

Evaluating Dance Flow in Callarama

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Moving dancers fluently and with good body flow is one of the marks of a good square dance caller. Guidance about what constitutes good flow is available in the form of

- general descriptions of good or bad body flow¹
- collections of call sequences that result in good or bad flow²

Documents like these are valuable and give a good insight into the matter, but the descriptions do not provide methods that can be coded in software, and the collections, even taken together, are far from covering all possible combinations of calls.

A compilation of call sequences and their flow would have to look at a call at a time and relate it to the calls that can follow it. All possible end formations and end arrangements (if gender specific) would have to be considered, and also all possible selections of active dancers for this and the next call.

Manually, this would be an enormous undertaking: Considering only MS and PLUS, Callarama yields more than **850,000** combinations of this kind.

The task, therefore, is to devise a universal method that evaluates body flow in code while the software performs in real time.

The Theory of Body Flow

Flow in dancing should be understood as physical momentum. It is governed by the 1st of Newton's laws: "An object will not change its motion unless a force acts on it".

While dancers are moving to the calls, they are constantly changing their direction. A moderate change requires little effort by the dancer and is not felt as bad flow. An abrupt change of direction (momentum) requires extra force. Whether it is felt as bad flow, depends on where this force originates.

When dancers "Circle Left" in a square and then "Circle Right", the force for this abrupt change in momentum comes from the left foot. Dancers step on it and then bounce back to the right. In circles, they are also joined by handholds that give stability. The rocking motion is enjoyable and perceived as good flow. We call this mechanism "**Bounce**". It is a property of certain **calls**. Examples are "Circle Left/Right" and "Forward and Back". The Bounce effect at the end of these calls enables the dancer to freely change direction.

Likewise, when dancers perform "Swing Thru" in a wave of 4, they can easily and enjoyably reverse their momentum because they have the hand of a facing dancer to press against and exchange momentum. This predisposition is called "**Pivot**". It is generally a property of certain **formations** and refers to certain **dancers** in these formations. For example, in Waves of 4, the center dancers can pivot in both directions while the end dancers have a pivot only for turning towards the center of the formation.

¹ e.g. Callerlab Handout 2016 Bad calls and why.pdf

² e.g. Smoothness in Dancing, Jim Mayo 1977

Pivot can also be a **property of certain calls** where dancers are facing each other in a hand hold that lets them pivot into the designated direction. 2-dancer calls with a pivot are “Allemande Left”, “Box the Gnat”, “Right Arm Turn” and “Touch a Quarter”.

However, when dancers are asked to abruptly change momentum without the help of a pivot and not from a “bouncing” step, the action can be perceived as bad flow.

Momentum evaluated in Software

The Callarama software can evaluate the transition between calls in real time as they are prompted by the user or played from a recorded routine, and it can show the result before the new call is executed. The evaluation uses keys that categorize the momentum of each dancer at the end of a call and at the beginning of the next call. In many cases, these keys are predicated by the call and can be provided by the call database.

For example, in “Slide Thru”, the momentum at the end is always a forward clockwise arc for the gents and a forward counter-clockwise arc for the ladies. In contrast, the momentum at the end of “Run” can be clockwise or counter-clockwise. The call database only predicates that there is an arc, but not its direction.

When the keys are not or not fully predicated, the software produces them by analyzing the animation. Callarama is well positioned for this because the animation is based on macro instructions for the path of the dancers that match the key categories.

The keys are then compared according to “**Flow Rules**” that determine whether a change of momentum is acceptable or not. For example, a change from an arc forward left to an arc forward right is not acceptable unless it occurs on a pivot, as for example in “Swing Thru”.

The result is displayed in a “**Flow Label**” at the top left of the dance floor. This happens while the dancers start performing the call and gives an instant feedback to the user. The label shows colors and displays symbols within the label:

		Result not available (currently only calls MS and PLUS are evaluated)
		Good Flow
	!	OK with proper Timing
	??	Bad Flow
	?	Other Problems, e.g. restricted Space for Dancers
	:	Improper Sequence of Handholds (can be combined with other colors)
	0	Overflow (can be combined with other colors)

The black border indicates an improper sequence of handholds, and the black circle indicates overflow (2 or more dancers have rotated more than 450 degrees without interruption). These can be combined with any of the other colors.

