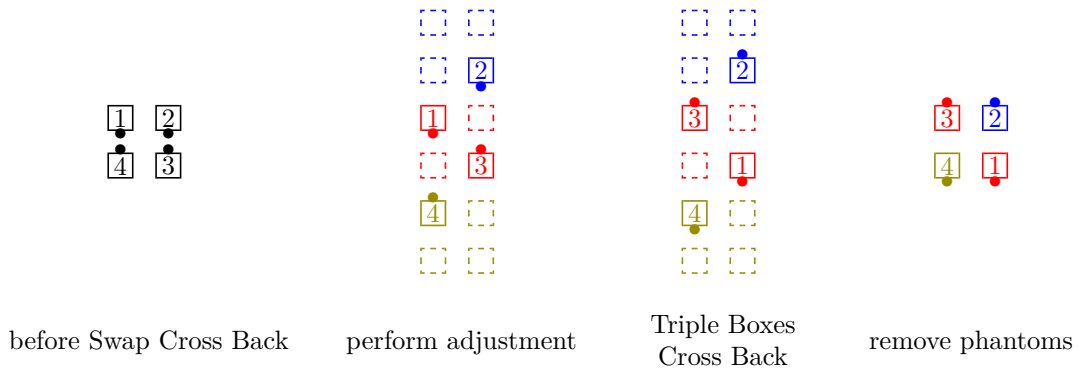
Example 1. Swap Follow Your Neighbor (= Swap The Top)



All steps of this procedure are unambiguous and well-defined, except for step 4. How do you know which way to squeeze out the phantoms, when it is not immediately clear like in Example 1? We describe the procedure in detail in section 3, but for now, we will leave this step imprecise, and only show examples where the adjustment is intuitively clear.

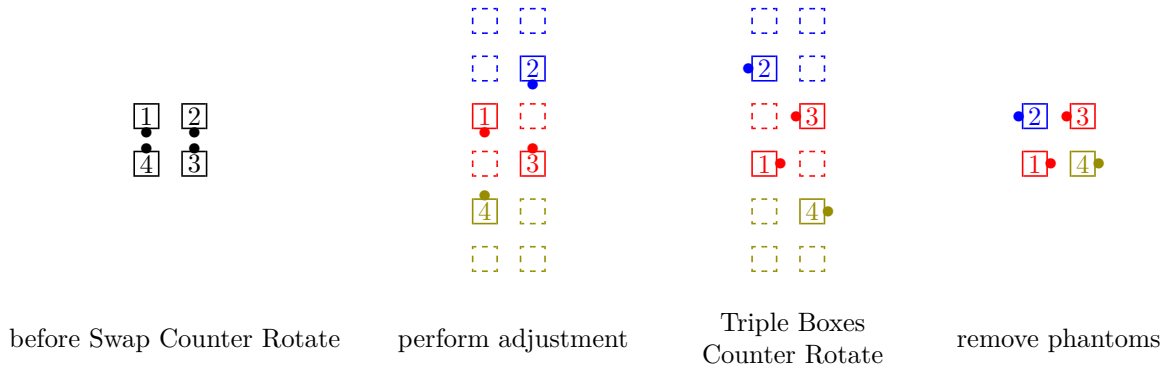
We leave it to the reader to check that this definition accounts for all four other entries of Table 1. Are there any other existing calls that can be generated by this concept?

Example 2. Swap Cross Back



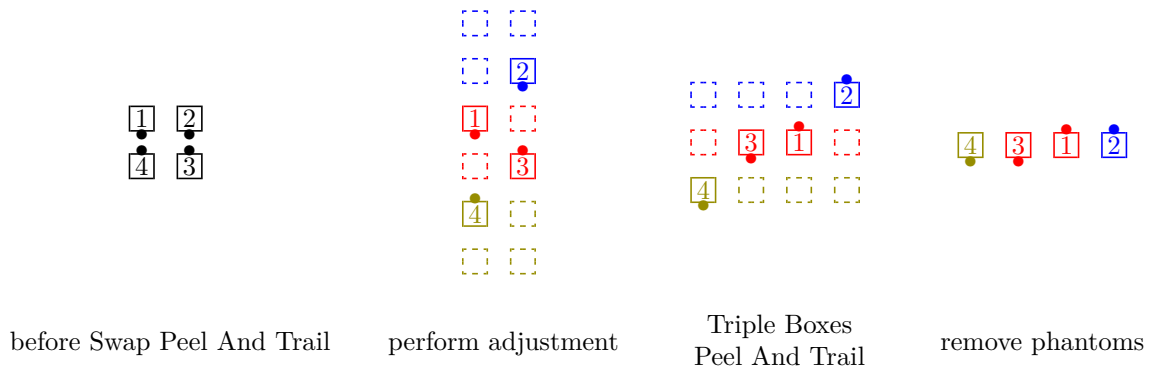
We see in Example 2 that Swap Cross Back is equivalent to Mirror Cross And Turn (except for the hand the trailers pull by with).

Example 3. Swap Box Counter Rotate



Example 3 shows that Swap Box Counter Rotate is equivalent to Mirror Short Cut.

Example 4. Swap Peel And Trail



As we see in Example 4, Swap Peel And Trail is equivalent to Single Stretch Turn To A Line.

The reader may verify that Swap Hinge is equivalent to Mirror Hinge, Swap Walk And Dodge is equivalent to Belles Walk Beaus Dodge, and Swap Zig Zag is equivalent to 1/4 In. Other examples to evaluate are Swap Couple Up and Swap Peel Off, which do not exactly correspond to existing calls.

2.2 Swap from non-facing boxes

Once more... why stop there?

We can perform Swap calls from any box, not just couples facing. The same people move, regardless of their facing direction.



The rule is no longer so simple as “the beaus adjust backwards.” How do you know who should adjust? There are a few different ways to think about it:

- The simplest formulation is “the trailing beaus and lead belles adjust.” We elaborate upon this idea in subsection 6.2.
- Another way to identify those people is to imagine drawing the line that goes through both handholds, and then rotating it slightly clockwise. The dancers the line intersects are the ones who adjust.
- More practically, the shape of the adjusted formation will always look the same on the floor, from the perspective of a dancer in the box. So one could memorize the shape of the adjusted formation above, and simply know to recreate that shape.
- Finally, one can note that after the adjustment, the dancers have a Phantom Tandem box.



before Swap <anything>

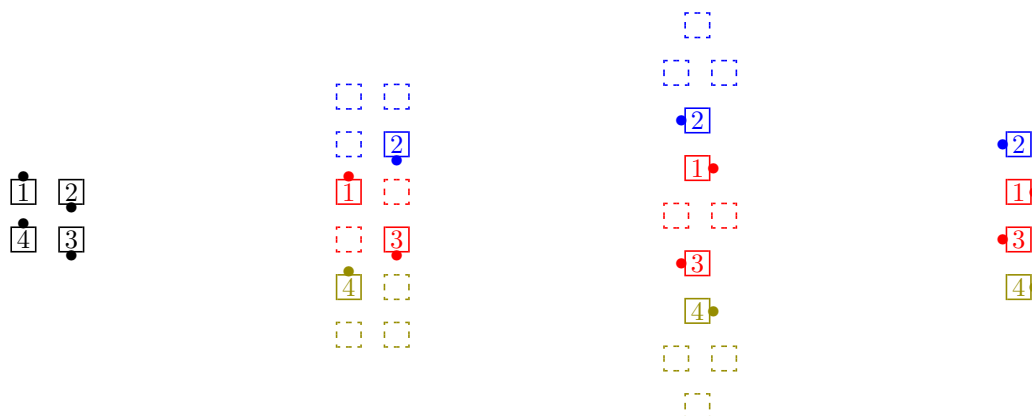
perform adjustment

The dancers should adjust so that each beau becomes a trailer in their Phantom Tandem pair, and each belle becomes a leader in their Phantom Tandem pair.

This formulation neatly captures the intuition that on calls in the Swap family, the belle goes in. Many other calls also have this nature, such as Dixie Style, Flutterwheel, and Half Sashay – indeed, the diagram above effectively shows the dancers performing a 1/4 Half Sashay (with some fudging).

We provide all of these formulations because different ways of thinking may work better for different people, but we believe the last two will be most helpful for dancing Swap at speed.

