Artifact typology

Third draft
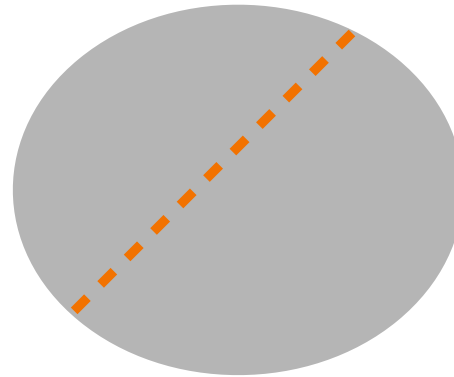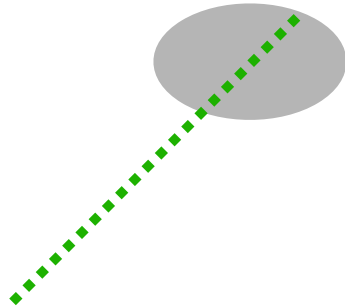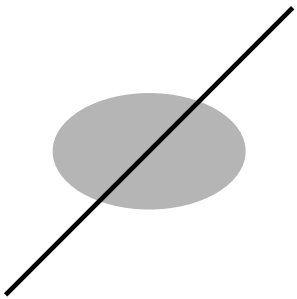
July 2024, simplification crew

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 ^ or also for S?

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> <apostroph 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
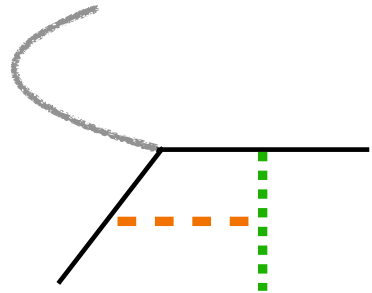
0-node artifacts

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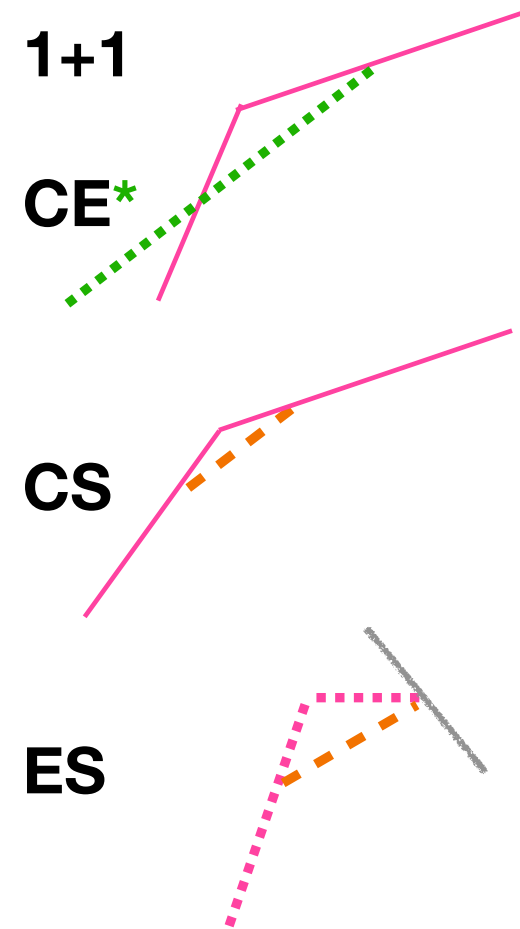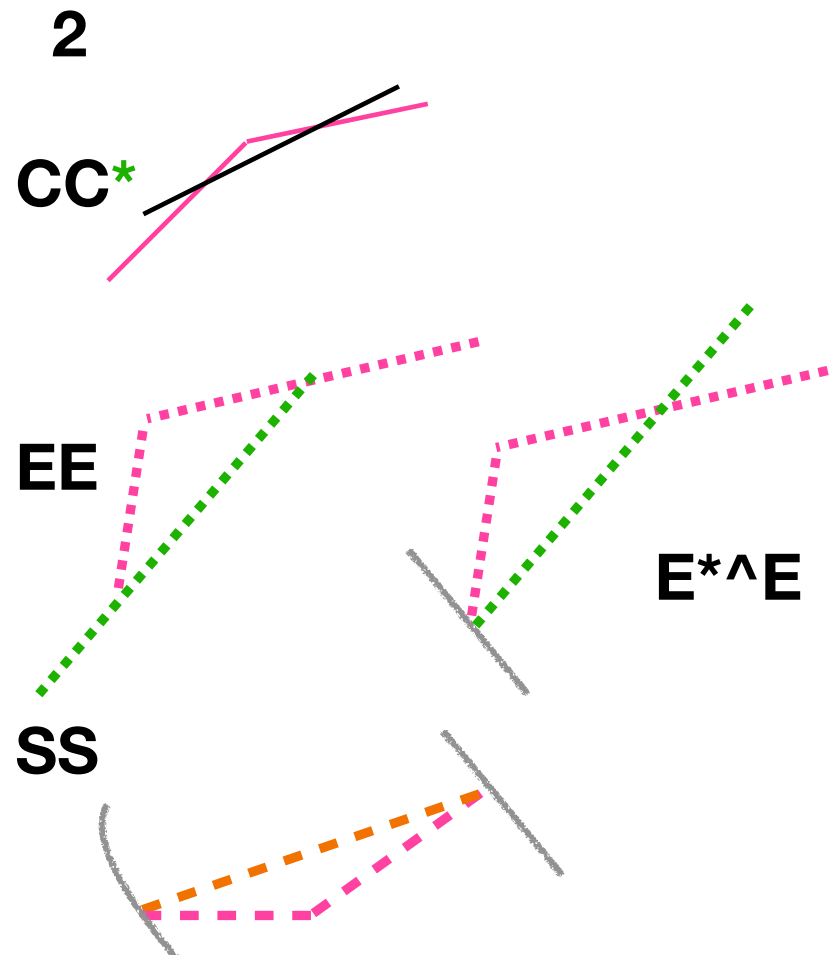**Because they are non-planar by definition**

