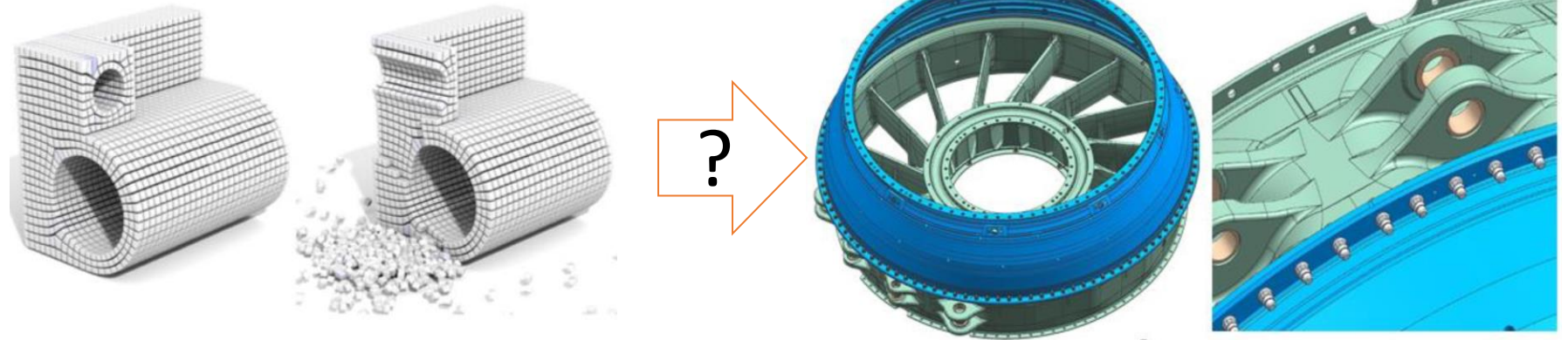


Our plans for hex meshing

D. Sokolov, F. Protais, N. Ray, L. Alonso

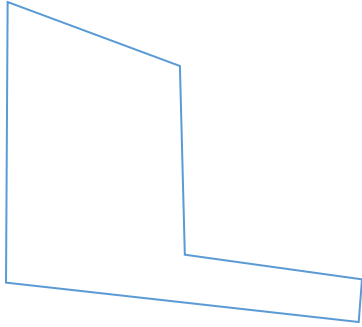
Context

- Our team changed from ALICE (B. Lévy) to PIXEL (D. Sokolov)
- We want to challenge industrial needs with
 - CEA
 - Distene
 - Siemens
 - Tonus

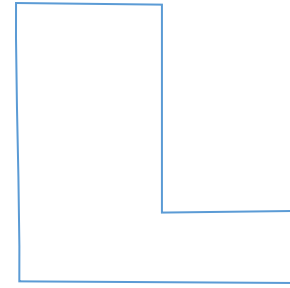
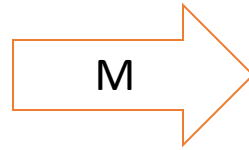
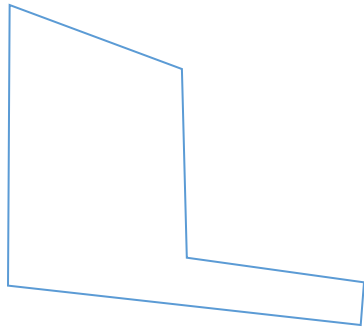


- Today, I will present a focus on our ideas

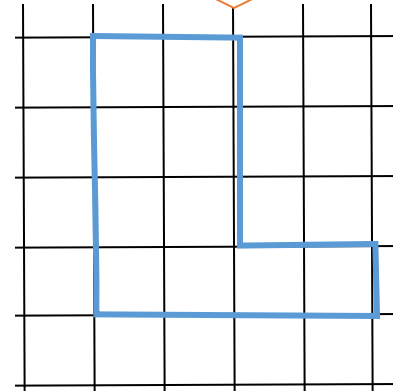
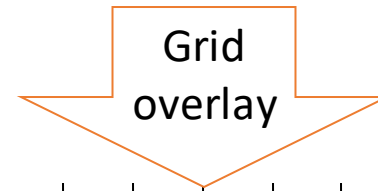
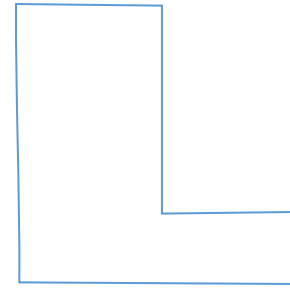
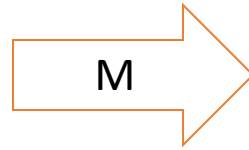
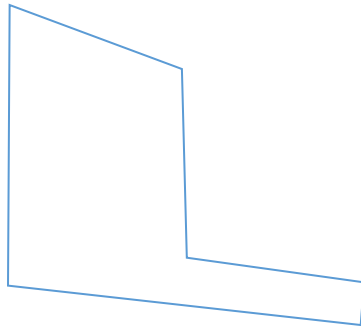
GP principle - trivial case