Example 5. Swap 1/2 Box Circulate



before Swap 1/2 Circulate

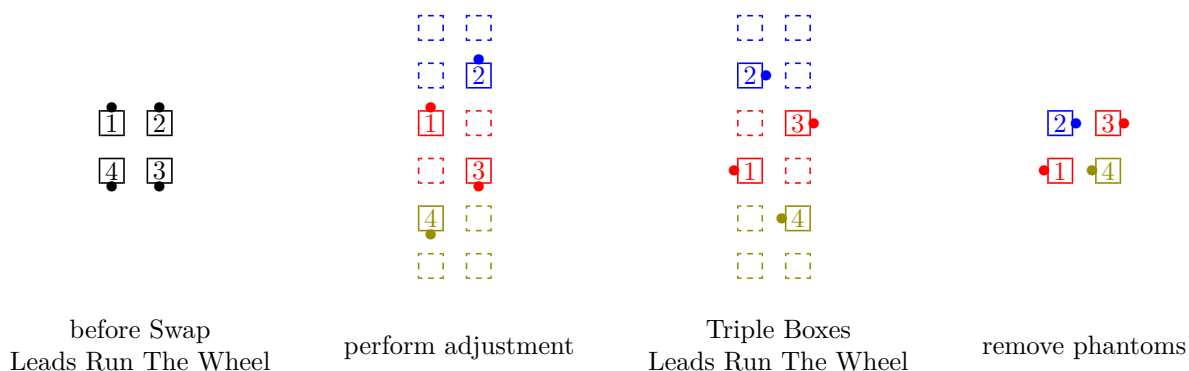
perform adjustment

Triple Boxes 1/2 Circulate

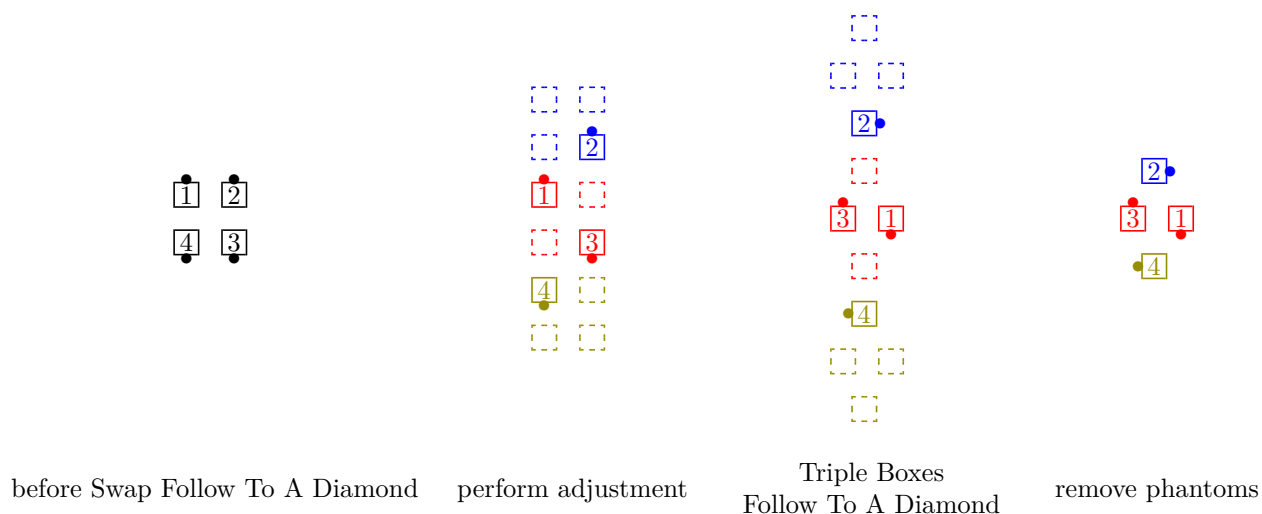
remove phantoms

Example 5 shows that Swap 1/2 Box Circulate is equivalent to Snake from a right-handed box.

Example 6. Swap Leads Run The Wheel



Example 7. Swap Follow To A Diamond (couples facing out)



Example 6 is similar to Nip And Tuck, but the belles go to the opposite spot. Example 7 happens to be equivalent to Mirror Beep Beep.

To provide further motivation for this definition, one can observe that Swap Scoot Back is choreographically equivalent to Belles Run from both facing boxes and boxes facing out.

3 Rules for collapsing phantoms

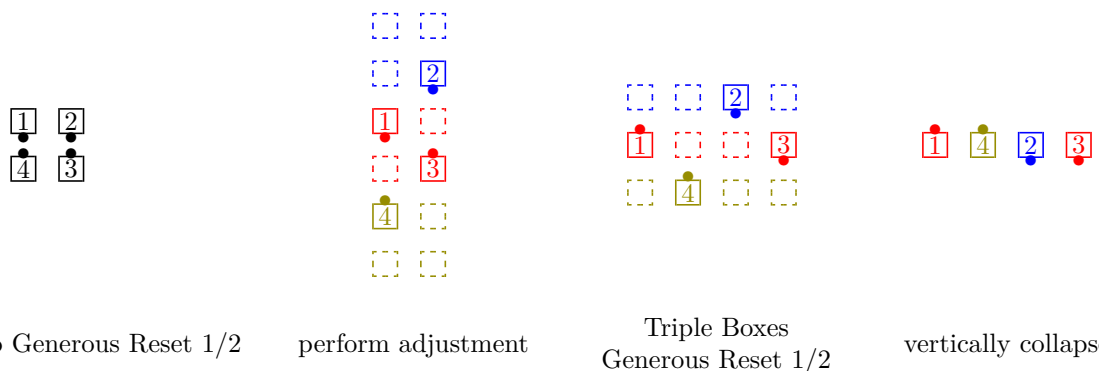
In this section, we formalize the meaning of the last step of the definition, and we fully explain what to do when phantoms need to be removed.

We believe that the nicest definition of the collapsing procedure involves two steps:

1. **Vertically collapse** the dancers in the *outside* triple boxes as much as possible.
2. **Horizontally collapse** the dancers in the *center* triple box if possible, taking the outsides with them.

What does this mean, exactly? We explain by example.

Example 8. Swap Generous Reset 1/2

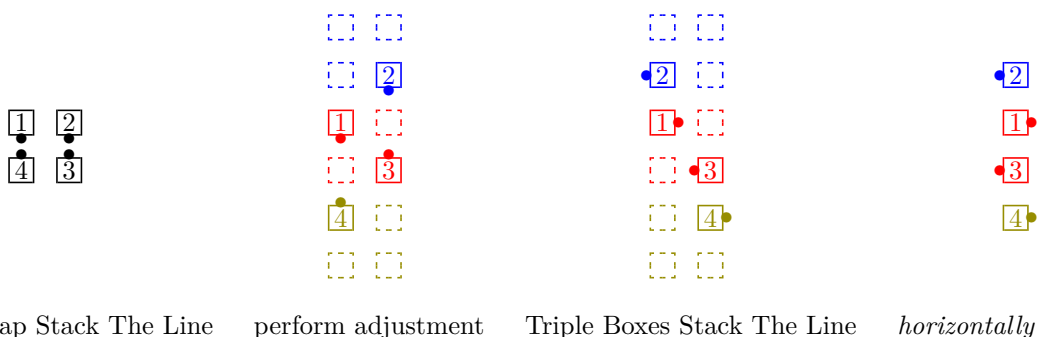


On the vertical-collapsing step, the goal of the dancers in the outside triple boxes is to get as close to the horizontal line through the middle of the center triple box as possible. In some cases, such as Example 8, they can in fact adjust all the way back onto this line. In other cases, such as Example 3 or Example 1, they stop because another live dancer is in the way.

Note that the dancers in the center triple box almost always stand still in this step. For instance, if the center triple box dancers in Example 3 tried to adjust vertically, they would end facing, and the full ending formation would be a Z. The one exception to this rule is that they are allowed to squeeze out a completely empty horizontal plane, as in Example 5.²

None of the examples given so far have required step 2, the horizontal-collapsing step.

Example 9. Swap Stack The Line (facing couples)



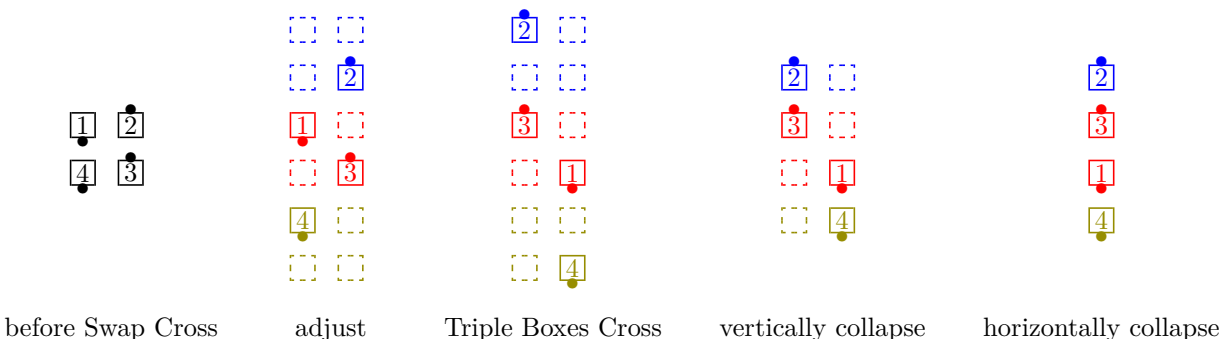
In Example 9, nothing happens on the vertical-collapsing step. The outside triple box dancers already have a live dancer in their way, and the center triple box dancers have no empty horizontal plane to squeeze out. On the horizontal-collapsing step, however, there *is* an available adjustment. The centers can collapse their 2x2 matrix into a mini-wave. They drag the outsides with them, and the ending formation is a left-handed wave. The call is equivalent to Mirror Hinge.

We comment that the choice made on the final adjustment here is the opposite of the one that would be made on a Mimic call. That is, there are two ways to squeeze out phantoms and make a compact formation, and the Mimic rules would say to opt for a box (to match the shape of the starting formation) rather than a line (as we do here). Why do we define the concept this way? In part, this is an aesthetic judgment that is difficult to explain, but we make some effort to provide a principled reason: this method of adjustment preserves the relative order of the dancers within each triple box. In particular, if we were to collapse Example 9 into a box, dancers 1 and 3 would switch their vertical order, shearing the center triple box. Since the Swap distortion has a distinguished axis, we would like the removal of the distortion to respect this axis.

