Artifact typology

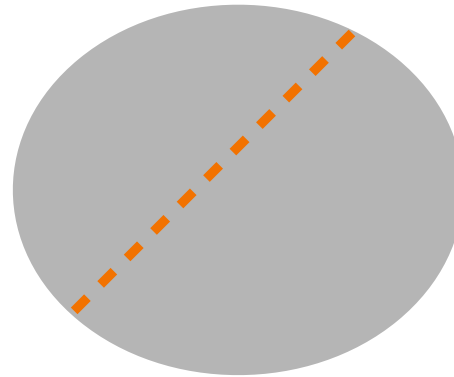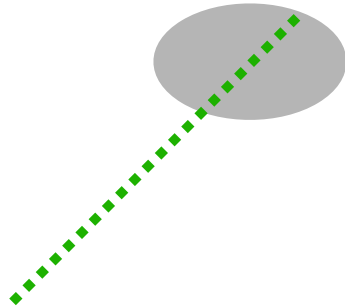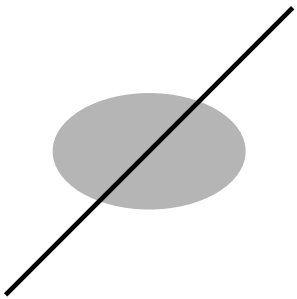**Draft #4**

July 2024, simplification crew

Three types of edges:

CONTINUING (C)   **ENDING (E)**   **SINGLE (S)**

"Continuing": continues before and after artifact

"Ending": continues only at one end

"Single": does not continue

Artifact classification code - reasoning

1. An artifact of **x** nodes can consist of **y** different continuity groups (or "strokes", aka "ways" from the updated COINS algorithm with 120 degrees angle threshold)

- If planar case: y <= x (there are *at most as many* continuity groups as there are nodes)

- In non planar case: y can be > x; if an artifact is caused by non-planarity —> we don't touch it at all

2. Interstitial nodes: If 1 < y < x, it means there are continuity groups that are "prime" (touched by an **external** stroke, where we need to keep the entry point) - determine which continuity group this interstitial node lies on, and mark with ' (prime)

3. "Touching": if there are 2 or more Es, we need to check whether these Es end in the same point - if so, mark with a hat ^

4. "Crossing CE": if there is at least 1 C and at least 1 E, for each E we need to check whether it crosses (or only touches) C. If it crosses C, it gets an asterisk *

Artifact classification - example

We ask the following questions:

1. How many nodes does an artifact have?

2. How many strokes is it delineated by?

3. Do these strokes continue before and/or after the artifact?

4. Is any of the nodes created by a stroke touching one of the continuity groups?

The answer gives us a code:

`<X-node> <letter code> <apostrophe at stroke with interstitial node>`, for example:

`4-node C'ES`

(This artifact has 4 nodes, is delineated by 3 strokes, of which one is continuous (C), another is ending (E), and the third one is single (S); the 4th node results from a stroke touching C, which is marked by the apostrophe
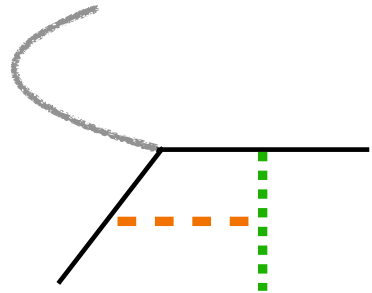
0-node artifacts

Not touching these - just identifying.
Because they are non-planar by definition

1-node artifacts with 1-continuity

1

C

E

S'