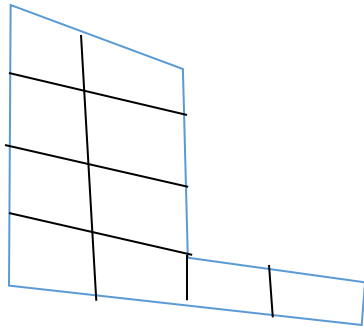
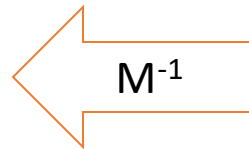
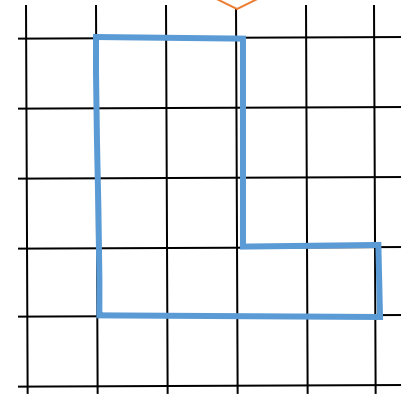
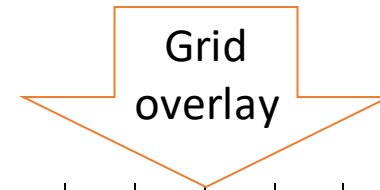
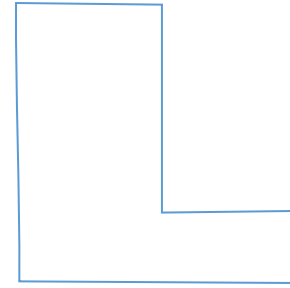
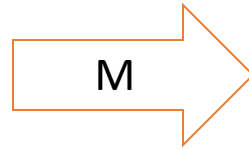
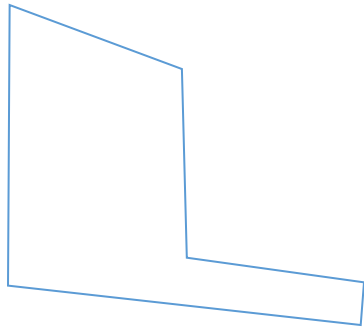
GP principle - trivial case