1-node artifacts with 1-continuity

1

C

E

S'

S'
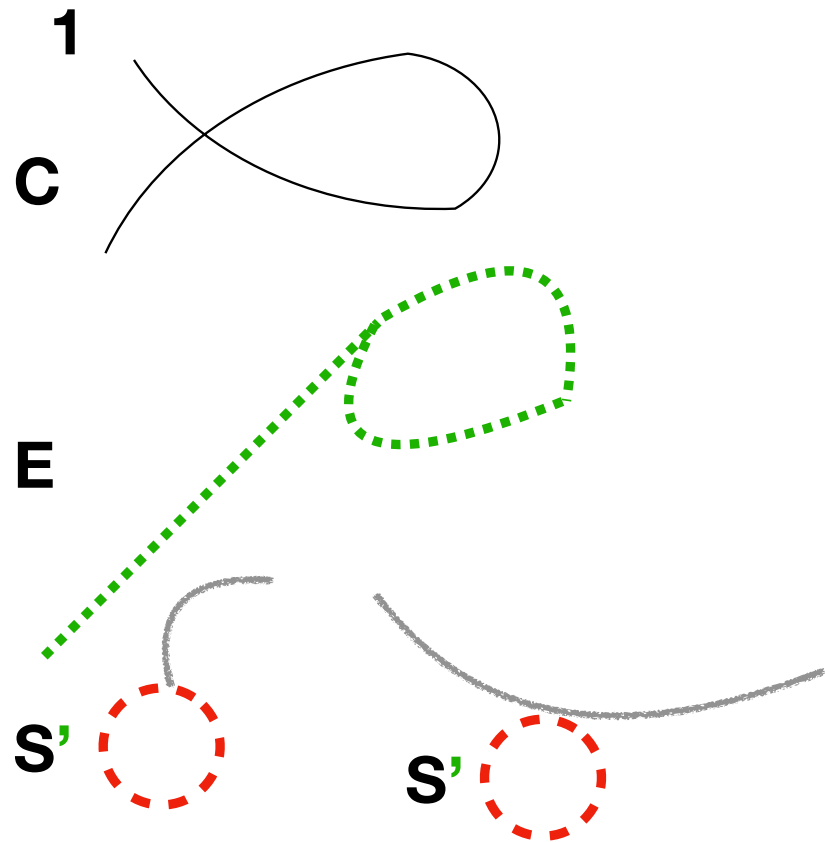
superscripts **' * ^ in green**
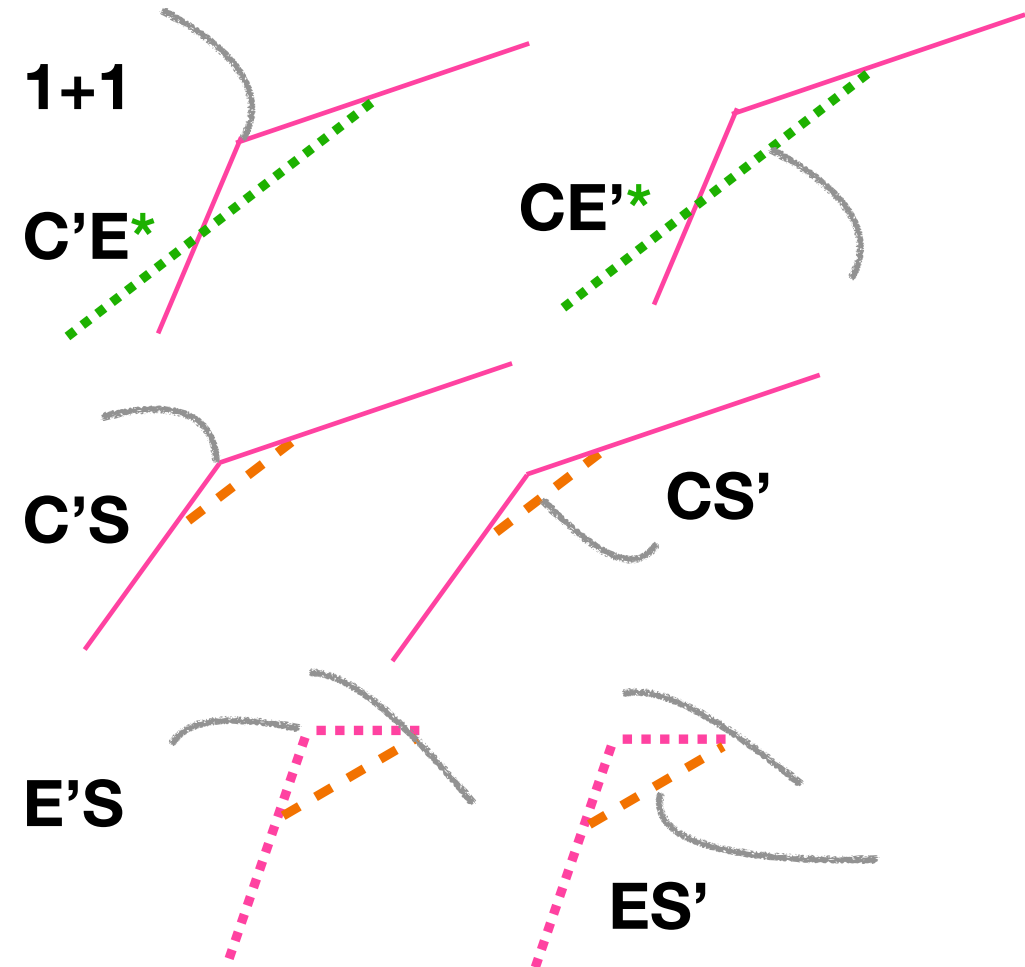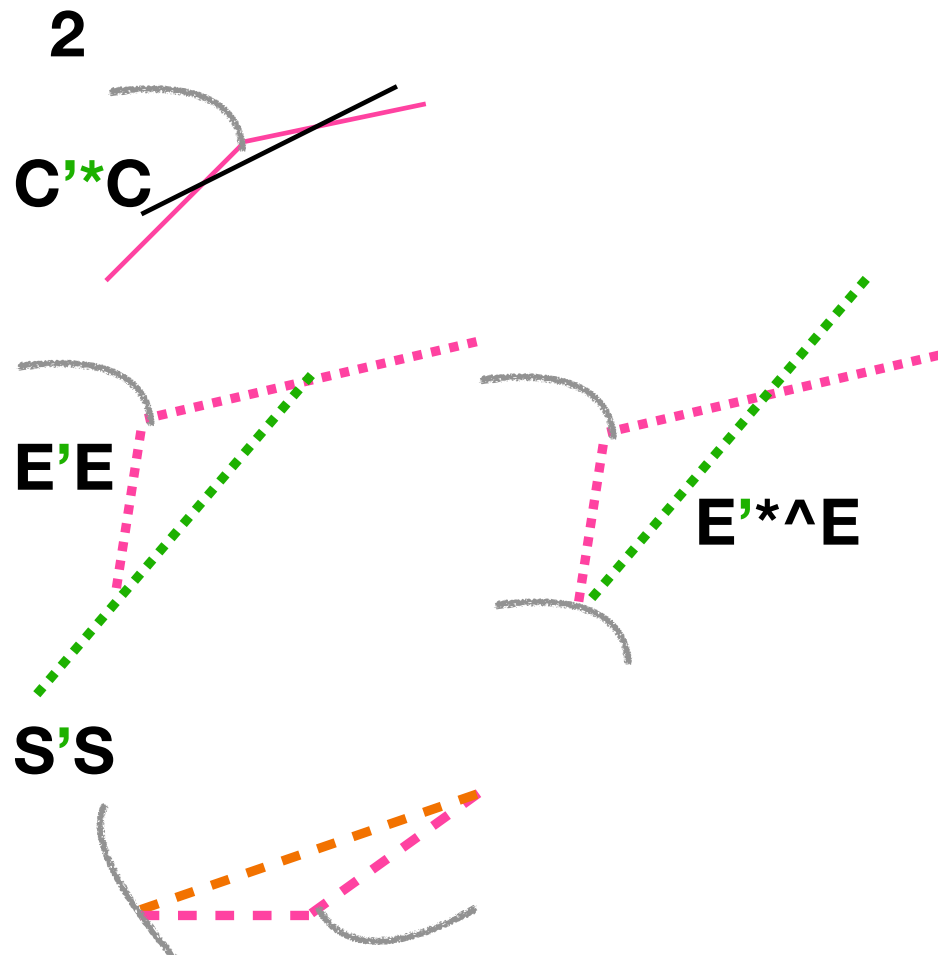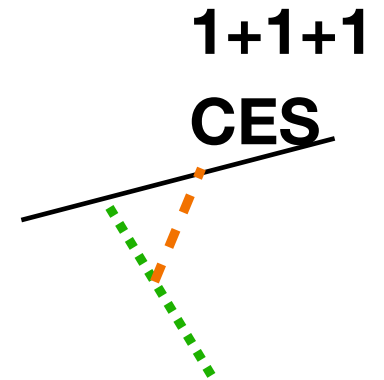= "by construction"