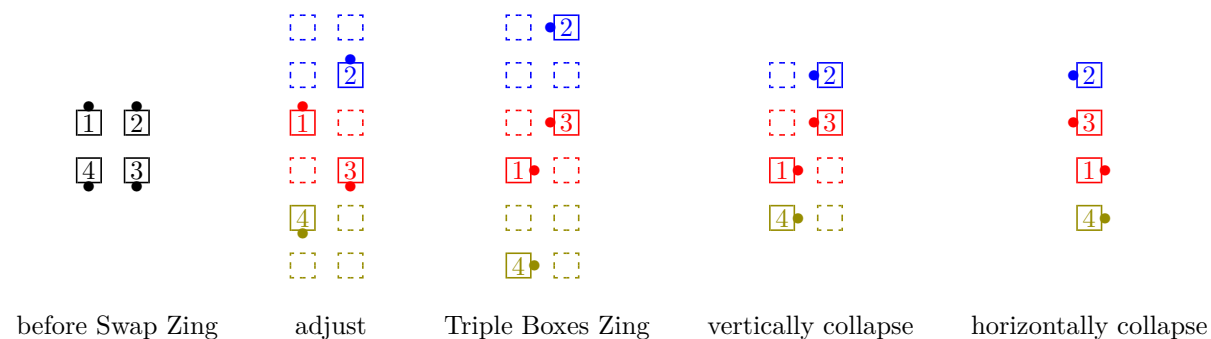
²Actually, it may be preferable to think of this as a step 3 of the collapsing procedure, since in Example 15 and Example 18 it is important that the outsides go first.

Here are a few more examples of calls where the distortion goes away in this manner.

Example 10. Swap Cross



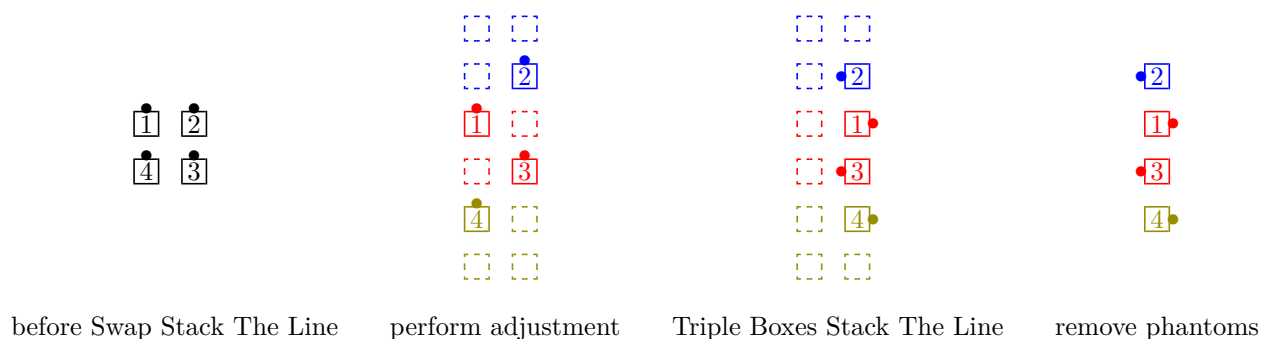
Example 11. Swap Zing



Both of these examples involve some collapsing in both steps. We see that Swap Cross from a left-handed box is the same as Stretch Single Bounce (Example 10), and Swap Zing from a box facing out is the same as Beaus U-Turn Back away from center, then all Follow Thru (Example 11).

Sometimes, the way the distortion goes away may be surprising!

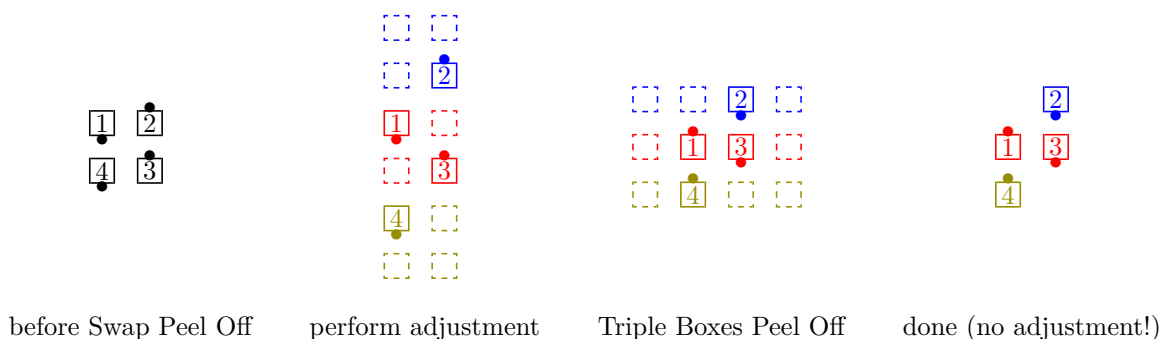
Example 12. Swap Stack The Line (completed DPT)



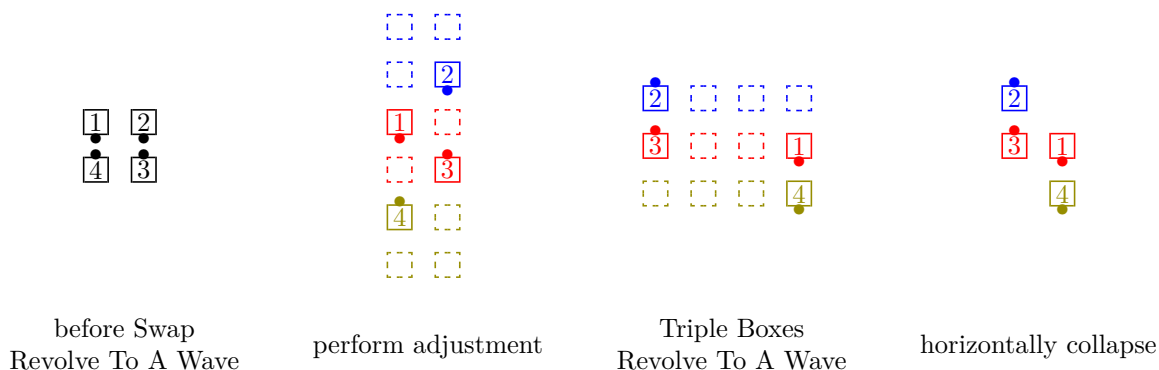
The meaning of “the centers take the outsides with them” in the horizontal-collapsing step may remain unclear. The intent is that the outside triple boxes, which each contain a single dancer, should not fully recenter themselves onto the vertical line down the middle of the triple boxes. Instead, they should only recenter as much as the center triple box dancers do.

As an outside triple box dancer, how do you know how much to recenter? If you are ever considering centering your own formation horizontally, it’s because there wasn’t space in the center triple box for you to collapse vertically. The reason there wasn’t space is because a person was there. Glue yourself to that person.

Example 13. Swap Peel Off



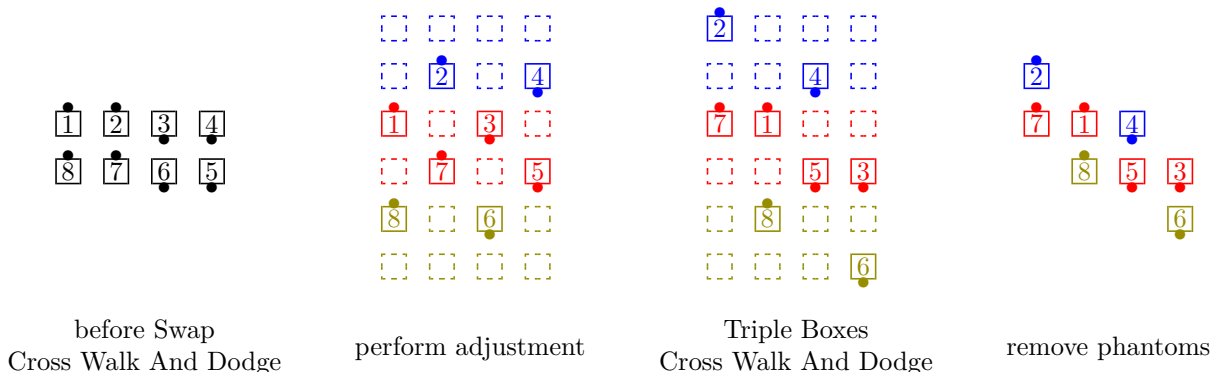
Example 14. Swap Revolve To A Wave



As some motivation for this rule, we remark that Example 13 dances more smoothly than if the outsides were to recenter and form a single 1/4 tag, since this adjustment would involve the outside triple box dancers moving opposite the direction they were just turning.

The center of mass of the subformation sometimes moves after collapsing. If this occurs, the original center line of the subformation must be preserved when putting multiple subformations back together.