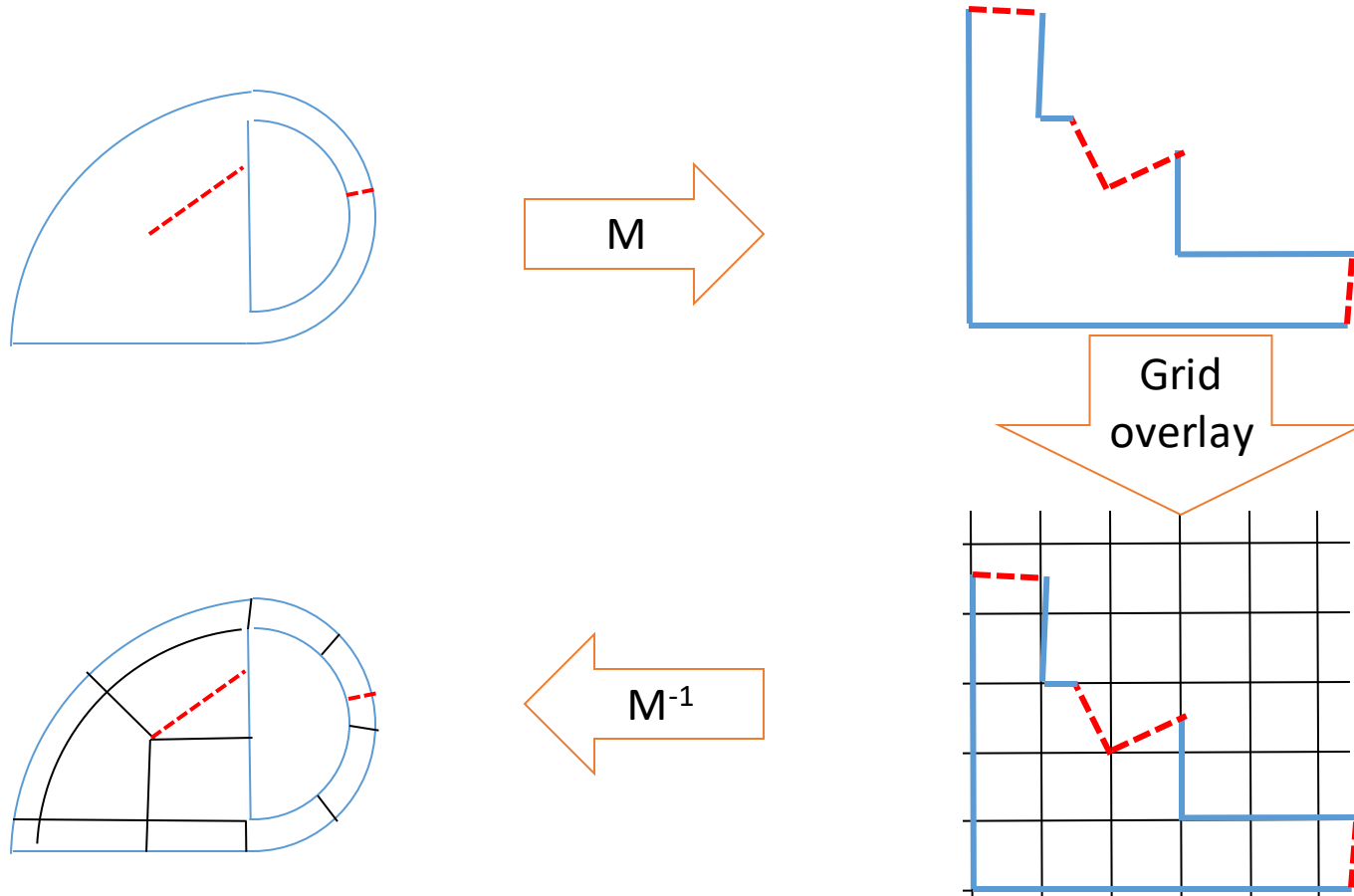
GP principle - trivial case



GP principle - trivial case

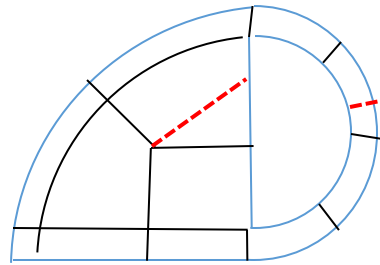
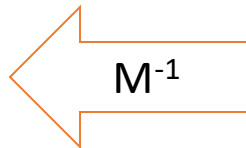
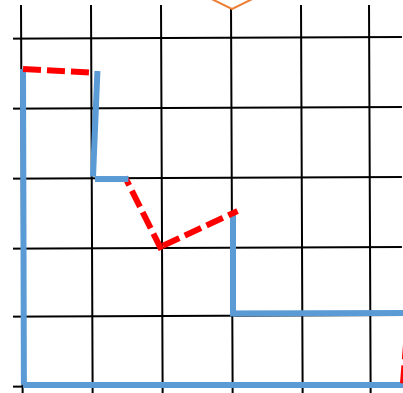
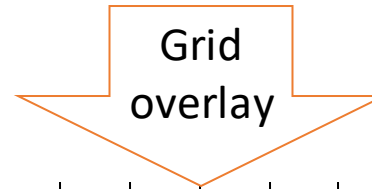
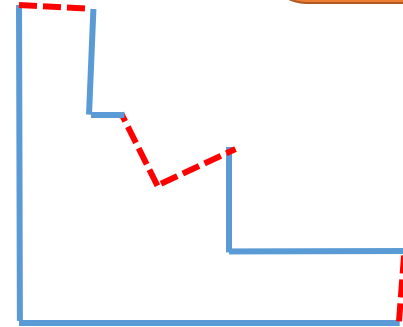
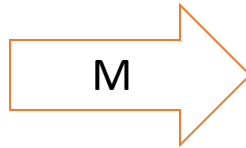
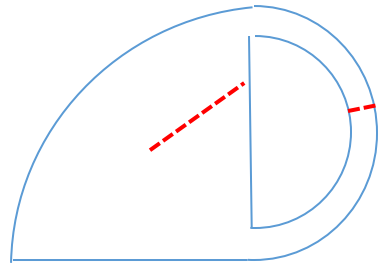


GP principle – more challenging



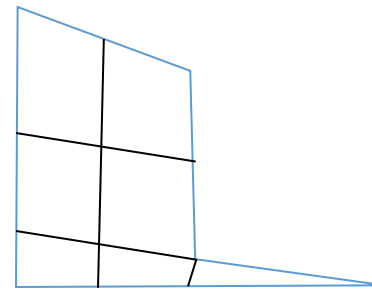
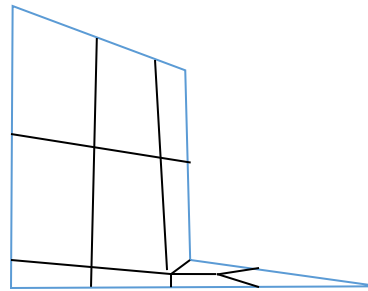
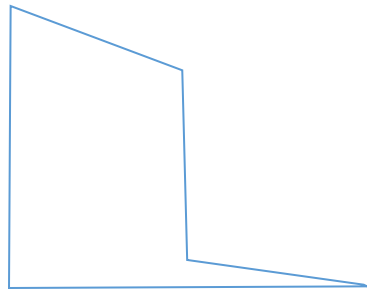
GP principle – more challenging

Challenge #1
Find M !