2-node artifacts with 1-continuity
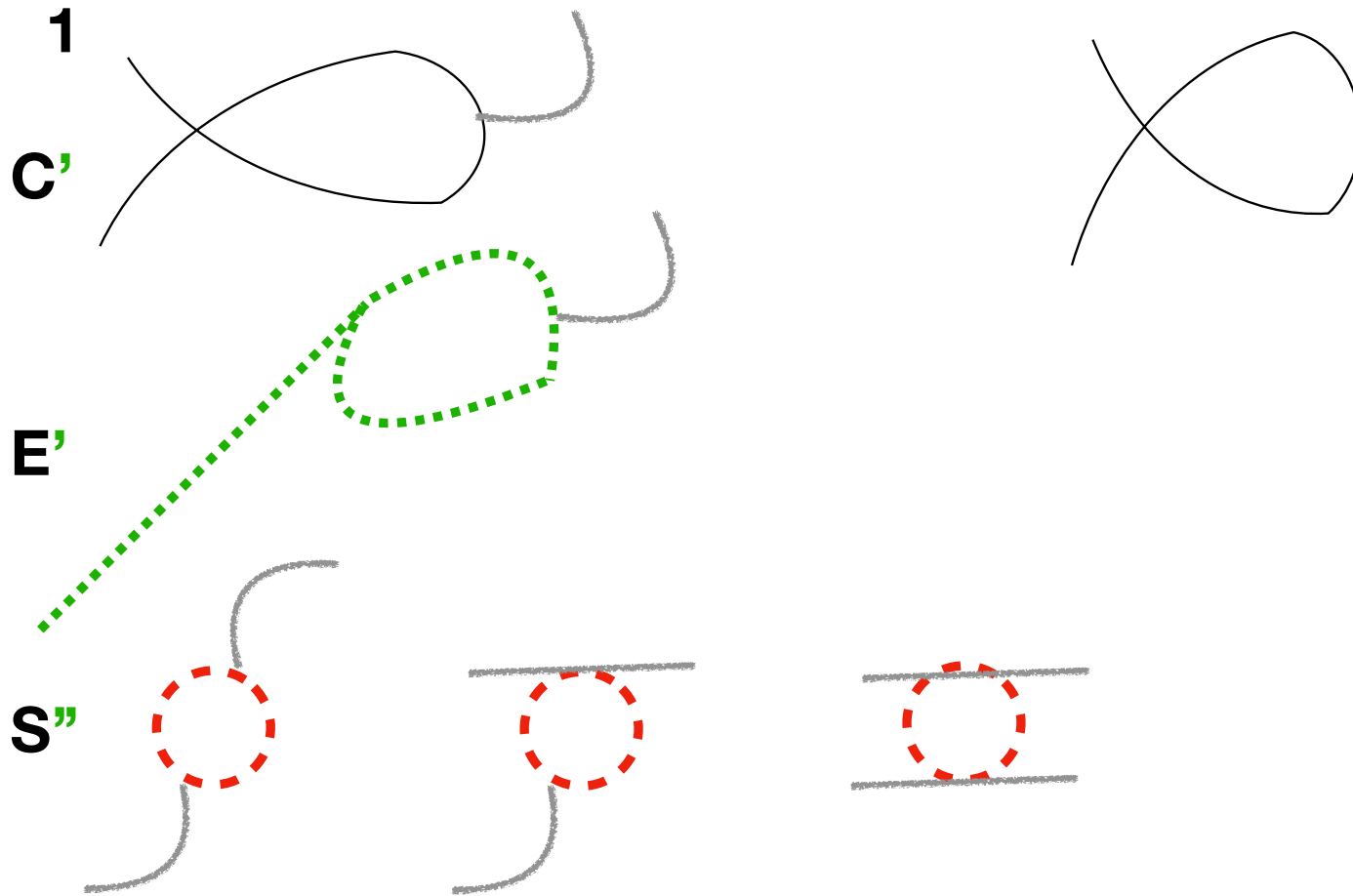
1

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

S'S

C'S

CS'