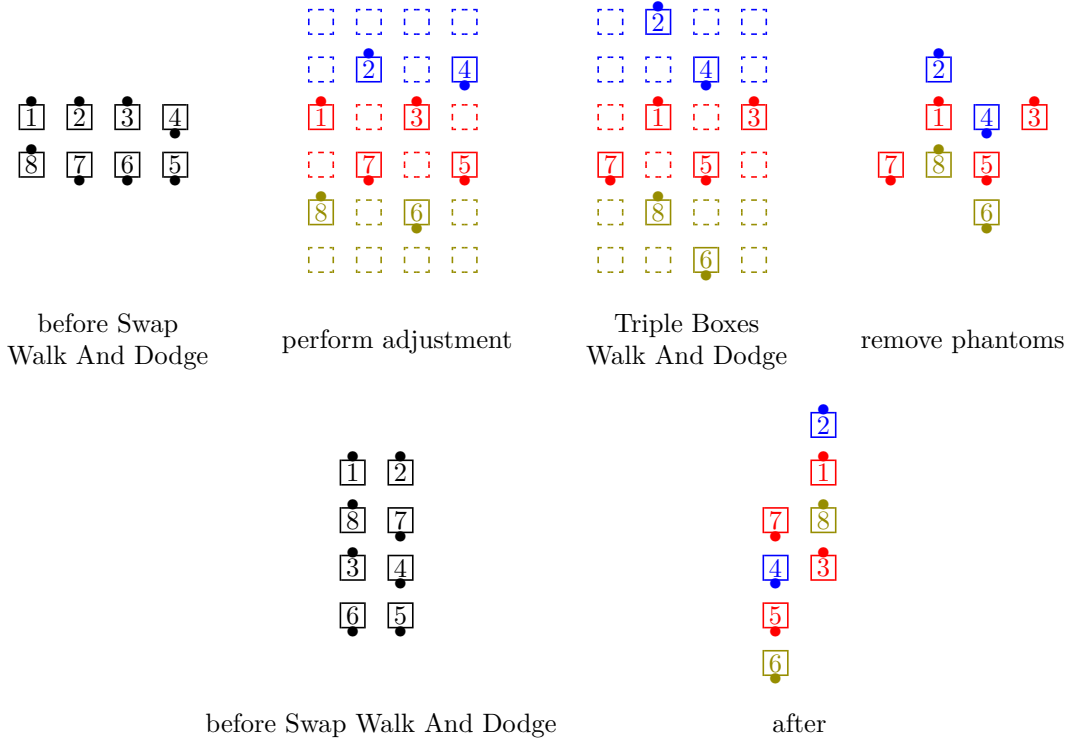
Example 15. Swap Cross Walk And Dodge



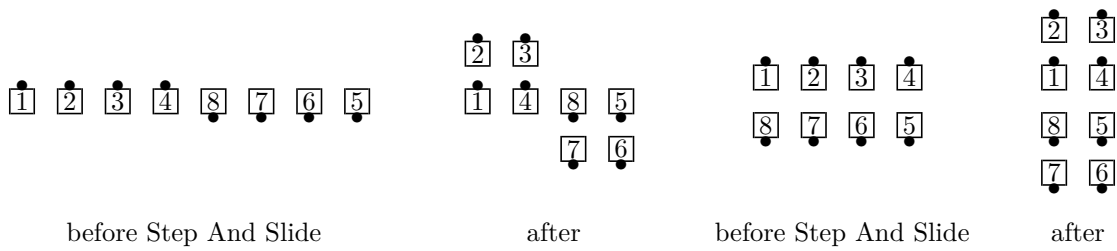
Dancers in Example 15 might be tempted to do a 1/2 Press Back after removing phantoms in order to realign the subformations. However, the center line of the left subformation is still between dancers 1 and 8, and this center line must remain aligned with the center line of the right subformation, which is between dancers 4 and 5. The net effect of the call in this case is therefore Beaus Stable Right Loop 0, Belles Press Left; ending in Z Lines.

To further emphasize this point, compare how the subformations are put back together in Example 16. Note that strong precedent for this kind of behavior can be found in a number of very familiar calls, such as Step And Slide (Example 17).

Example 16. Swap Walk And Dodge (from different formations)

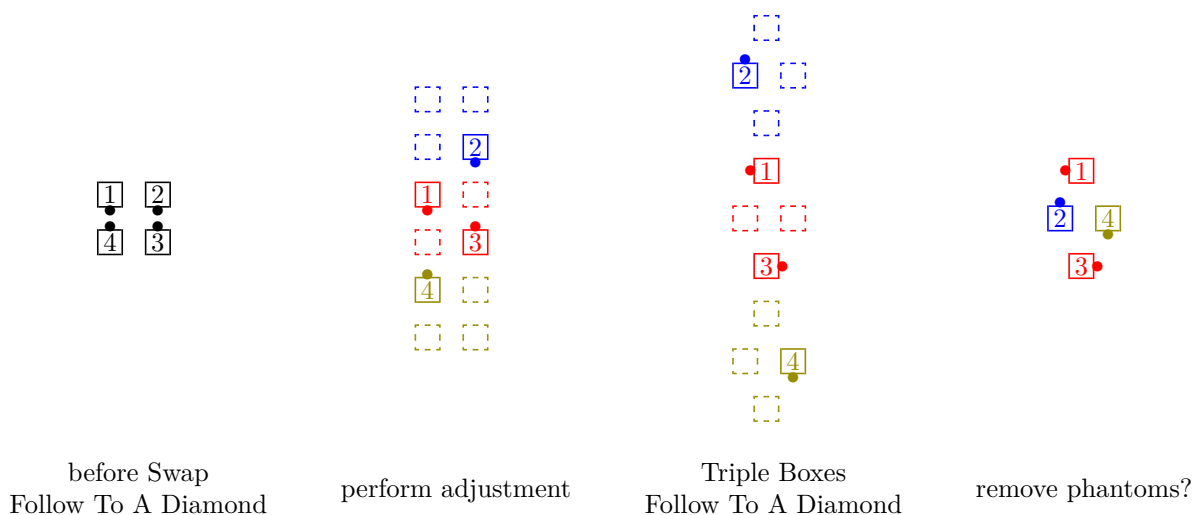


Example 17. Step And Slide (for illustrative purposes)



Finally, there is one last detail to address. In some cases, it may be unclear whether the outside triple box dancers believe there's someone "in the way" for the vertical-collapsing step.

Example 18. Swap Follow To A Diamond (facing couples)



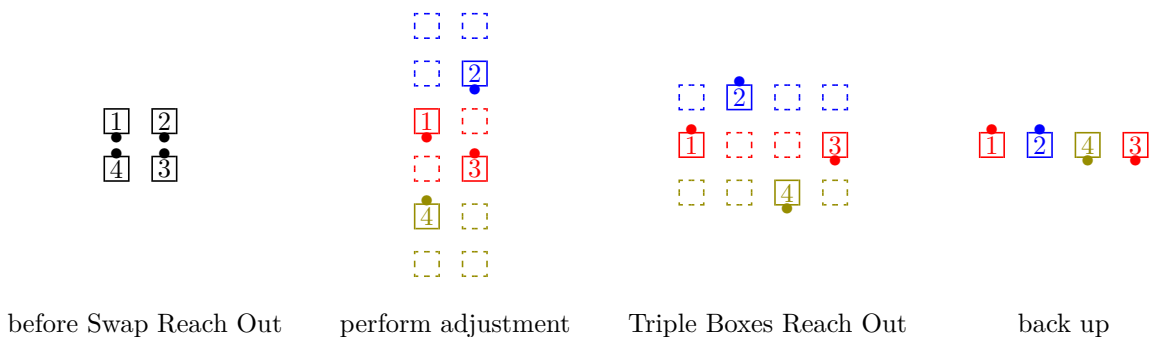
In cases like this, we choose to only consider dancers lined up to matrix spots exactly to be “in the way.” Therefore, collapsing vertically is allowed in this instance, and Example 18 ends in a diamond. We recognize that some readers may find this usage unaesthetic, in which case we suggest that they not call it.

One other concern the reader may have about Example 18 is that it dances extremely poorly if the call is done by physically making the distortion. We address this concern presently in section 4.

4 Doing it smoothly

Sometimes, physically making the adjustment is not only clunky but actually forces people to walk backwards to undo the adjustment.

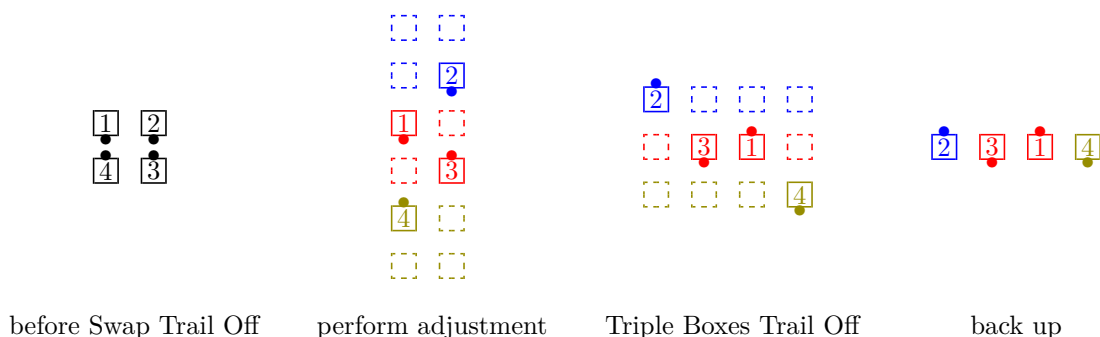
Example 19. Swap Reach Out



In Example 19, the beaux have effectively done a Trail Off with each other. However, if they physically perform the Swap adjustment, they back up, flip to the right, and back up again. It would have been much nicer if they had simply waited for the belles to do the call, then done a Trail Off. Another way to think of this is that if the beaux know they’ll end up in the center, they can do a Press Ahead and then do the call in the center triple box, instead of doing a Press Back and then doing the call in the outside triple boxes.

Is it always safe to let the belles go first in situations like Example 19? Alas, not always.