Is GP self-sufficient ?

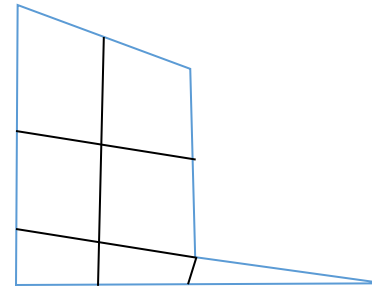
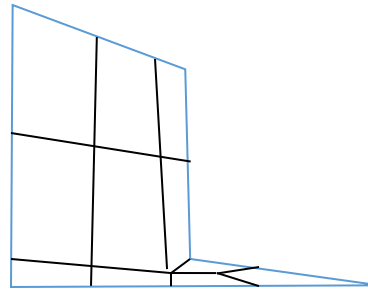
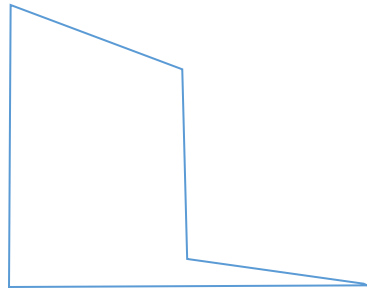
- Theory says yes
 - split each tet into 4 hex
 - Use it as mapping
- But not with fair practical constraints:
 - M piecewise linear
 - Minimal geometric quality of hex



Is GP self-sufficient ?

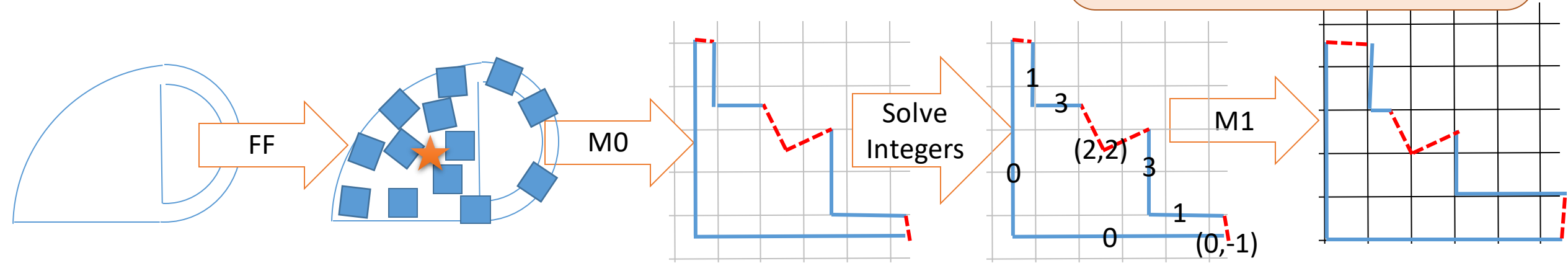
Challenge #2
Help GP

- Theory says yes
 - split each tet into 4 hex
 - Use it as mapping
- But not with fair practical constraints:
 - M piecewise linear
 - Minimal geometric quality of hex



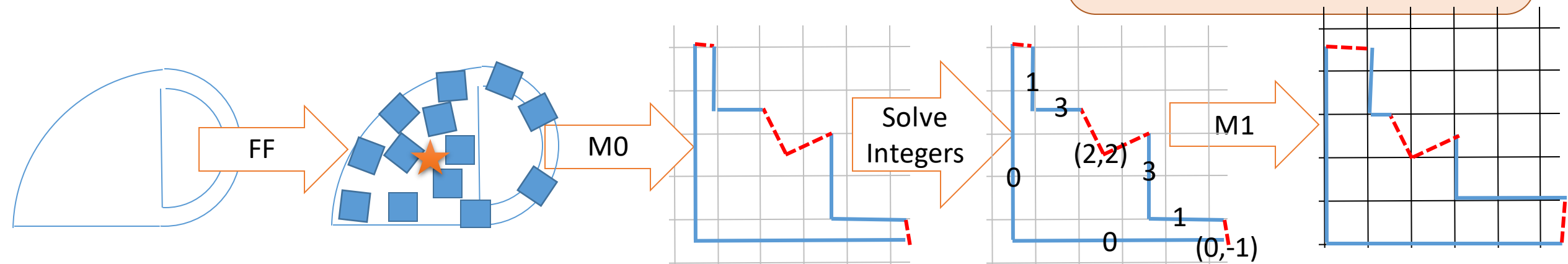
How does it work ?

Challenge #1
Find M !



Our plans

Challenge #1
Find M !