S'
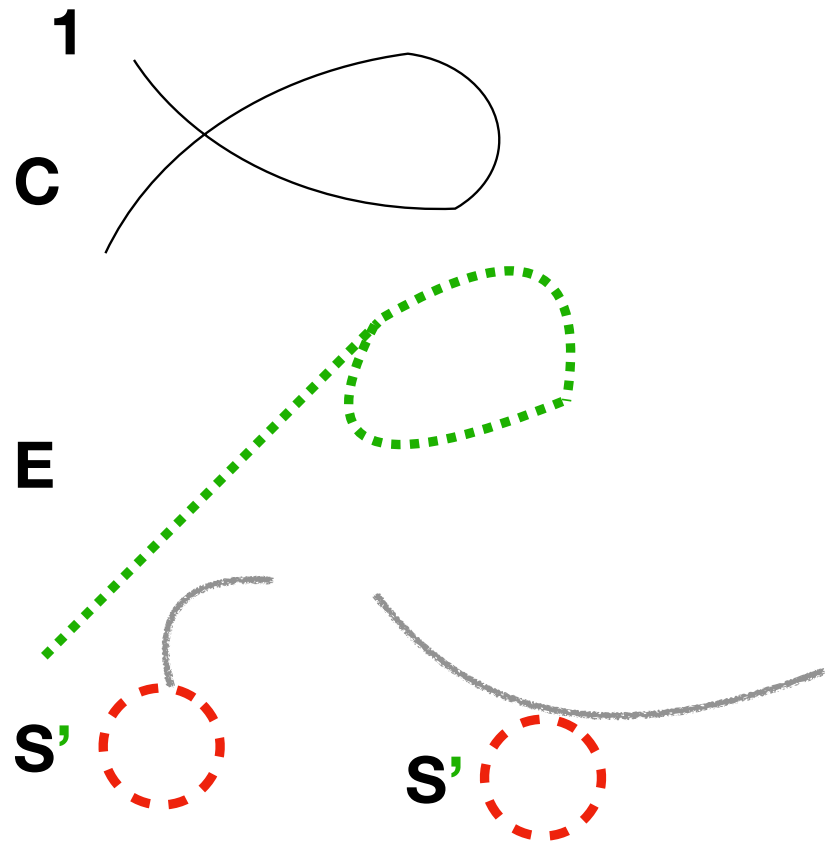
superscripts ' * ^ in green
= "by construction"
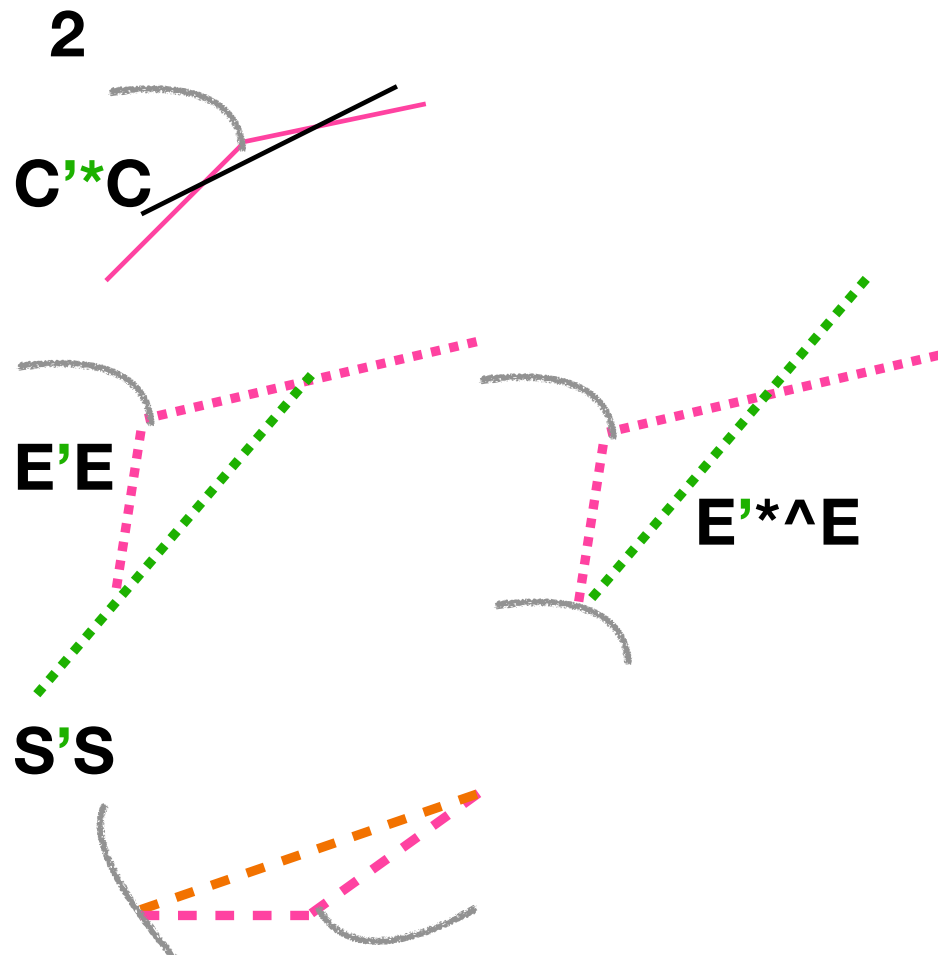