Example 20. Swap Trail Off



The beaus again wish to Press Ahead and do the call in the middle in Example 20, but this time the dance action is smoothest if the beaus go first, and the belles wait. Then the beaus could do what is effectively an Extend and Squeeze, after which the belles can do what is effectively an Extend and Trade.

What is the difference between Example 19 and Example 20? In particular, how can you tell who should go first? In general, this question only makes sense if full vertical-collapsing happens, and the answer is “the people who end on the outside.”

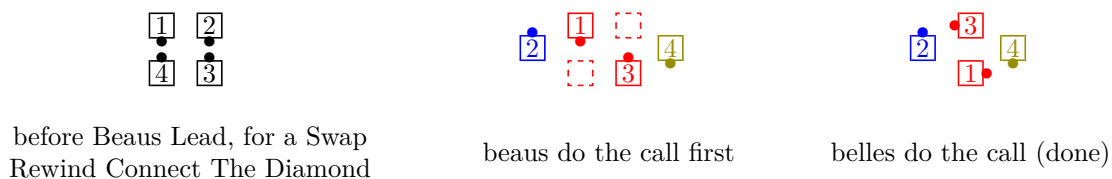
However, we do not think it reasonable to expect the dancers to fully compute the ending formation of the call before they start to move. As an aid, we suggest that the caller cue the “nice” traffic pattern explicitly. In particular, the caller could say “Belles Lead, for a Swap Reach Out” for Example 19, and “Beaus Lead, for a Swap Trail Off” for Example 20. The caller implicitly promises that full vertical-collapsing will occur when cuing anything like this.

Example 21. Belles Lead, for a Swap Scoot Apart



This bit of assistance can make some particular instances, such as Example 18, dramatically more pleasant to dance. For Example 18, the caller would cue “Belles Lead, for a Swap Follow To A Diamond.” Compare with Example 22.

Example 22. Beaus Lead, for a Swap Rewind Connect The Diamond



(The base call in Example 22 is the same as Box Counter Rotate followed by Box Circulate 1/2, or the first part of Breaker for the centers.)

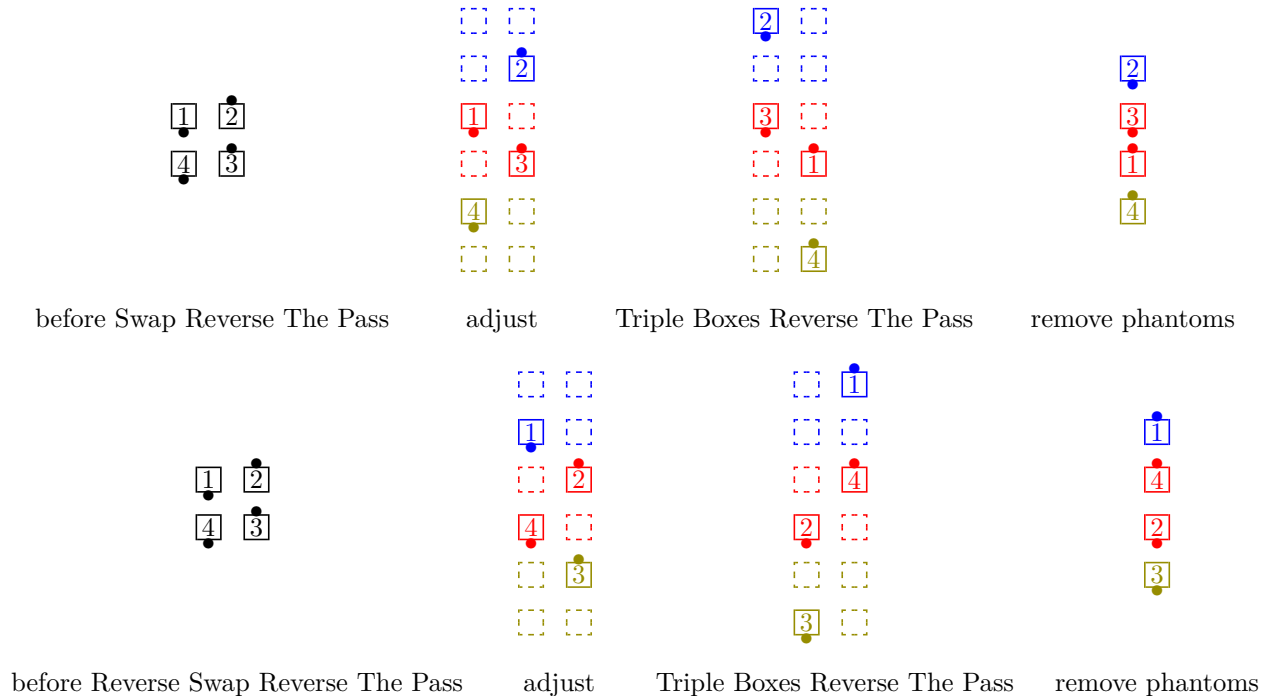
5 Further extensions

In this section, we introduce a number of additional features of the Swap concept.

5.1 Reverse Swap

If the Reverse modifier is given, make the opposite kind of adjustment at the beginning of the call. Everything else is the same.

Example 23. (Reverse) Swap Reverse The Pass

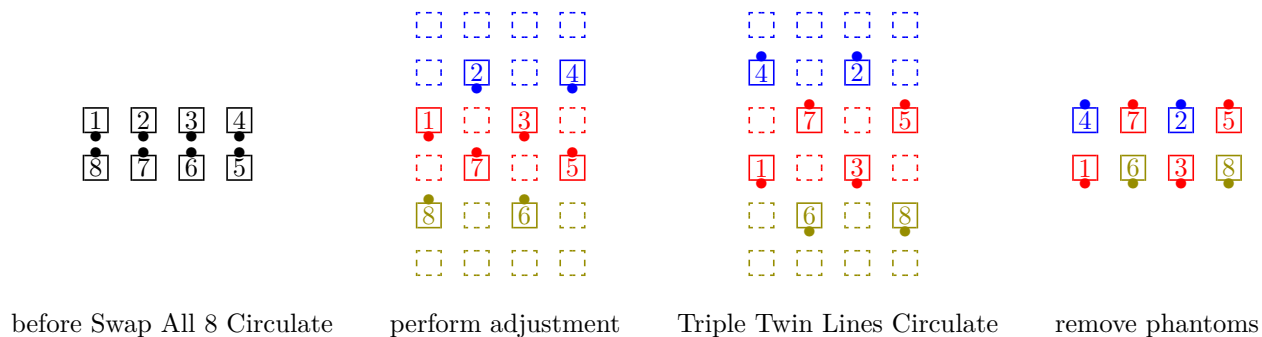


Contrast the two cases of Example 23: the former is a Tandem Twosome Single Wheel, while the latter is a Tandem Twosome Single Turn And Deal (except dancers 2 and 4 do a Wheel Thru-like action with each other).

5.2 Eight-person calls

From generalized lines, the Triple Boxes formed by the Swap adjustment can be put together to form Triple Twin Lines. One can therefore use 8-person calls with the Swap concept.

Example 24. Swap All 8 Circulate

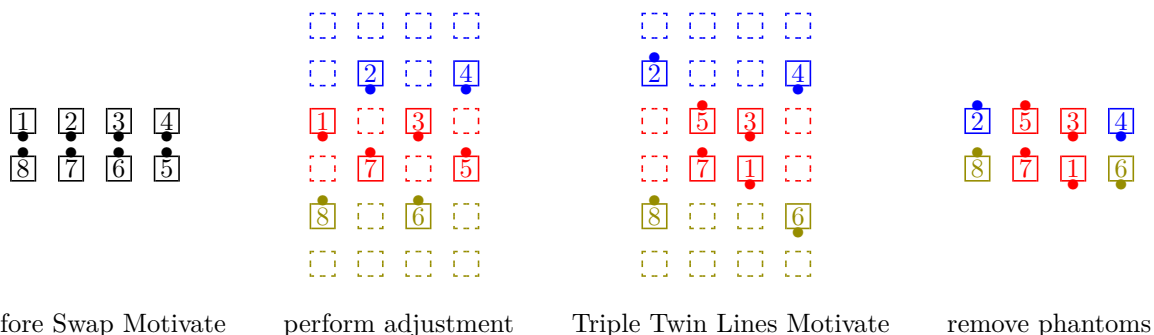


Example 24 has the essence of a “Scatter Swap Around,” if such a thing were legal.

With 8-person calls, the number of ways one might need to squeeze out the distortion grows dramatically,

and the procedure may become fraught. We recommend limiting usage to cases where the removal of the distortion is particularly clear.