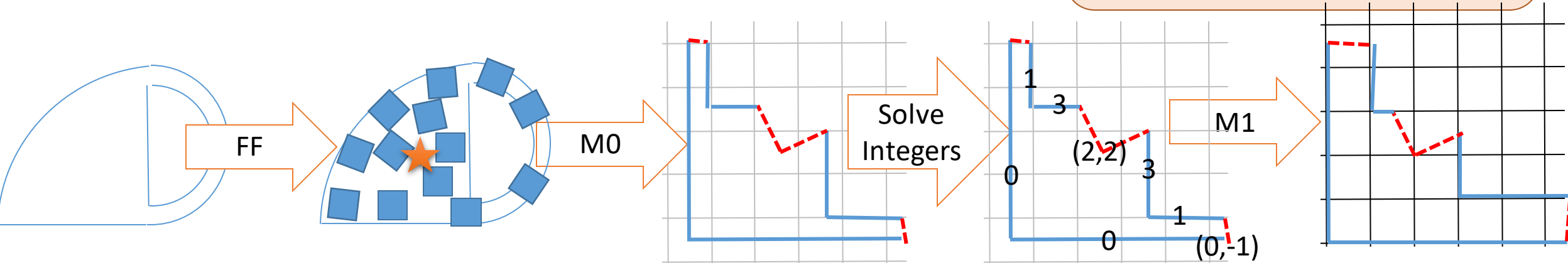
Invalid singularity graph

Lots of efforts to fix an initial singularity graph

2.5D Frame Fields:
generate locally valid FF

Our plans

Challenge #1
Find M !



Invalid singularity graph

Lots of efforts to fix an initial singularity graph

2.5D Frame Fields:
generate locally valid FF

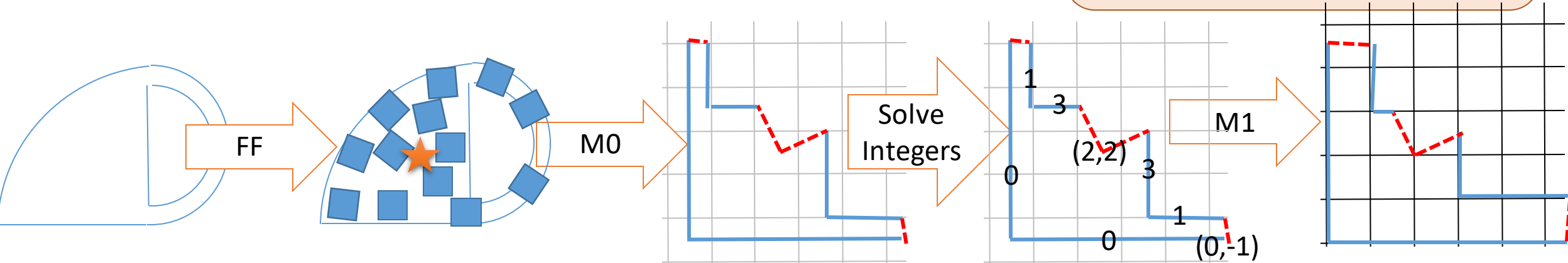
Force to map an edge to a point

Motorcycle in 2D

Extend to 3D with:
• Polycube case
• Subset of constraints

Our plans

Challenge #1
Find M !



Invalid singularity graph

Lots of efforts to fix an initial singularity graph

2.5D Frame Fields: generate locally valid FF

Force to map an edge to a point

Motorcycle in 2D

Extend to 3D with:

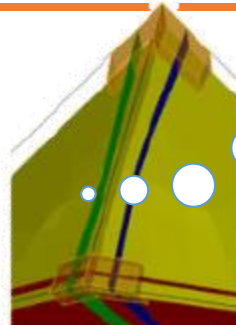
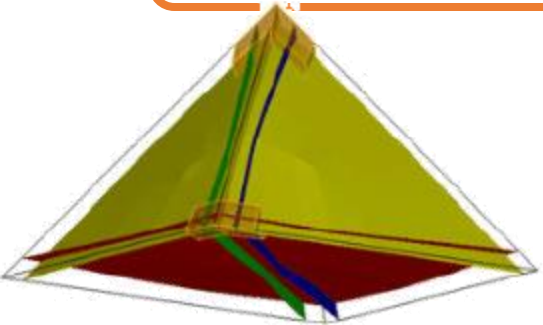
- Polycube case
- Subset of constraints

M have negative Jacobian

Constrained optimization problem

How to help GP ?