2-node artifacts with 1-continuity
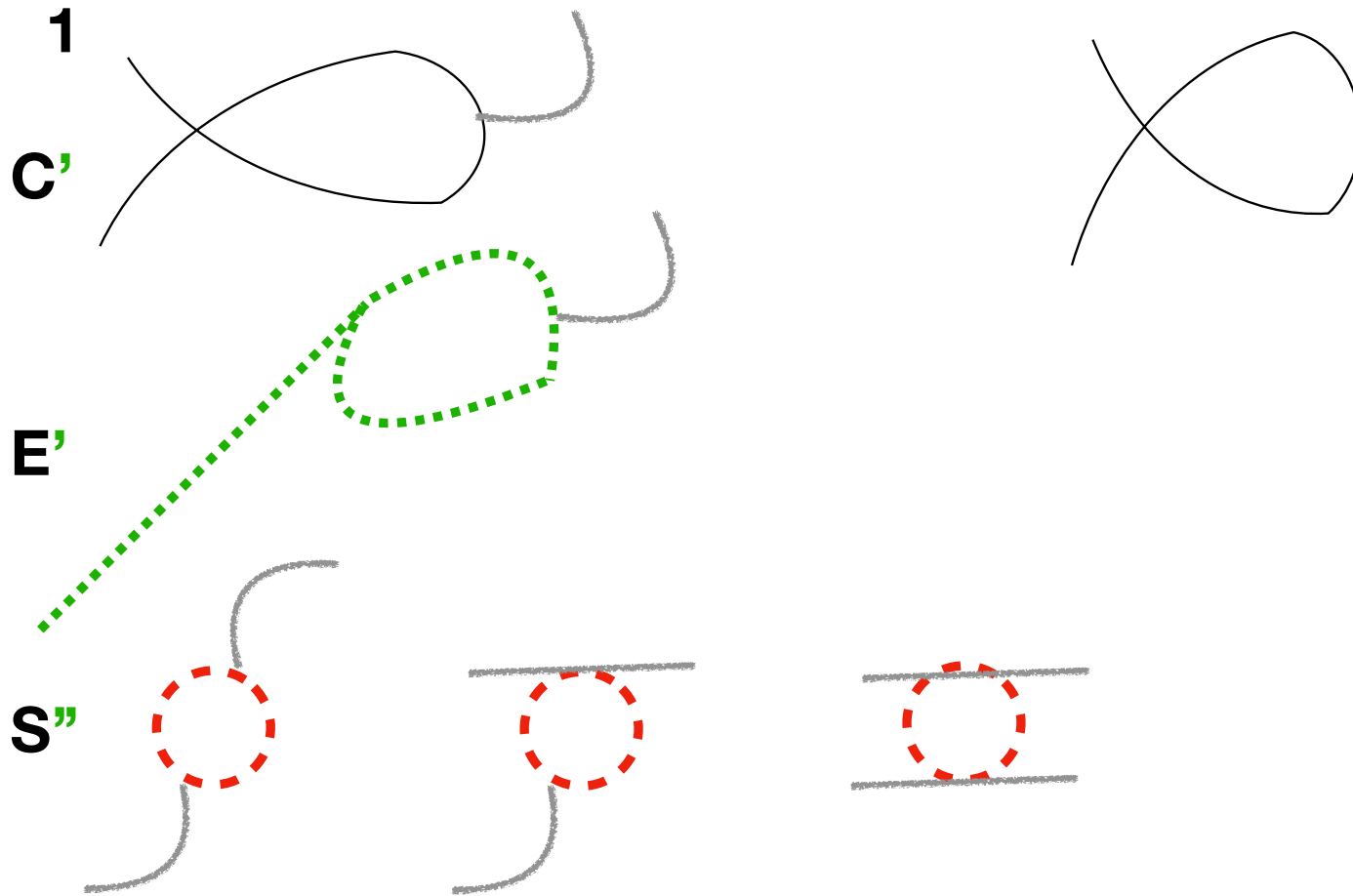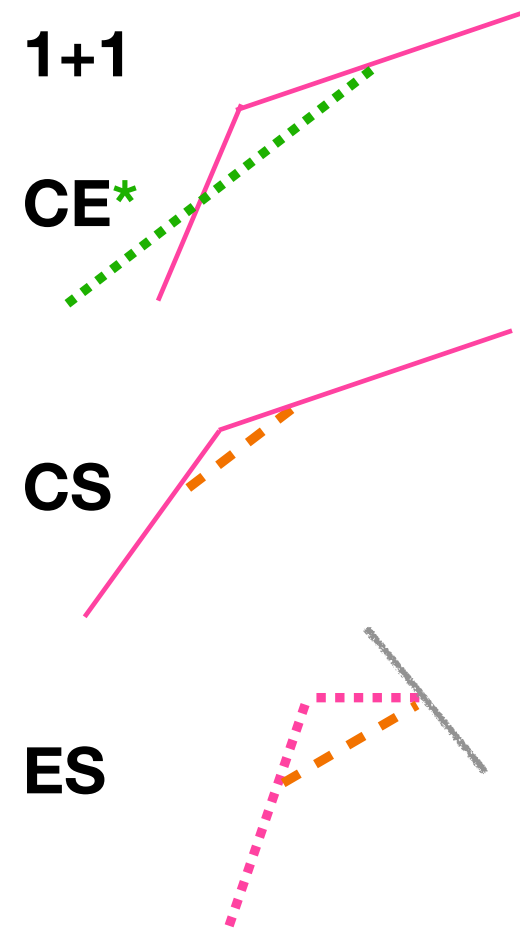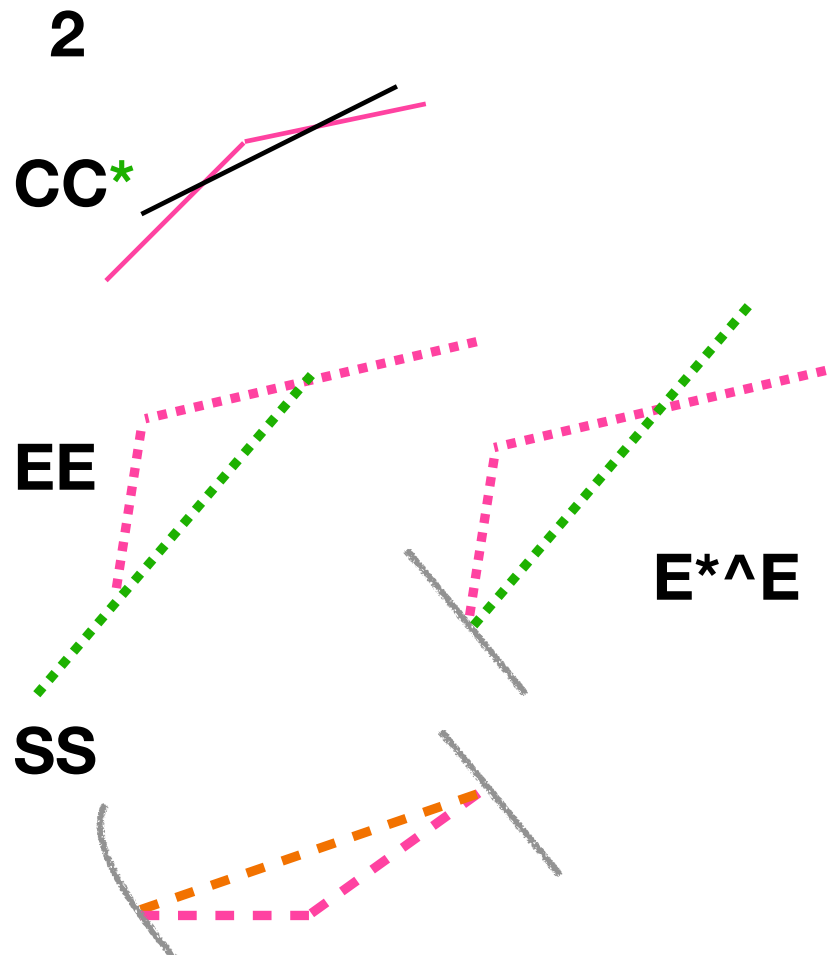
1