The symbols shown in the 2nd column are inserted in the routine list, enabling the user to review all calls that have been performed. They are, however, not saved with the routine.

The Flow Monitor can be turned on and off in the “LEARN” menu of the Callarama window.

Considerations beyond Momentum

Obviously, the evaluation is not only based on momentum. Other aspects had to be recognized by way of exceptions and special algorithms:

- **Dancers move differently when they hear the next call in time:**

If, for example, “Pass Thru” is called from facing lines of 4, the animation in Callarama places the dancers in the designated end formation of lines facing out without being able to anticipate the next call. If the next call is “Bend the Line”, it results in a reversal of movement. In reality, if this call is given early enough, the dancers can smoothly transition. Sequences of this kind are indicated **Blue-Green / “!”** to remind the caller of proper timing.

- **Breathing out:**

When a call starts in a tight formation and ends in a wide spaced formation (e.g. “Star Thru” from a Box to Lines of 4), the dancers move out to give themselves space for the next call. This creates a **Bounce** effect after which a change of direction is acceptable. Callarama monitors the formations before and after the call and indicates good flow.

- **Breathing in:**

When a call starts from a wide formation and ends in a tight formation , e.g. “Star Thru” from Lines of 4 to a Box, the dancers will take a couple steps forward before they can actually perform the call. This has a neutralizing effect and allows a change of momentum from the previous call.

- **Breathing restricted:**

When 2 facing couples are between outside dancers, a number of calls are awkward because there is not enough space. Examples are “Right and Left Thru”, “Flutterwheel, and “California Twirl”. These cannot be detected by the key method and are indicated **Yellow / “?”** by special treatments.

A Note about Breathing and Pivots: The Callerlab formation diagrams which have also been adopted by popular software like Taminations, do not visualize tight or wide formations---they are all depicted in the same footprints of dancers close to each other. They also do not visualize waves of 2 or more dancers---all dancers

are centered on the same line, not slightly opposite from each other as they are in real dancing. Unfortunately, an opportunity to educate callers about breathing and pivots is missed in this system.

Callarama uses formation footprints that visualize these aspects clearly. This will hopefully help to understand the principles employed here. It is also suggested that Callerlab might want to revise the formation footprints.

Current Status

Choreography with good flow from the “Choreo” collection has tested with appropriate results. Testing of the material in “*Callerlab Handout 2016 Bad calls and why.pdf*” has produced consistent results, with a few debatable exceptions. The feature is released as a **Beta Version** in Callarama so that users can work with it and provide feedback.

Users can test their own material or generate sequences with the “**Random Call**” feature (the “R” button) in Callarama. The computer-generated sequences will produce plenty of bad flow. Beyond the Beta stage, an internal procedure, not yet made public, can produce patten that starts and ends at home, using modules and/or random calls. Flow detection, if ultimately reliable, can be incorporated in this procedure to avoid “bad” random calls and let it perform as a robotic caller.

Eventually, Callarama can run all 850,000+ combinations automatically and create a compendium of flow ratings for each call and the calls that follow it, specified by formation, arrangement, and active dancers. This material can be made available to the user to compile and print lists of call sequences with their ratings.

Conclusion

A call sequence that has an abrupt change of momentum is not necessarily “bad”. A skilled caller can use such sequences successfully with proper timing, as a gimmick, or with the very purpose of creating excitement. It also depends on the ability of the dancers and their expectations.

Flow ratings in Callarama are provided not as strict rules but as a learning tool that reminds the caller to take special care. They can be turned off if not considered useful.

Jim Mayo wrote this about smooth dancing as early as 1977, when Square Dance was more unified than it is today:

“In modern choreography it is not possible to assure that the body position is always perfect. We are always involved in some compromise with perfection. There are many reasons for this need to compromise. Certainly one of these reasons is that flow and smoothness are not the only important elements of good square dancing. The elements of variety and interest are important also, and excitement and challenge contribute substantially to the overall experience. Sometimes a deliberate violation of the smoothness rules provides excitement and variety that is of equal importance to the dancers. Unfortunately, we have overworked this excuse for bad flow. Too often the smoothness is unnecessarily bad merely because too little attention has been given to improving it. Many callers today have never given much thought to whether the action they are calling is smooth or not.”

Because the rules that govern the feeling of smoothness are not simple, too few callers have concerned themselves with how to accomplish this feeling in their choreography.”

01/21/2022