Conflicting constraints

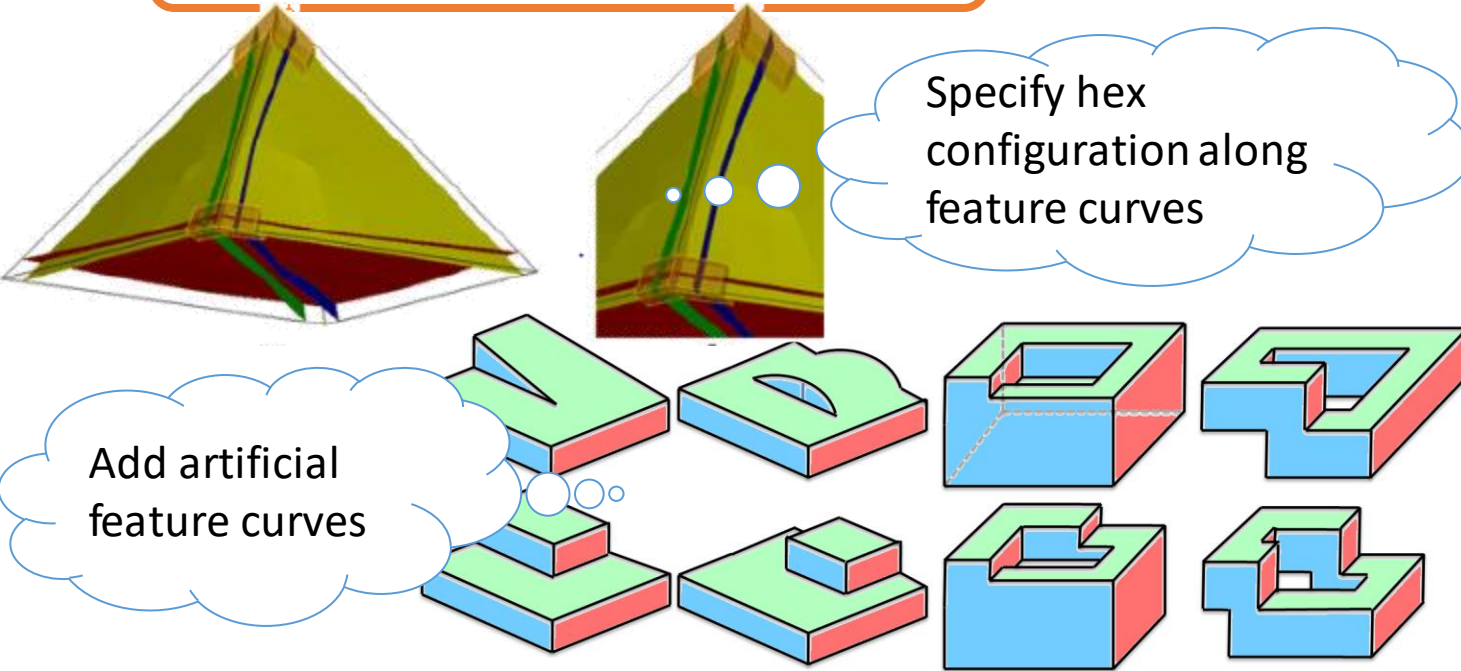


Specify hex
configuration along
feature curves

Challenge #2
Help GP

How to help GP ?