C'

E'

S"

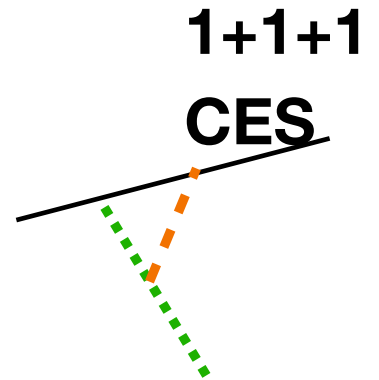# 2-node artifacts with 2-continuity

2

CC *

1+1

CE *

EE

E*^E

CS

SS

ES

3-node artifacts with 1-continuity

1

C"

E"

S'''

3-node artifacts with 2-continuity

2

C'*C

1+1

C'E*

CE'*

E'E

E'*^E

C'S

CS'

S'S

E'S

ES'

3-node artifacts with 3-continuity

3

C*C*C*

EEE

SSS

2+1

CC*E*

CC*S

CE*^E*

E^ES

CSS

CE*E

1+1+1

EES

CES

ESS

4-node artifacts with 1-continuity

1

C'''

E'''

S''''

4-node artifacts with 2-continuity

2

CC

C"C, C'C'

EE

E"E, E'E'

E"*^E, E'*^E'

SS

S"S, S'S'

1+1

CE

C"E, C'E', CE"

CS

C"S, C'S', CS"

ES

E"S, E'S', ES"

4-node artifacts with 3-continuity, pt 1

3

CCC'

EEE'

EEE*^'

SSS

4-node artifacts with 3-continuity, pt 2

2+1

C'*CE*

C'*CE*, C*CE'*

CCS

C'*CS, C*CS'