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
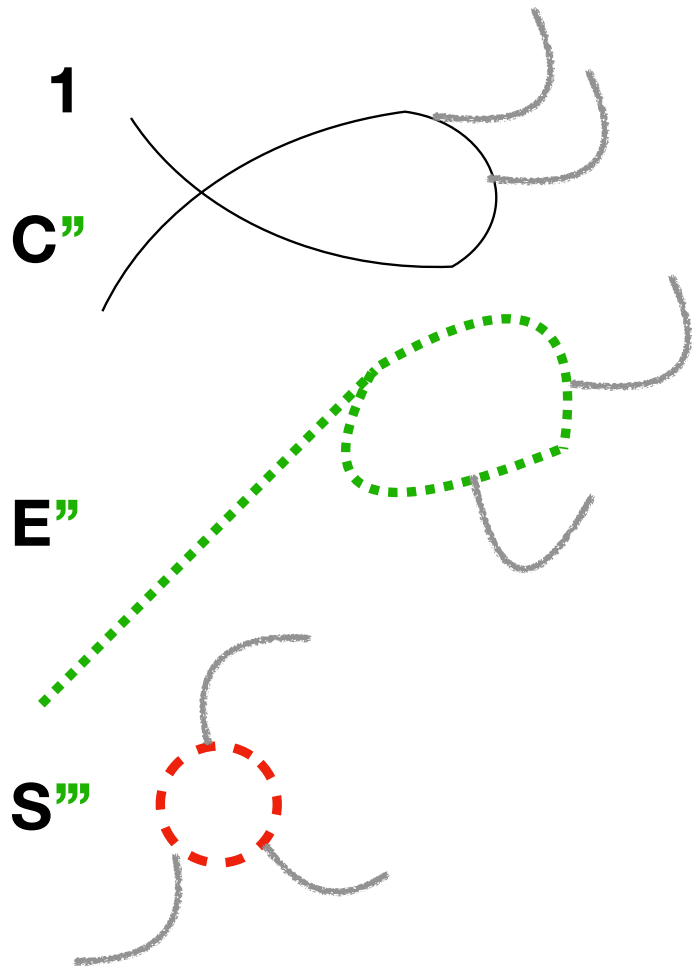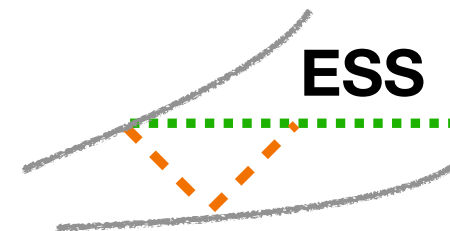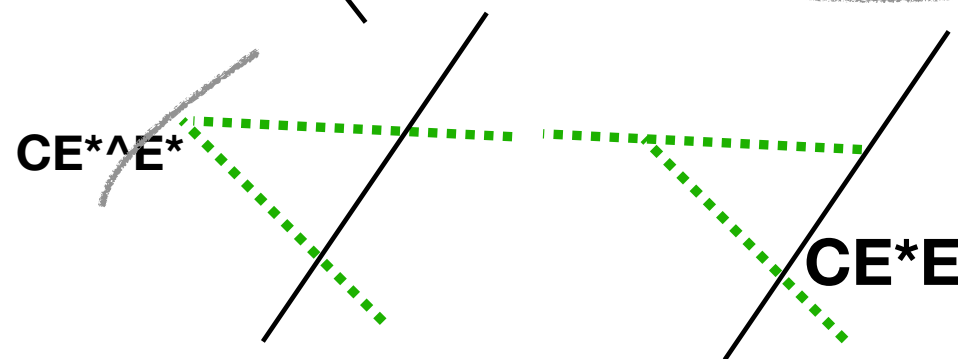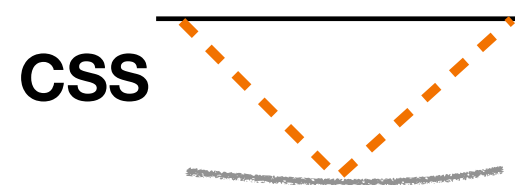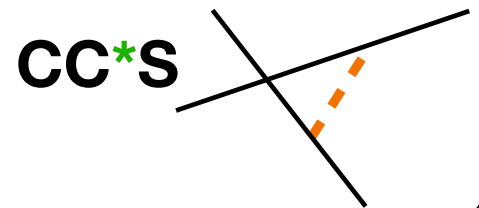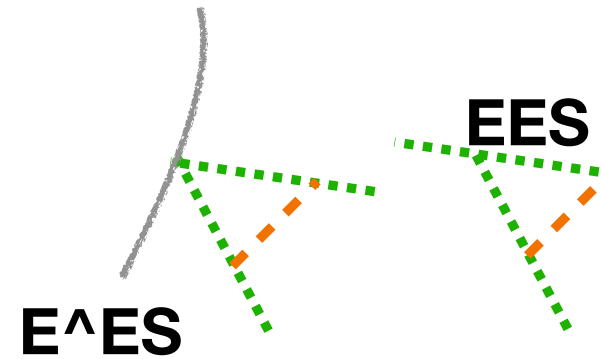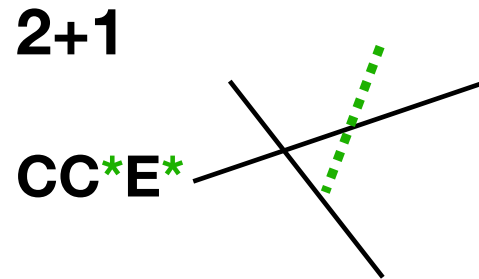