Conflicting constraints

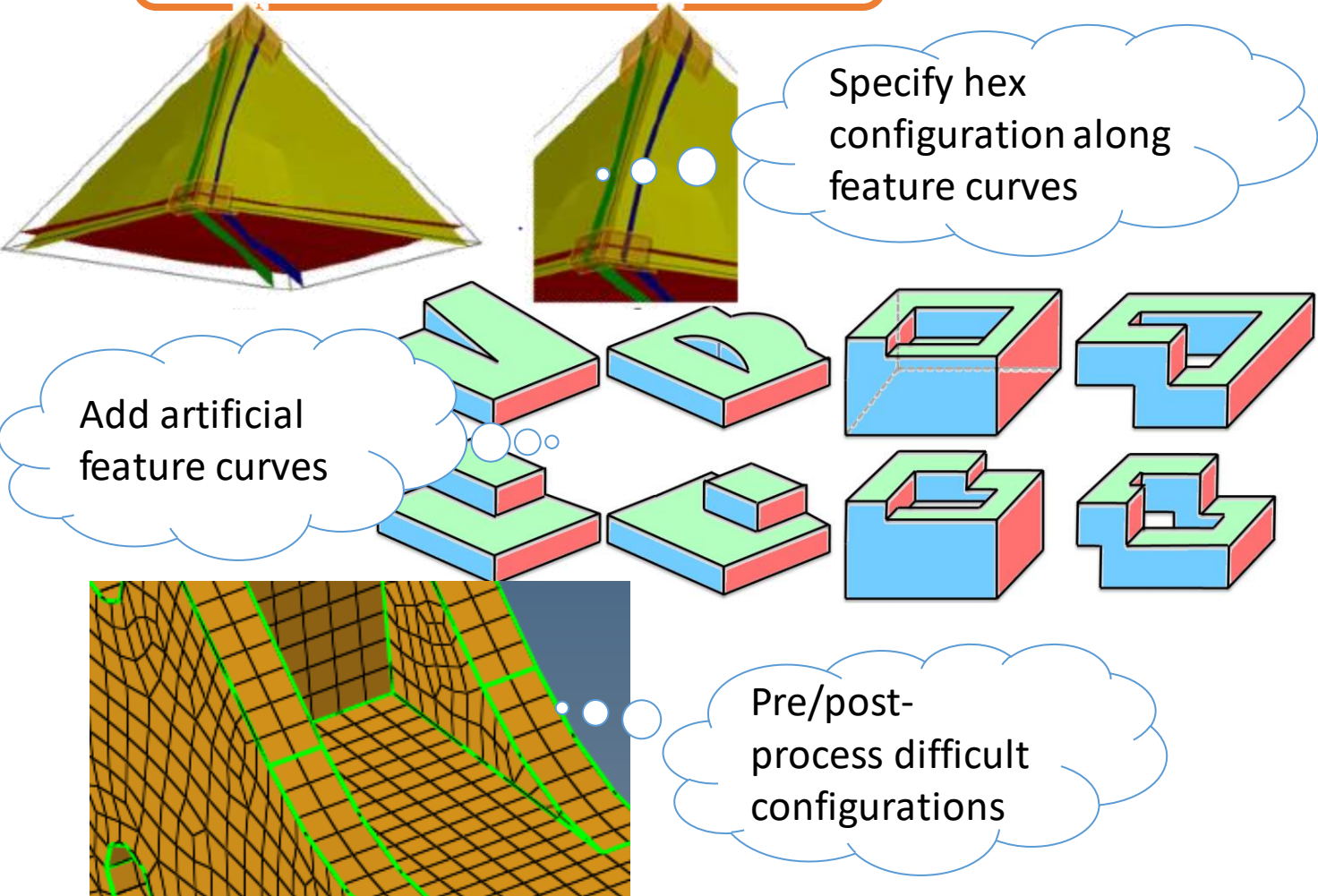


Challenge #2
Help GP

How to help GP ?

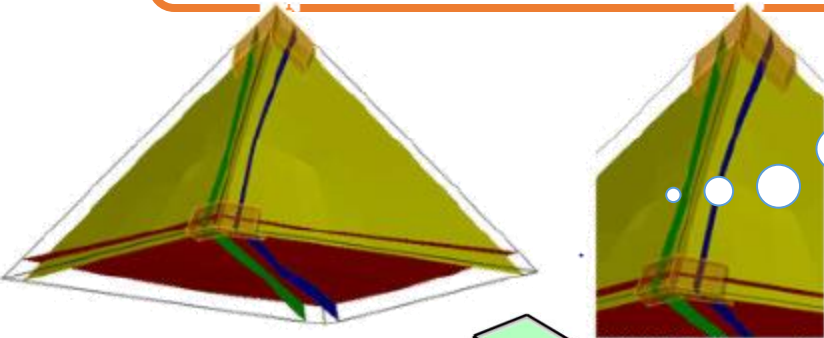
Challenge #2
Help GP

Conflicting constraints



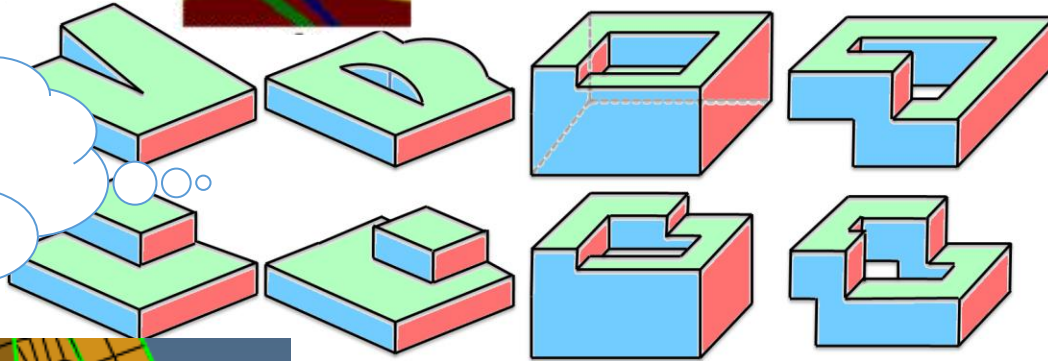
How to help GP ?