CEE'
C'EE

CE'*^E*
C'E*^E*
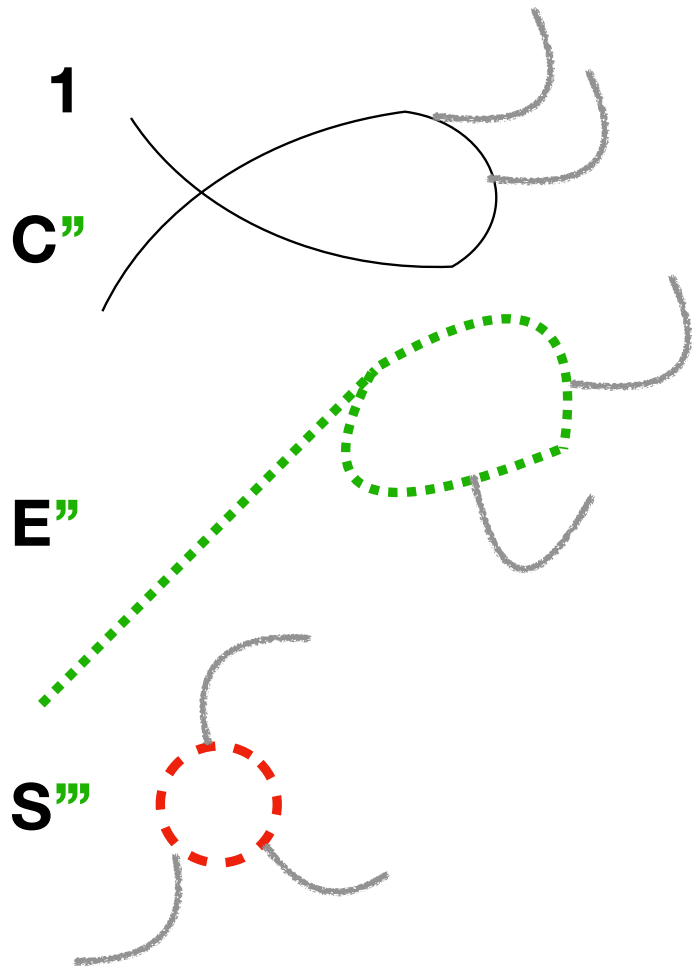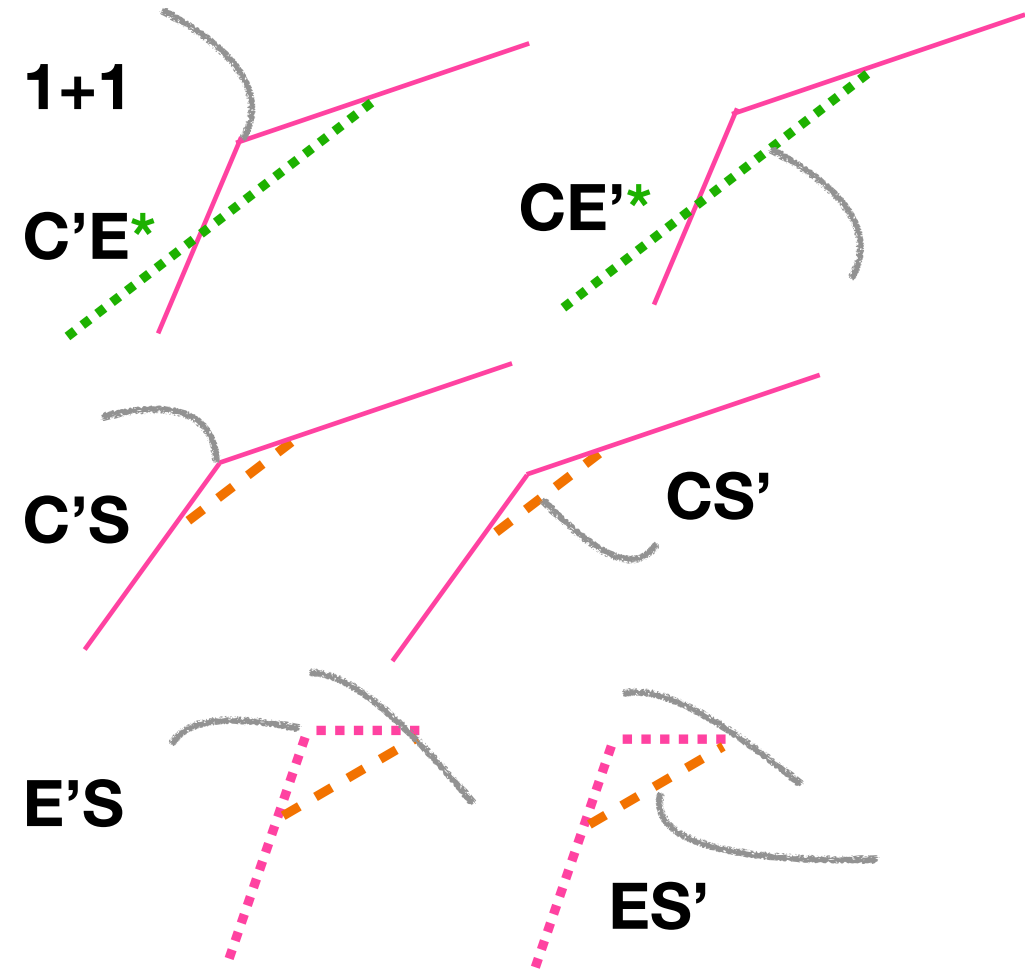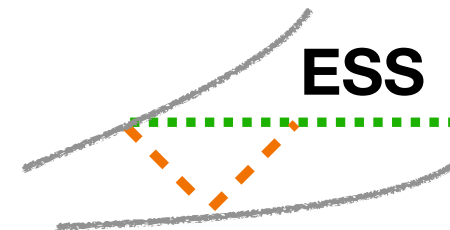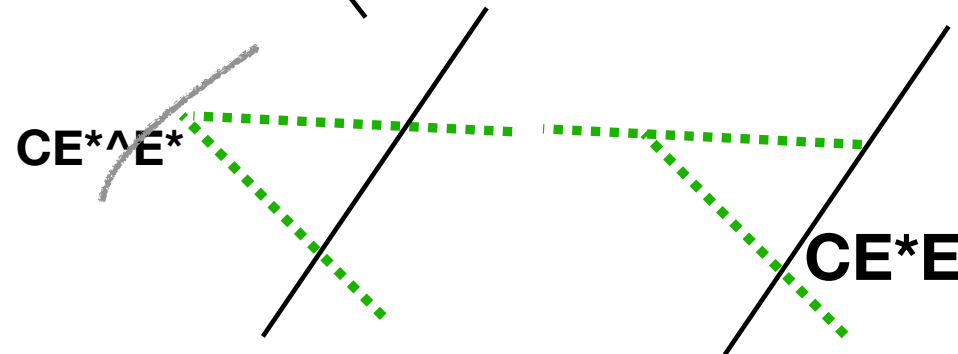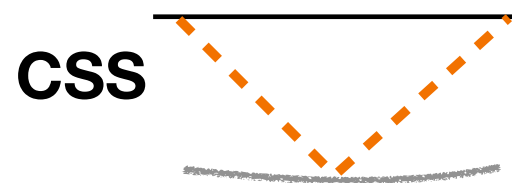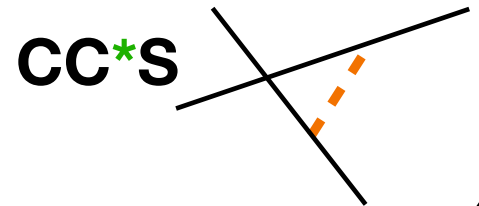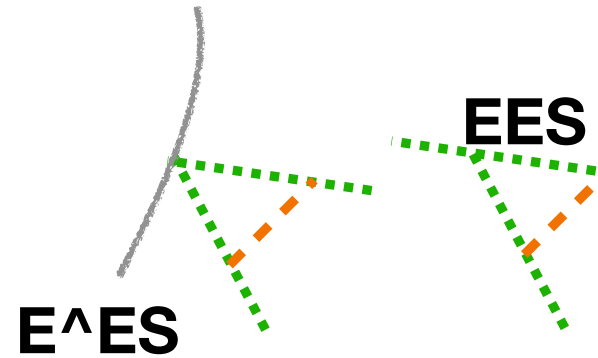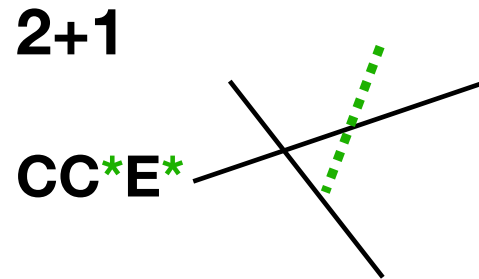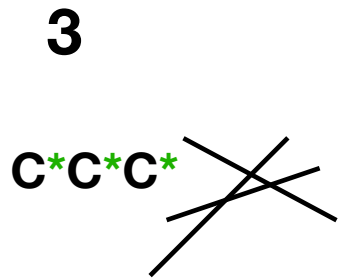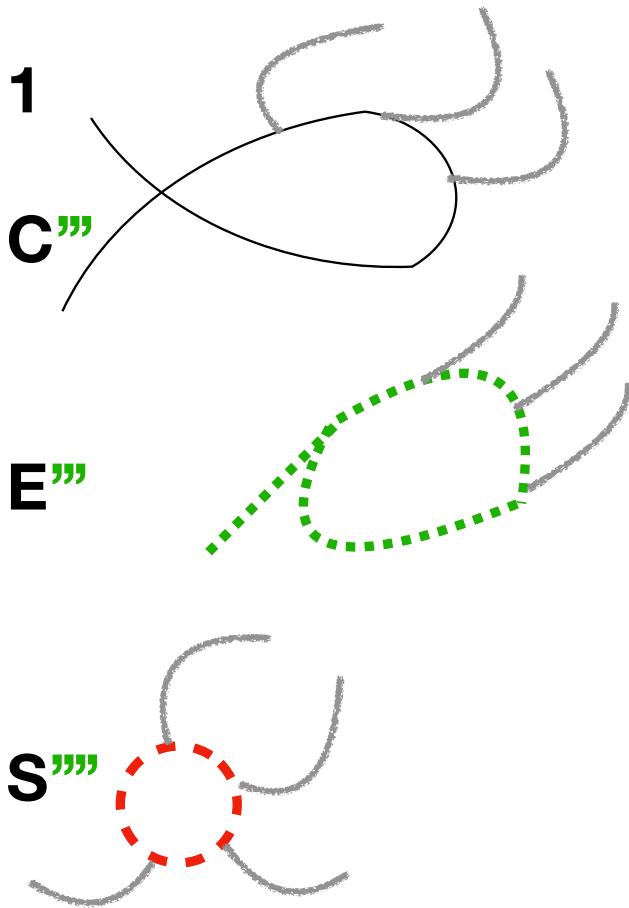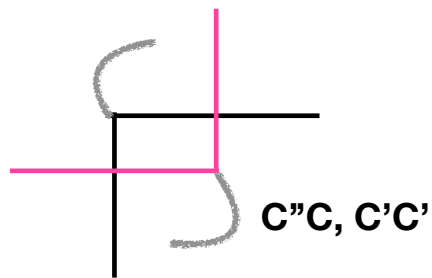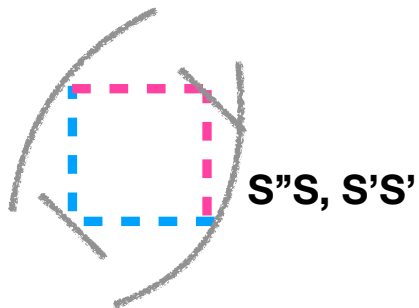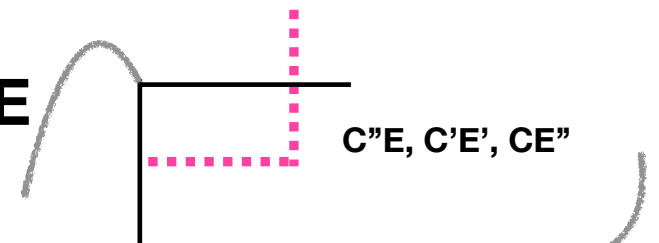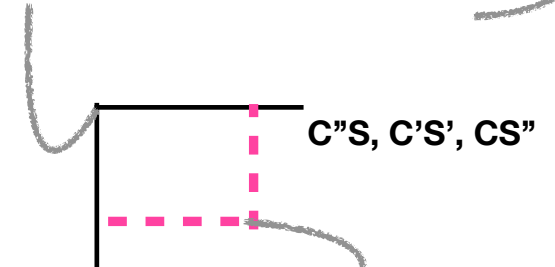