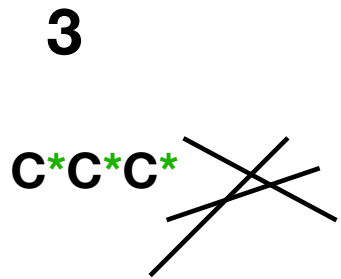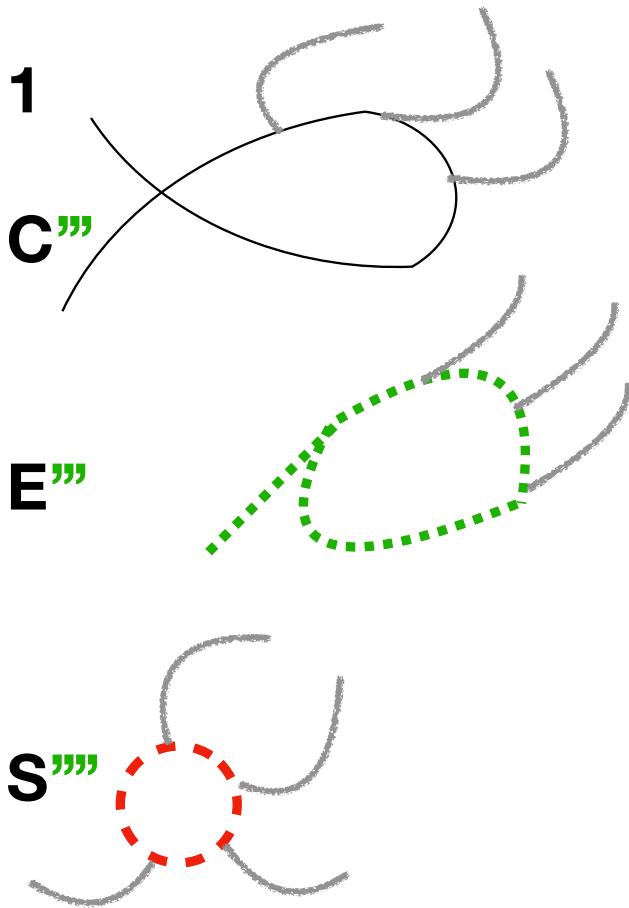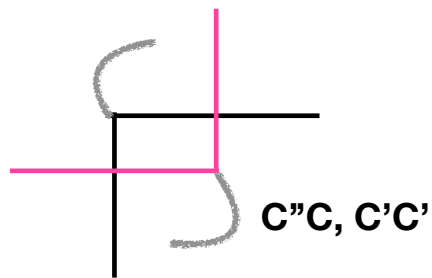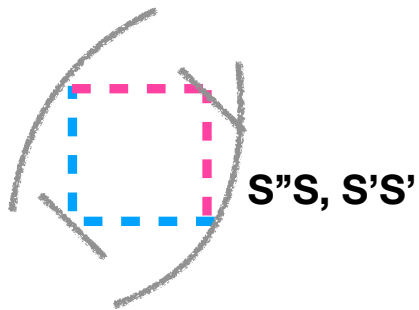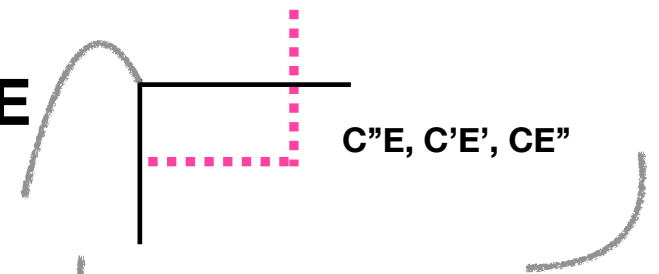
E"S, E'S', ES"
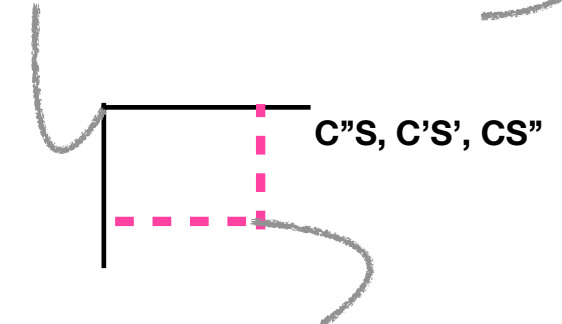
4-node artifacts with 3-continuity, pt 1