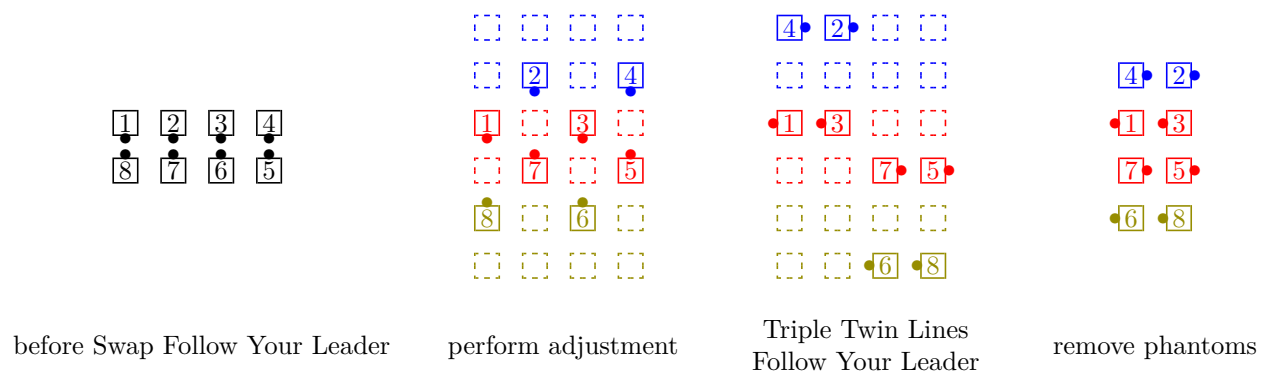
Example 25. Swap Motivate



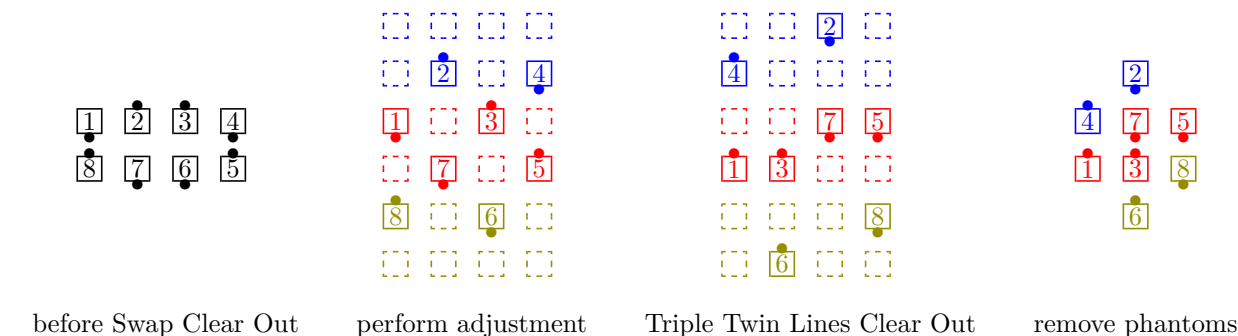
As a point of amusement, observe that Example 25 is choreographically equivalent to Belle Couple Diagonal Box Swap Around. (This is not a coincidence!)

In more complicated cases, the same rules as usual apply: first collapse the outside triple twin lines vertically, then collapse whoever ends up in the center triple twin lines horizontally, dragging the outsides with them. Work in the entire 8-person formation; do not apply the rules to subformations separately.

Example 26. Swap Follow Your Leader



Example 27. Swap Clear Out

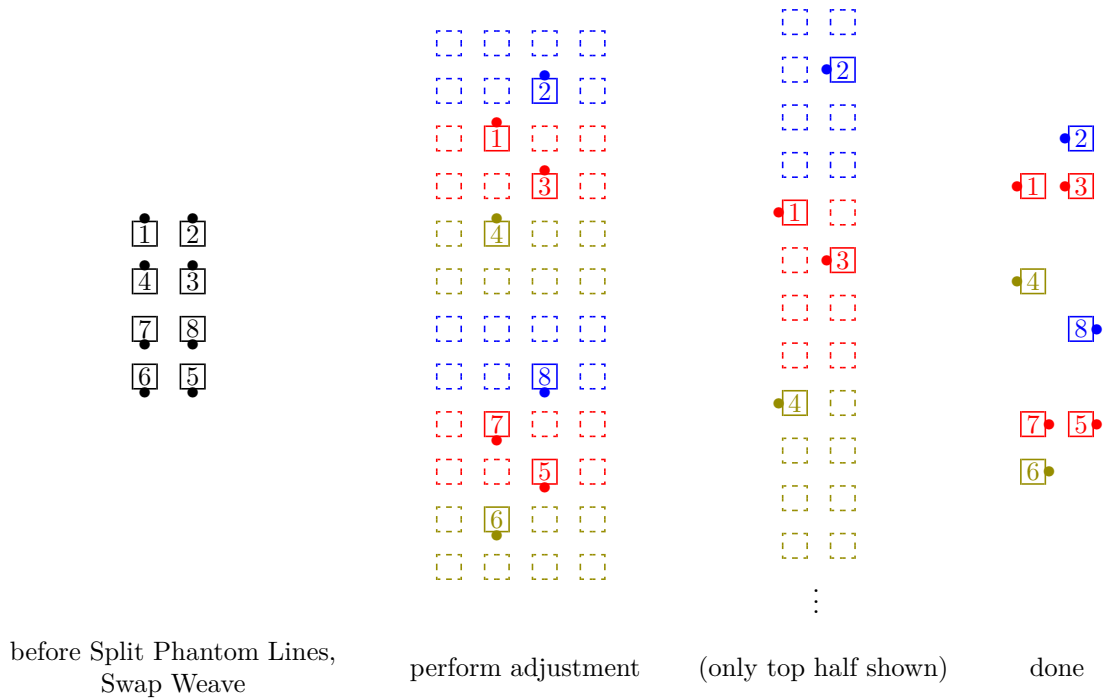


We remark that Example 26 feels somewhat similar to a Swap The Windmill, except that the outsides circulate the wrong way, and the centers just do a The Windmill instead of a Spin The Windmill.

5.3 Working with phantoms

Since the definition of the collapsing procedure refers to the locations of real people, dancing Swap with phantoms can be exceedingly challenging.

Example 28. Split Phantom Lines, Swap Weave



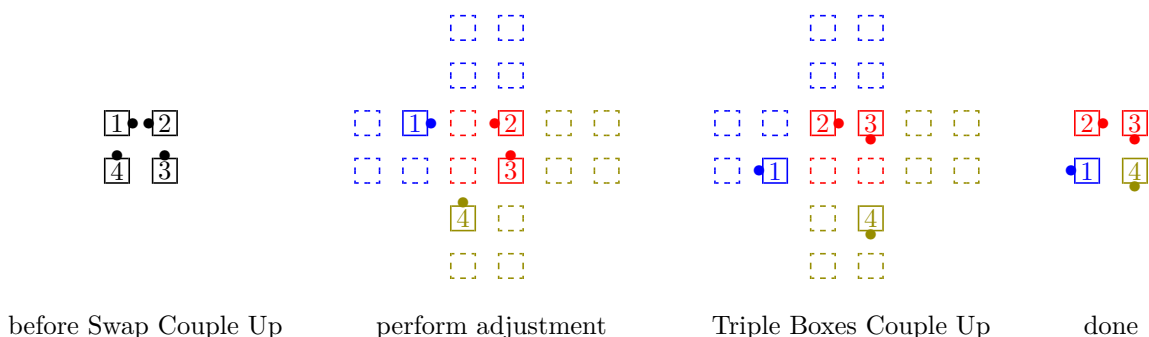
In line with several other usages of phantom concepts, we assume local symmetry unless otherwise specified by the caller. In other words, dancers 1 and 4 of Example 28 work as though starting in a left-handed box, and dancers 2 and 3 work as though starting in a right-handed box. We feel that this is a necessary evil – if phantoms were not tracked, then much more aggressive collapsing would occur. For instance, Example 28 would end in left-handed two-faced lines, and Swap Box Circulate would no longer be equivalent to Swap Around when phantoms were involved.

Given the precarious nature of these usages, we recommend calling them with extreme caution, if at all.

5.4 T-Bones

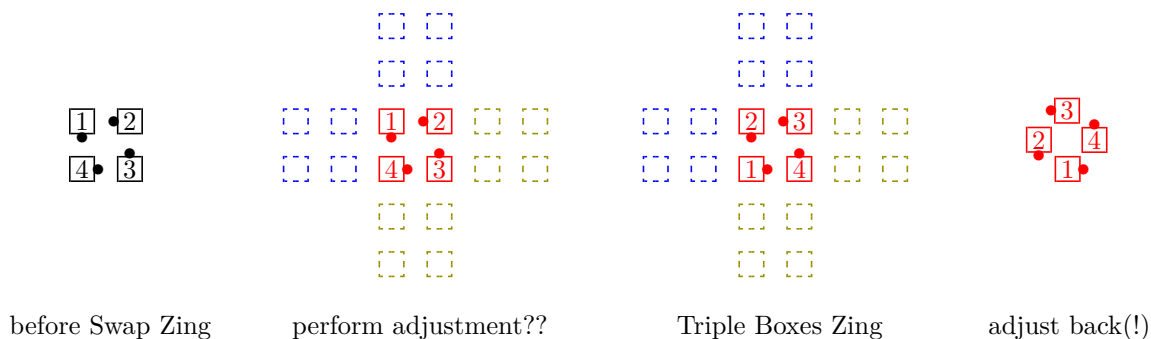
The Swap concept can be done from T-Bones, where each dancer works in the box matching their own orientation. Since T-Bones are a kind of phantom formation, they should be treated with the same level of caution.

Example 29. Swap Couple Up (T-Bones)



This can become unreasonably tricky. We strongly recommend against calling Example 30.

Example 30. Swap Zing (T-Bones)



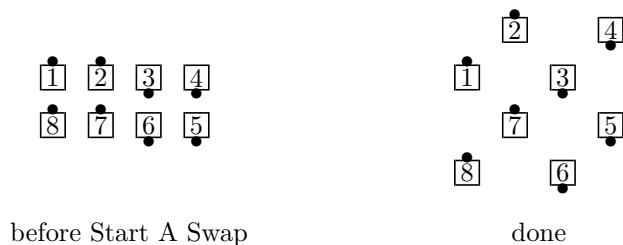
6 New calls and designators

The Swap concept naturally gives rise to a few new calls and designators, all of which can find applications unrelated to the Swap concept.