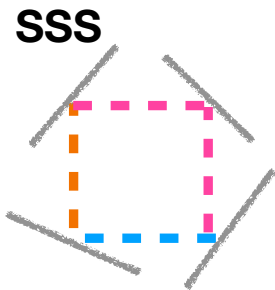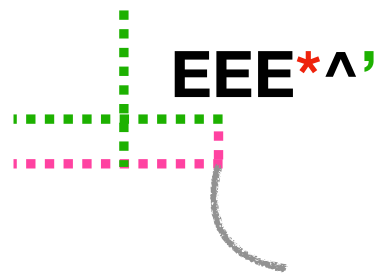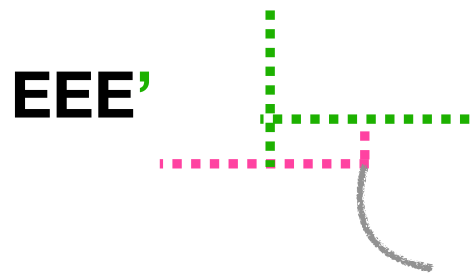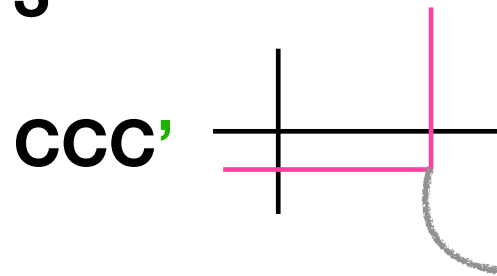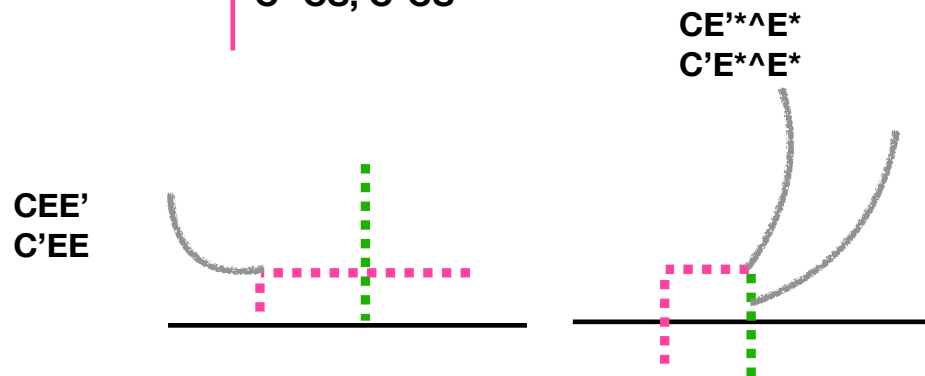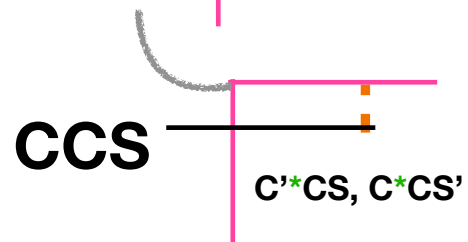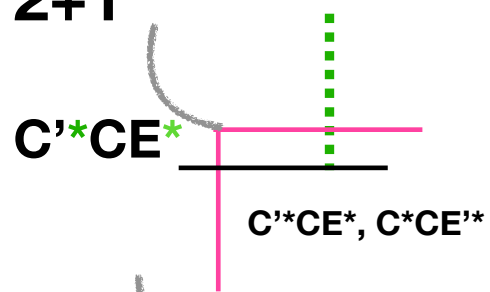
E'ES
EES'
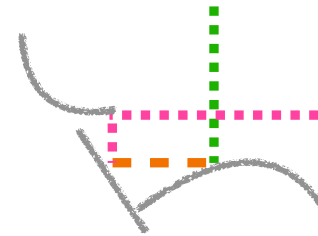
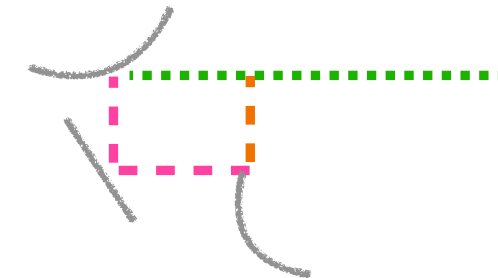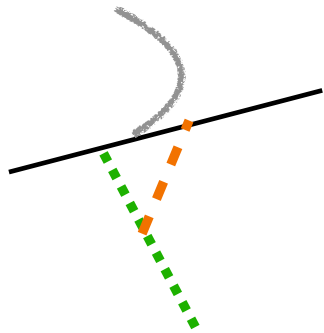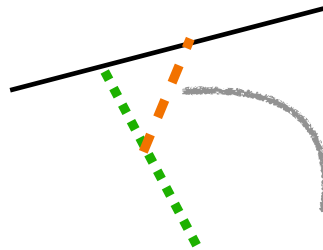E'^ES
E^ES'
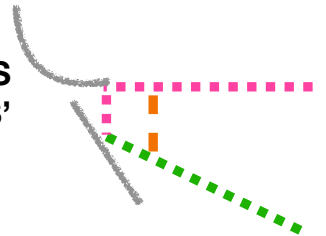
CSS'
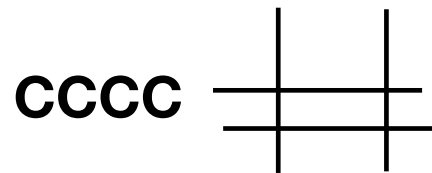C'SS
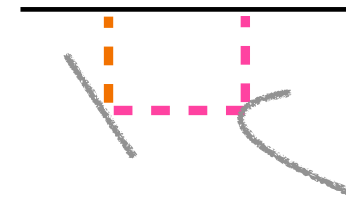
ESS'
E'SS