3

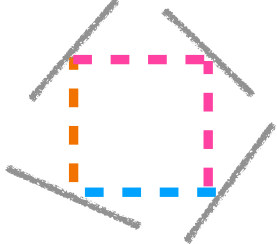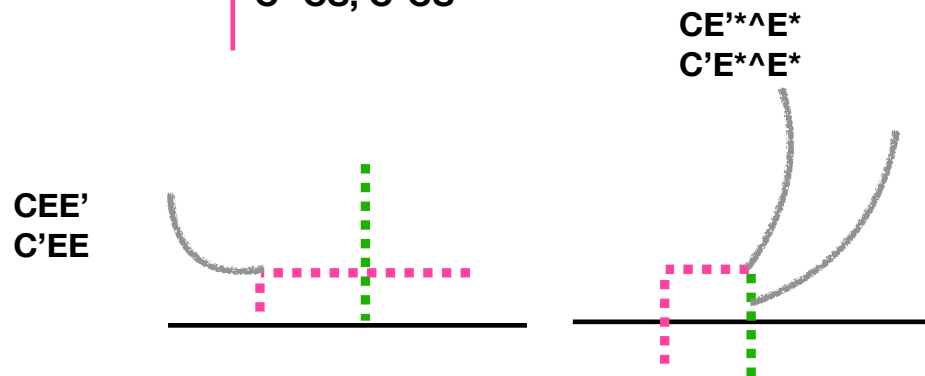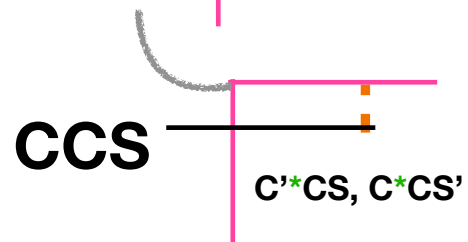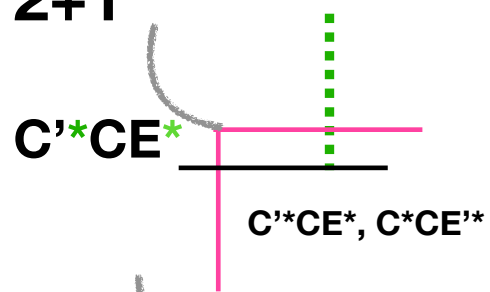**CCC'**
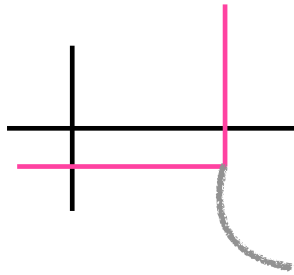
EEE'

EEE*^'
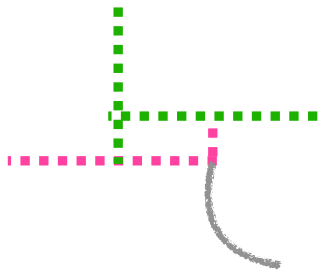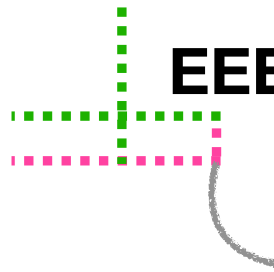
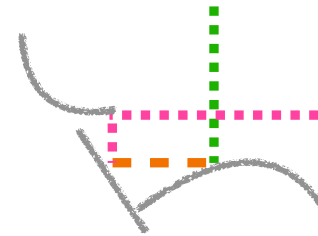? Do we care about the crossing

or only about the touching Es

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'
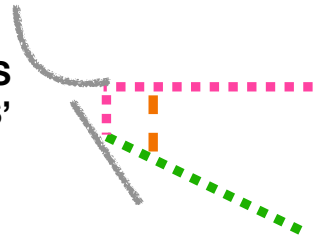
CSS'
C'SS
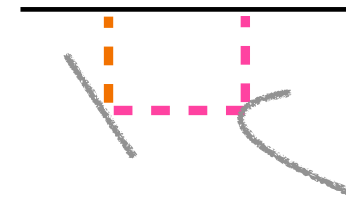
ESS'
E'SS
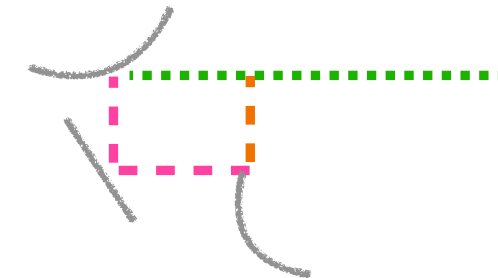
4-node artifacts with 3-continuity, pt 2