6.1 The Swap adjustment in isolation

One can imagine doing either the starting or ending adjustment of the Swap concept without doing any of the other steps. We refer to these calls as *Start A Swap* and *Like A Swap* respectively, in analogy to Like A Rigger.

Example 31. Start A Swap

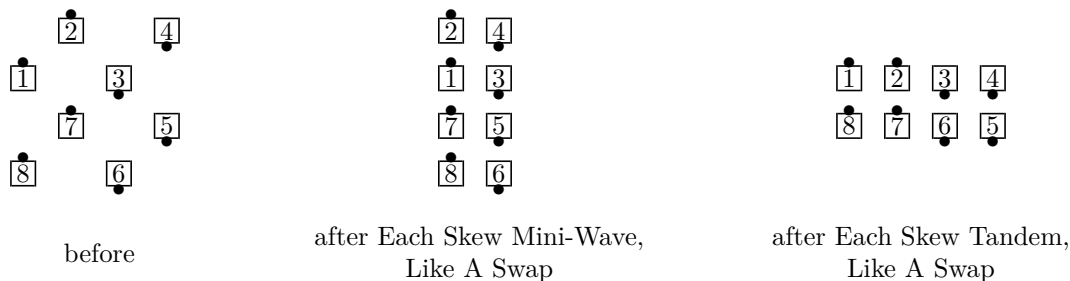


Example 32. Like A Swap

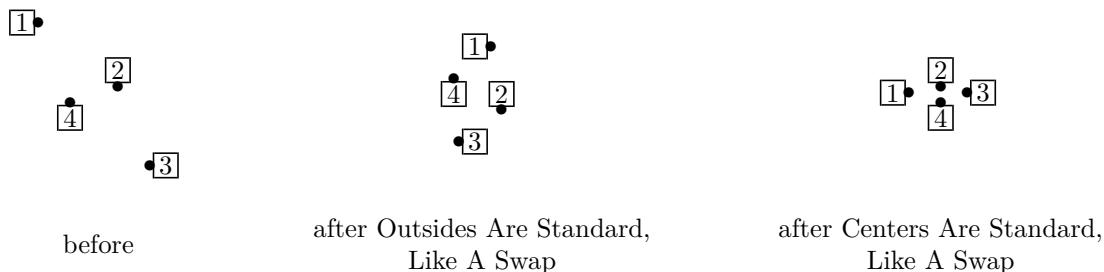


Start A Swap provides a convenient way to get into Blocks or a Zipper, as in Example 31. Like A Swap is a fragile call that has a high potential for ambiguity in determining how to split the formation or which orientation to imagine the starting adjustment having been in. By default, we assume that the square is split perpendicular to its long axis, or parallel to the dancers’ facing direction if there is none; and that the axis for the Swap adjustment is thought of as the long axis of each subformation, or parallel to the dancers’ facing direction if there is none. However, the caller is encouraged to be as precise as possible as applicable, as in Example 33 or Example 34.

Example 33. Like A Swap (disambiguated by splitting axis)



Example 34. Like A Swap (disambiguated by adjustment axis)



6.2 Designators for the Swap adjustment

In subsection 2.2, we say that the “trailing beaus and lead belles” adjust. For convenience, we might want to define a pair of designators to refer to a dancer’s role in the Swap adjustment.

We say that the *[DESIGNATOR 1]s* are the dancers who adjust; i.e., the trailing beaus and lead belles, or those on the southwest-to-northeast diagonal; and the *[DESIGNATOR 2]s* are the dancers who do not; i.e., the lead beaus and trailing belles, or those on the northwest-to-southeast diagonal.

Example 35. [DESIGNATOR 1]s and [DESIGNATOR 2]s



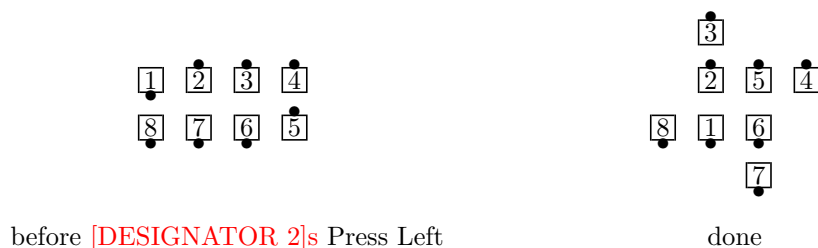
The most immediate use for this pair of designators is in the definition of Swap: in the adjustment step, the [DESIGNATOR 1]s move one matrix spot into the outside triple boxes. But they have a number of further applications:

- The call Trixie can be defined as “[DESIGNATOR 1]s 1/4 Left, [DESIGNATOR 2]s 1/4 Right.”
- The call Short And Sweet can be defined as “[DESIGNATOR 1]s Zing, [DESIGNATOR 2]s Partner Tag.”
- The designators can simply be used in normal calling, to e.g. get into Magic Columns as in Example 36, or a Pinwheel setup as in Example 37.
- From any non-T-boned 2×4, the designators each identify one of the two Interlocked Parallelograms.

Example 36. [DESIGNATOR 1]s Run (to Magic Columns)



Example 37. [DESIGNATOR 2]s Press Left (to Pinwheel / C1 Phantoms / Siamese Box)



7 Conclusions

The Swap concept formally explains the analogy between Box Circulate → Swap Around and Follow Your Neighbor → Swap The Top, which was independently observed by both authors before the development of the concept, in a principled manner. It furthermore neatly generalizes the paradigm in Table 1, generating the nonexistent calls “Swap Back,” “Swap Thru,” and “Swap Back And Dodge,” also proposed long before the conception of the generalized concept. It even exactly produces the natural meaning one would imagine of “Scatter Swap Around” (Example 24), by performing the exact same transformation as the Scatter concept (of Box Circulate to All 8 Circulate) under the Swap concept.

Moreover, Swap can be applied much more generally than to this set of calls. It reveals relationships between different pairs of existing calls, such as Box Counter Rotate and Mirror Short Cut (Example 3). It also generates a large number of entirely new calls that feel nice to dance, such as Swap Leads Run The Wheel from couples facing out (Example 6).

Of particular note is that Swap is very good at generating calls with a “handedness” from calls without one. In other words, a call that is its own Mirror, such as Box Circulate, becomes a call where there is an asymmetry, such as Swap Around. There are currently very few other ways to do this in square dancing.

Furthermore, the Swap concept gives rise to the convenient new calls and designators described in section 6, which have a range of applications completely unrelated to the concept itself.

A Feedback

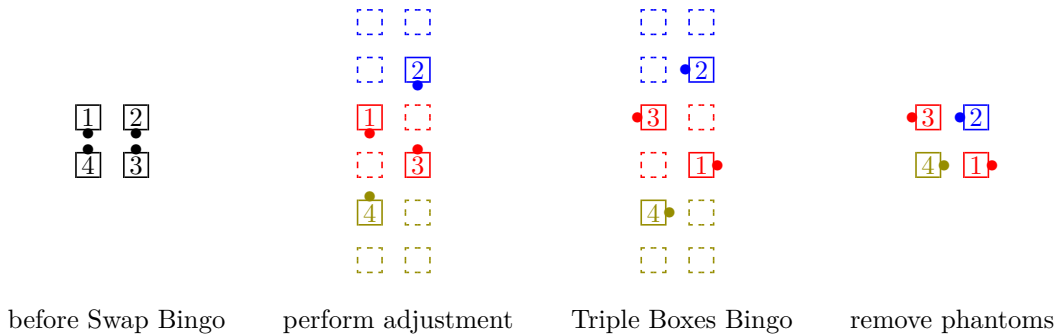
This paper is currently in draft form, and the authors remain unsure about several aspects. Particular areas of feedback that would be appreciated are:

- for section 4, is the caller-cued traffic pattern really the best solution?
- is there better phrasing for the disambiguation in Like A Swap (subsection 6.1)?
- what should the designators in subsection 6.2 be called?

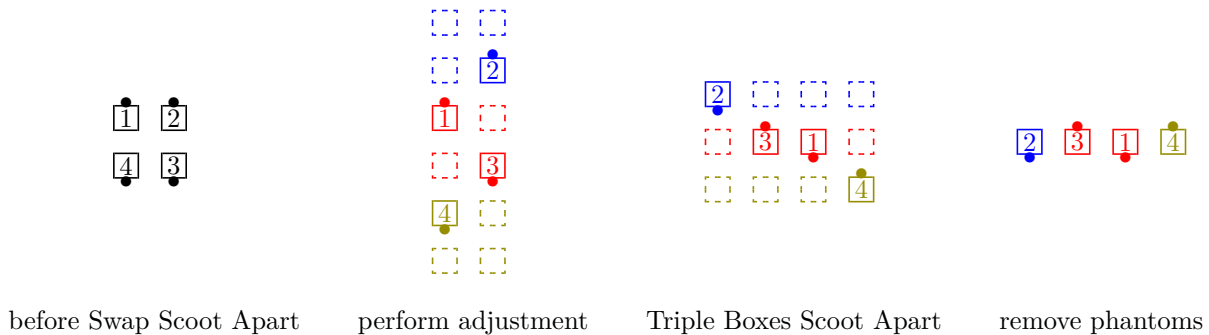
B Further examples

Finally, we provide a smattering of additional examples which we would like to show – either because they dance particularly nicely or because they are particularly interesting or amusing – and which did not fit elsewhere in the paper.