4-node artifacts with 3-continuity, pt 2

1+1+1

C'ES
CE'S
CES'

4-node artifacts with 4-continuity, pt 1

4

CCCC

EEEE
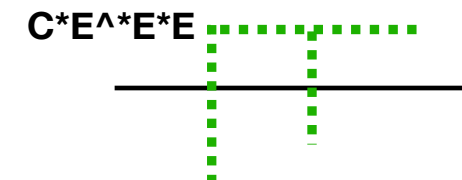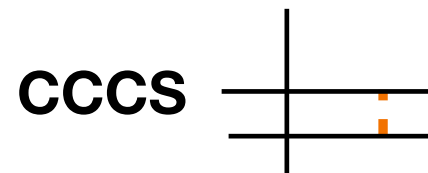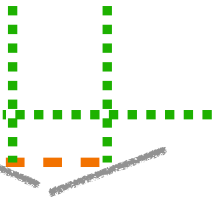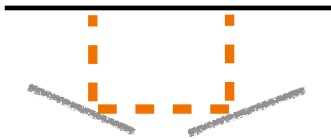
SSSS

3+1

C*C*CE*

CCCS

CE*EE

C*E^*EE

C*E^*E*E
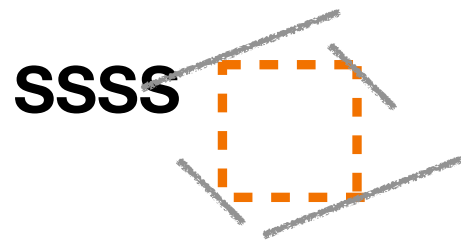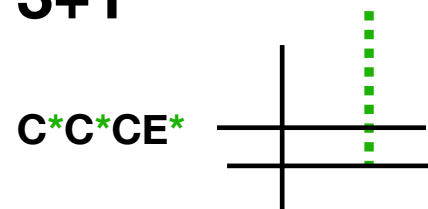
4-node artifacts with 4-continuity, pt 2

3+1

EEES

CSSS

ESSS
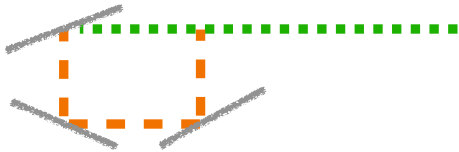
4-node artifacts with 4-continuity, pt 3

2+2

C*CEE

C*CSS

E^ESS

CCE*E*

CCE*E

CCSS

EESS

CCE*E

4-node artifacts with 4-continuity, pt 3

2+1+1

C*CES

CE^E*S

CES^S

Plus asterisk!