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
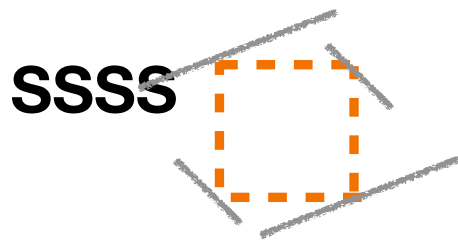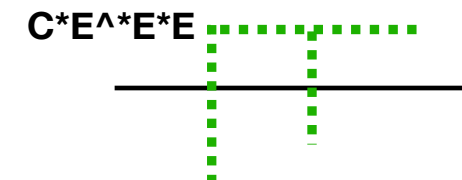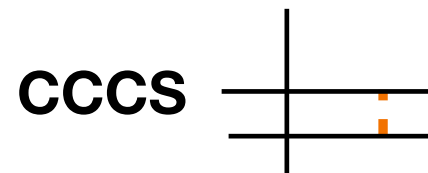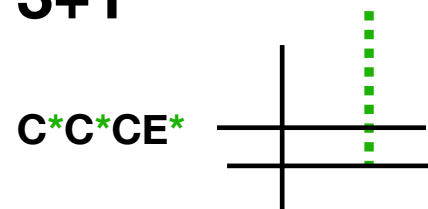
? Do we care about the crossing

of EC only, or also about EE?

4-node artifacts with 4-continuity, pt 2

3+1

EEES
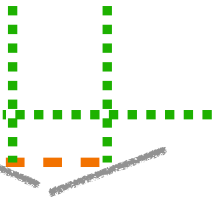
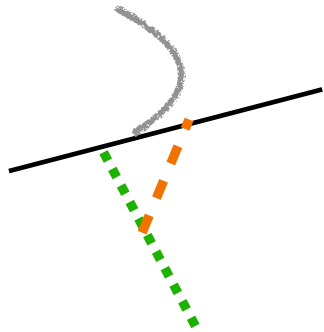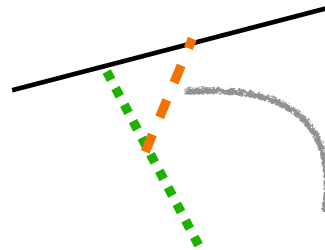**CSSS**
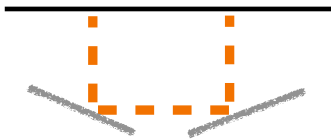
ESSS
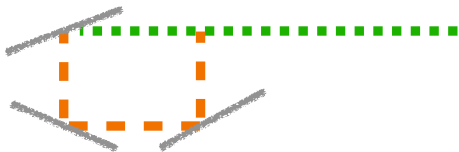
4-node artifacts with 4-continuity, pt 3

2+2
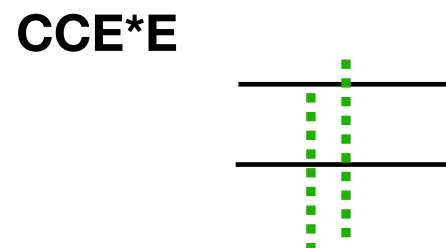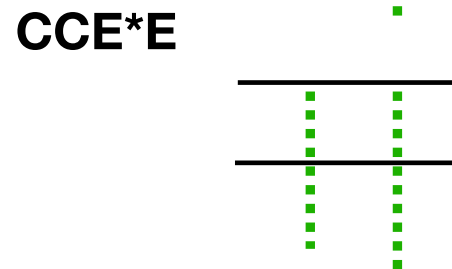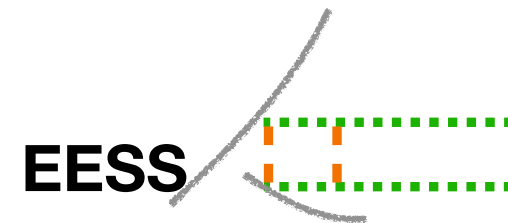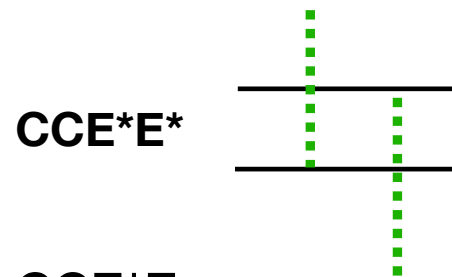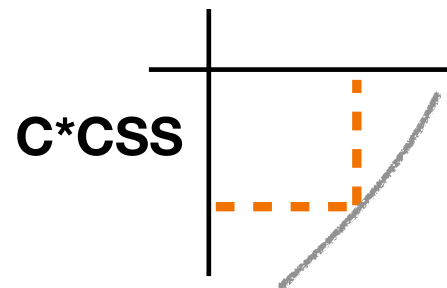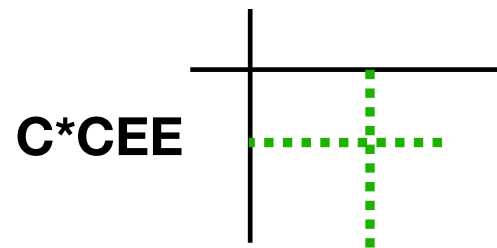
C*CEE

C*CSS

E^ESS

CCE*E*

CCSS

EESS

CCE*E

CCE*E

4-node artifacts with 4-continuity, pt 3

2+1+1

C*CES

CE^E*S

CES^S

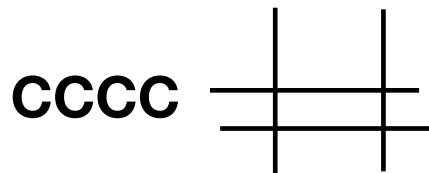Plus asterisk!