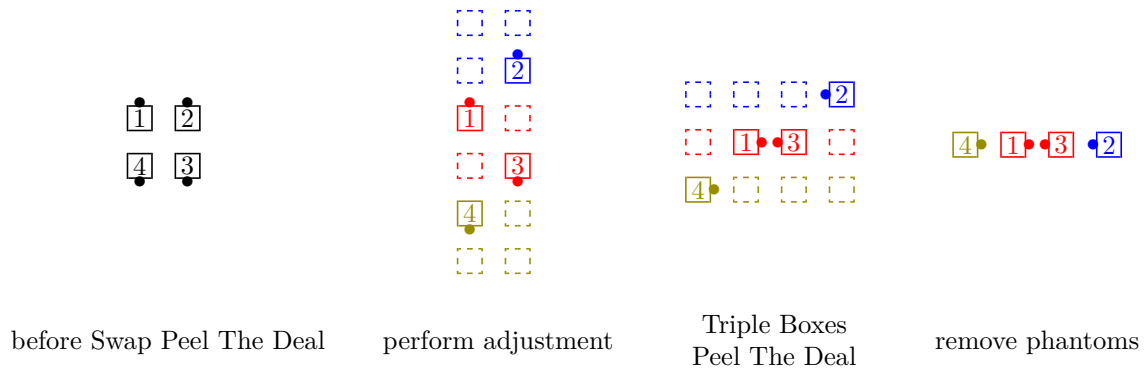
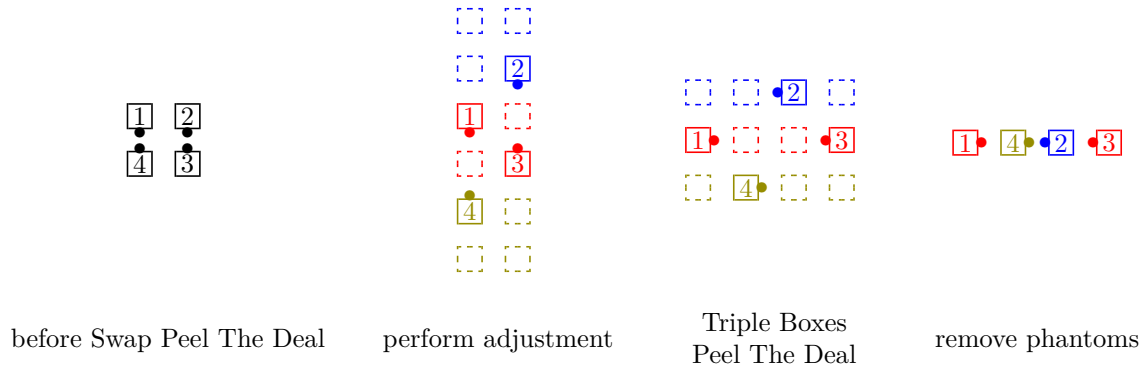
Example 38. Swap Bingo



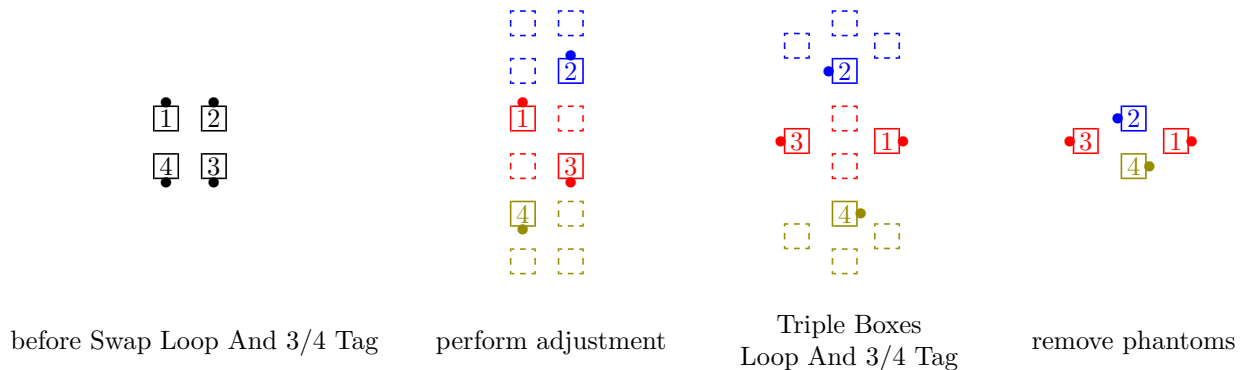
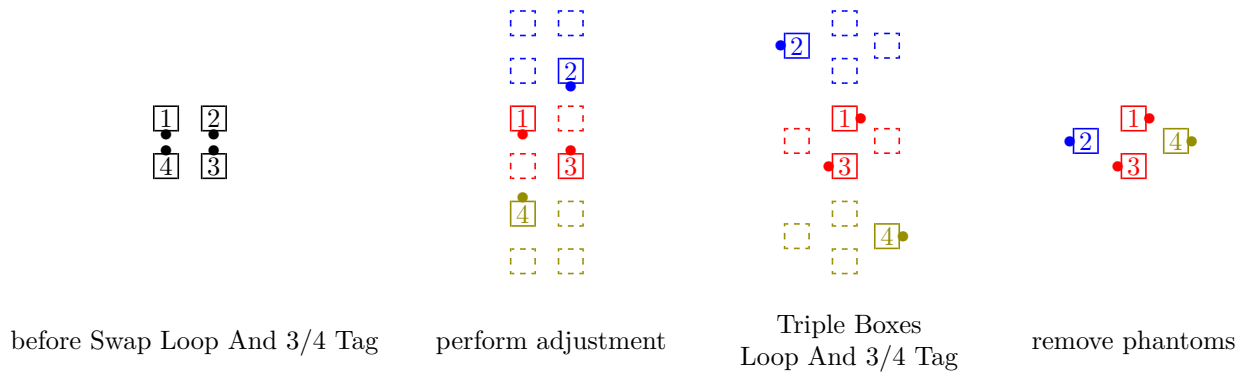
Example 39. Swap Scoot Apart (couples facing out)



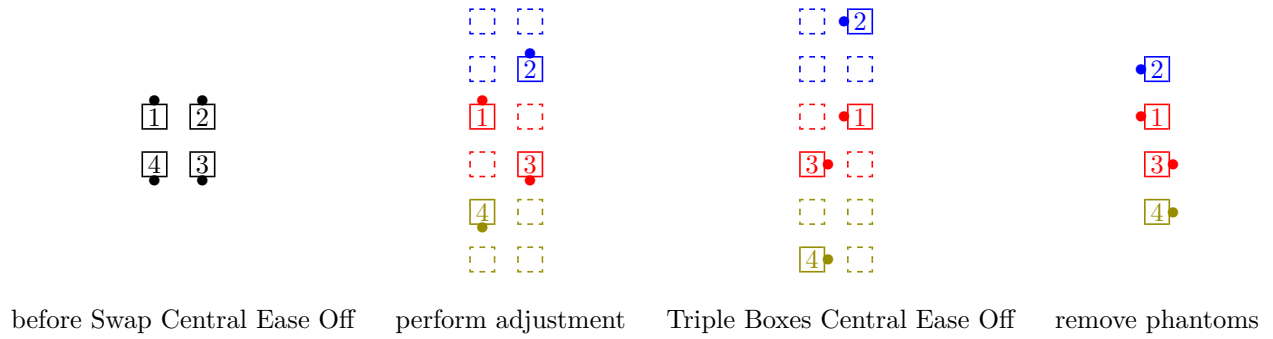
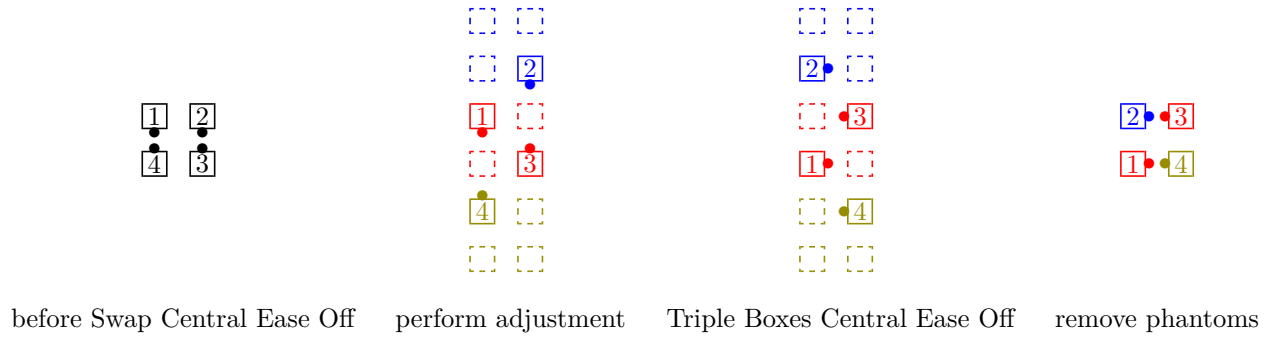
Example 40. Swap Peel The Deal (different formations)



Example 41. Swap Loop And 3/4 Tag (different formations)



Example 42. Swap Central Ease Off (different formations)



Example 43. Swap Mesh (different formations)