CCE*S

CEES

CESS
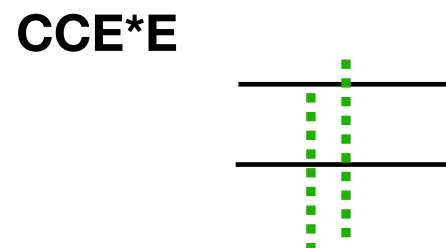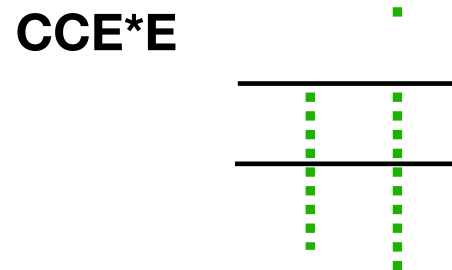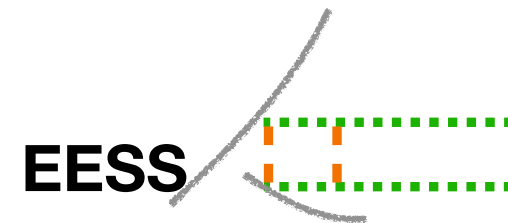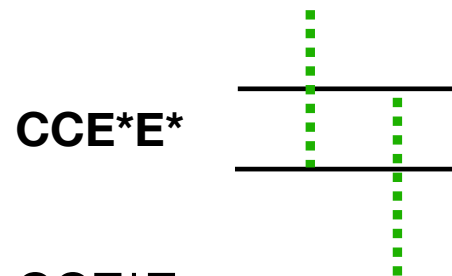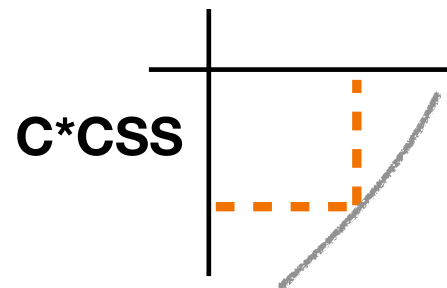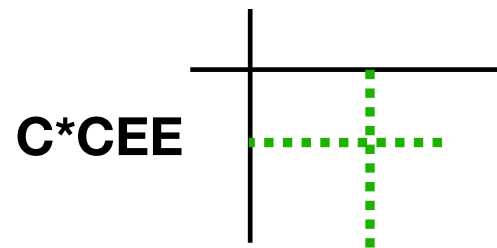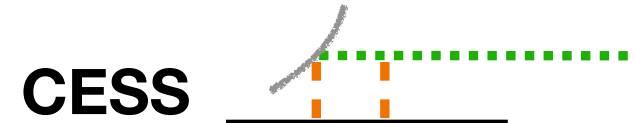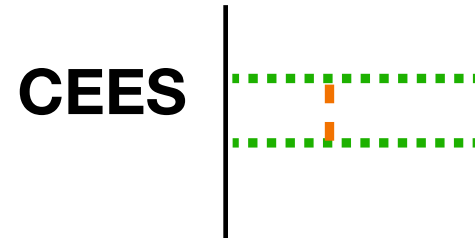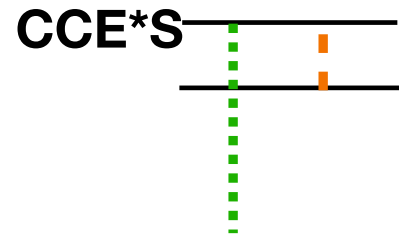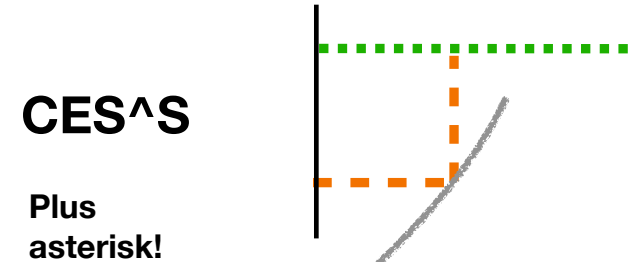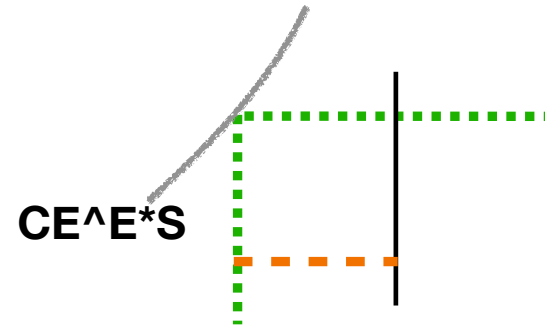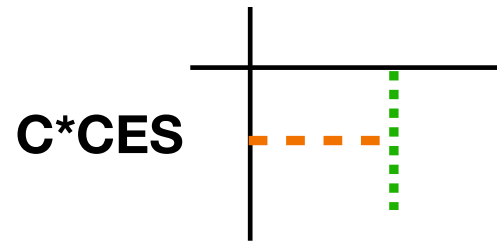
Trying to derive general principles

- Geometry changes happen ONLY inside artifacts

- Keeping geometries is preferable over changing them (eg dropping rather than skeletonizing)

- Conflicting priorities: intersection density vs. continuity preservation

General solutions

If there is only 1 continuity group {C, E, S} and only 1 node: drop the edge

If there are 1+ continuity groups, but more than 1 node (n>=2): "roundabout" solution
      n>=2, nXX… (only same group) roundabout

General solutions

If there are 2+ continuity groups {C, E} (no S): drop one of the Es.

Selected by: shorter one // the one that does NOT hit the C (if C present) // the one has has no prime… //

General solutions

If there are 2+ continuity groups {C, E, S} with at least one S:

Drop the S if possible. If it has prime: drop S and join somehow

Exception: 4CEES: drop S and also both Es and skeletonise (if no hat, otherwise: as above)