CCE*S

CEES

CESS
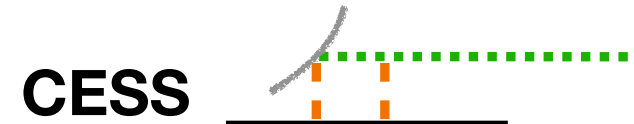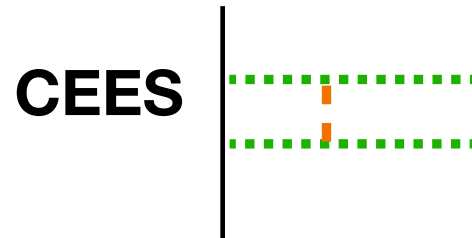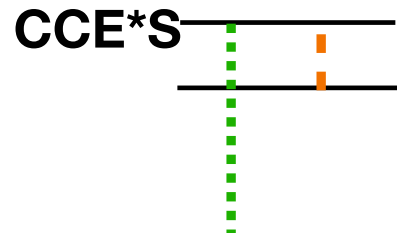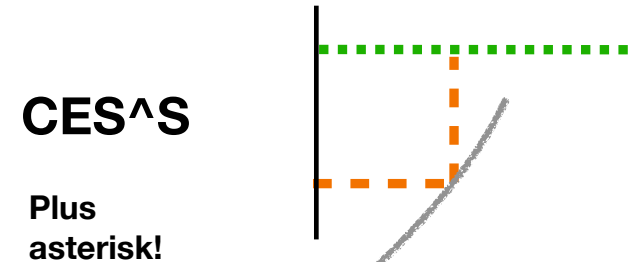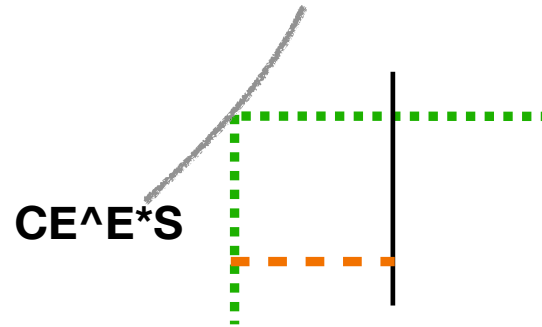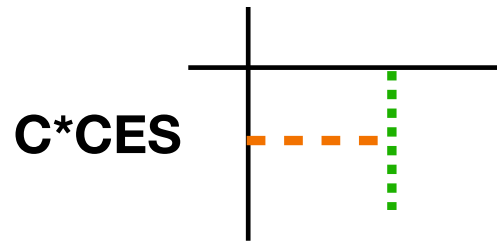
? Do we care about the crossing of EC only, or also about EE?

? Do we care about the touching of EE only, or also about SS?

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

Top 20 solutions (Liège)

- 3CES - triangles.case_1 (use the shortest line or drop the S)

- 2CS - drop the S (may replace with a centerline deadend)

- 1E - drop or replace a centerline deadend (mirrors 2CS)

- 1S - as above

- 3S, 4S, nS - triangles.case_8 (roundabout)

- 3CEE - triangles.case_5

- 3CS - 3C'S - drop S; 3CS' - drop S and replace with shortest line or the shortest edge

- 2EE - drop the shorter edge

- 4CES - 4C'ES [rectangles.case_5c] or 4CE'S [rectangles.case_5b] - drop S ; 4CES' - drop S and join the node with CE intersection with a straight line or a skeleton

- 4CEES - 4CEES rectangles.case_2 (drop S and Es, replace with skeleton); 4CE^ES - drop S

- 3CCS - triangles.case_2 (drop S)

- 2CE -drop the E (may replace with a centerline deadend) (as 2CS)

- 2C (or 2CC incorrectly labelled as 2C) - remove and connect nodes (ensure that the connector is inside)

- 3EEE - triangles.case_7 - keep the longest, make the shortest

- 4CEE - 4CE'E - drop E; 4C'EE - remove Es, join node to prime node; 4C'*EE - rectangles case_5 (drop E with no *)

- 4CCSS - 4CCSS - rectangles.case_3; 4C*CSS - drop S, connect prime node with C*C node

- 3CE - 3CE' - drop end part of E; 3C'E - drop E

- 2E - try roundabout solution -if it is shorter than non-ending of the two edges, use it. otherwise use the existing non-ending edge

- 5CES - 5C''ES | 5CE''S | 5C'E'S drop S. 5C'ES' | 5CE'S' - drop S and connect prime to main intersection (CE), 5CES'' drop S, join primes to centroid, join centroid to int of CE

- 3E'E - drop E without '

General solutions

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

Q: should this also hold for 1C? (We haven't seen that case yet)

If there is only 1 continuity group, but more than 1 node: centroid solution.

Q: should this also hold for 2C, or do we stick to "connect nodes" in that case?

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… // !! 3EEE differs!

General solutions

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

Drop the S if possible.

If not: case-specific solutions