Conflicting constraints

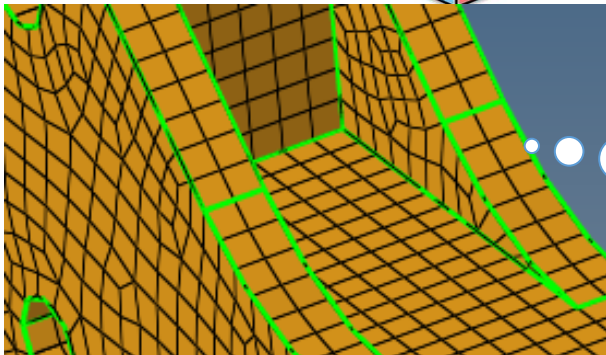


Specify hex configuration along feature curves

Add artificial feature curves



Pre/post-process difficult configurations



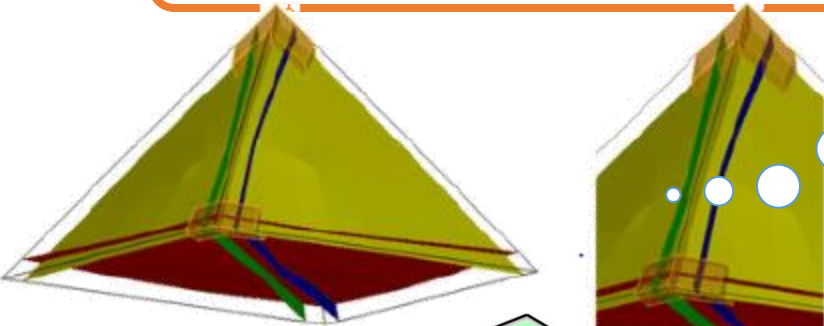
Challenge #2
Help GP

Ensure FF integrability

Polycube followed by
« Deep pillowing »

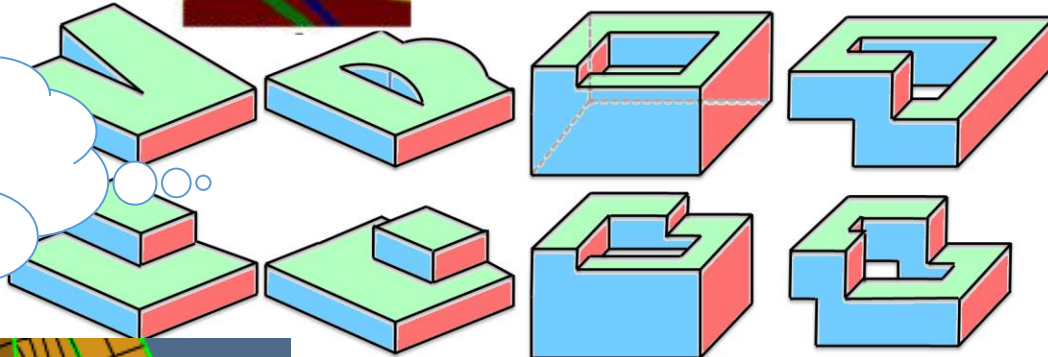
How to help GP ?

Conflicting constraints

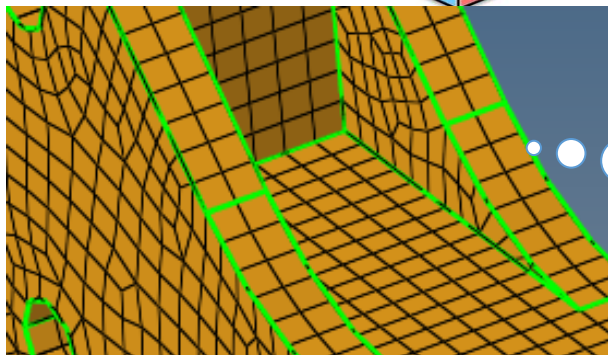


Specify hex configuration along feature curves

Add artificial feature curves



Pre/post-process difficult configurations



Challenge #2 Help GP

Ensure FF integrability

Polycube followed by
« Deep pillowing »

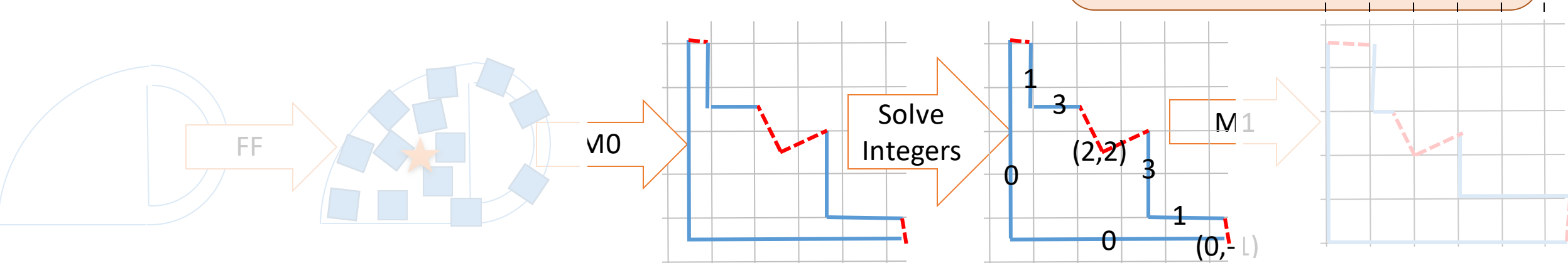
Relax bijectivity constraint

Qex and Hexex
partially fix it

Extract the combinatorial
structure **before** finding
the geometry ?

TODAY'S FOCUS

Challenge #1
Find M!



Invalid singularity graph

Lots of efforts to fix an initial singularity graph

2.5D Frame Fields: generate locally valid FF

Force to map an edge to a point

Motorcycle in 2D

Extend to 3D with:

- Polycube case
- Subset of constraints