

# Affine Transformation 3

Computational Visual Design Laboratory  
(<https://github.com/cvlab>) “Roma Tre” Univ, Italy

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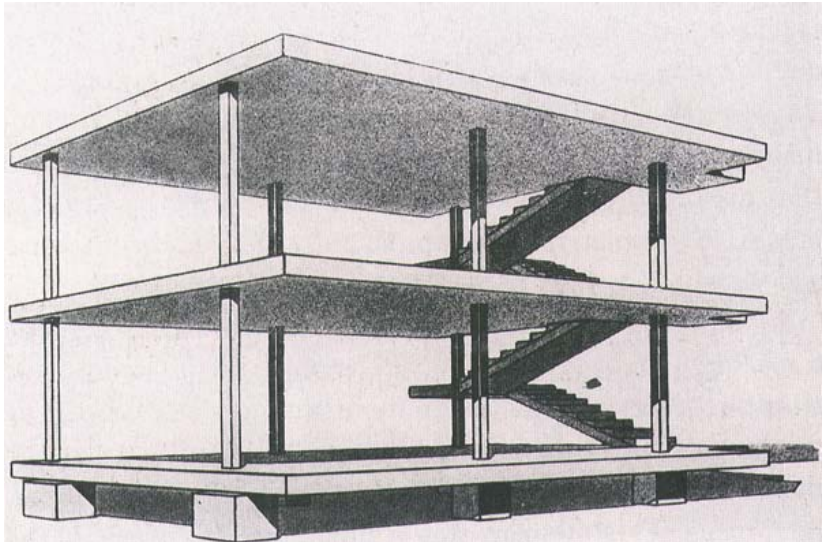


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Building fabric modeling

# A great example: Maison Domino

Le Corbusier in 1920's developed the Maison-Domino, a basic building prototype for mass production with free-standing pillars and rigid floors.

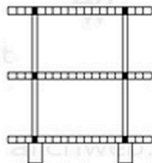


# A great example: Maison Domino

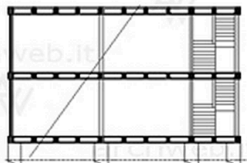
Nel 1914 Le Corbusier elabora un sistema costruttivo adatto ad affrontare i problemi della ricostruzione postbellica. Le Corbusier progetta quindi un sistema strutturale, una sorta di scheletro del tutto indipendente dalla pianta della casa. Questa ossatura, che sostiene esclusivamente i solai e le scale è costituita da elementi standard componibili e permette una grande varietà nell'aggregazione delle unità.



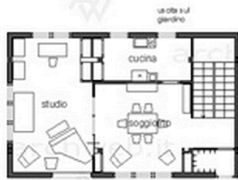
ALLOGGIO TIPO 1 - PIANO TERRA



SEZIONE



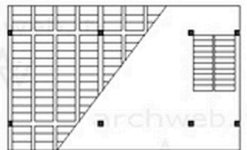
SEZIONE LONGITUDINALE



ALLOGGIO TIPO 2 - PIANO TERRA



ALLOGGIO TIPO 2 - PIANO PRIMO



SEZIONE SOLAIO

# The building fabric

## A functional breakdown of the construction

- ▶ foundations
- ▶ building frame
  - ▶ beams
  - ▶ pillars
- ▶ building enclosures
  - ▶ horizontal enclosures
  - ▶ vertical enclosures
- ▶ building partitions
  - ▶ horizontal partitions
  - ▶ vertical partitions
- ▶ vertical communications
  - ▶ staircases
  - ▶ elevators
- ▶ mechanical, electrical, and plumbing (MEP) plants



# Utility functions

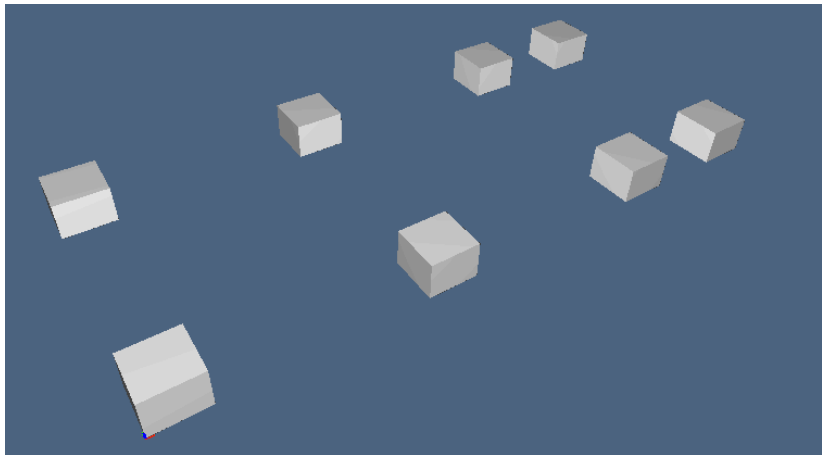
```
GRID = COMP ( [ INSR ( PROD ) , AA ( QUOTE ) ] )
```



# Foundations

notice the position of origin of the coordinate frame

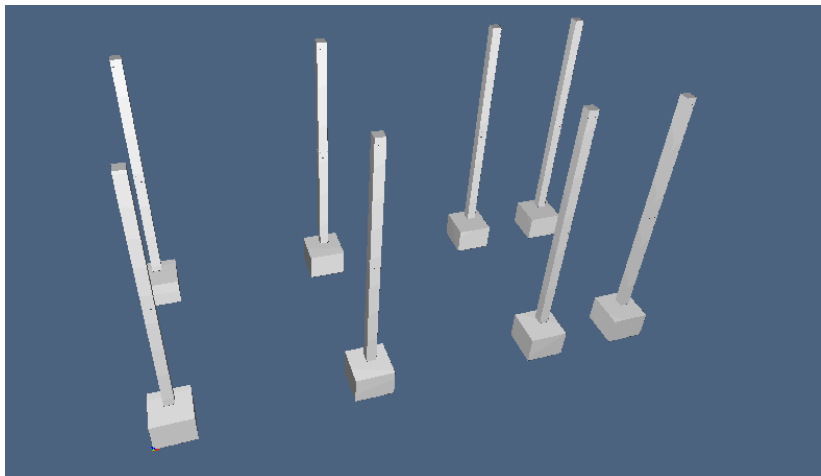
```
foundations = GRID ([[8,-30,8,-30,8,-12,8],[8,-30,8],[6]])  
VIEW(foundations)
```



# Pillars

notice the initial (implicit) translation

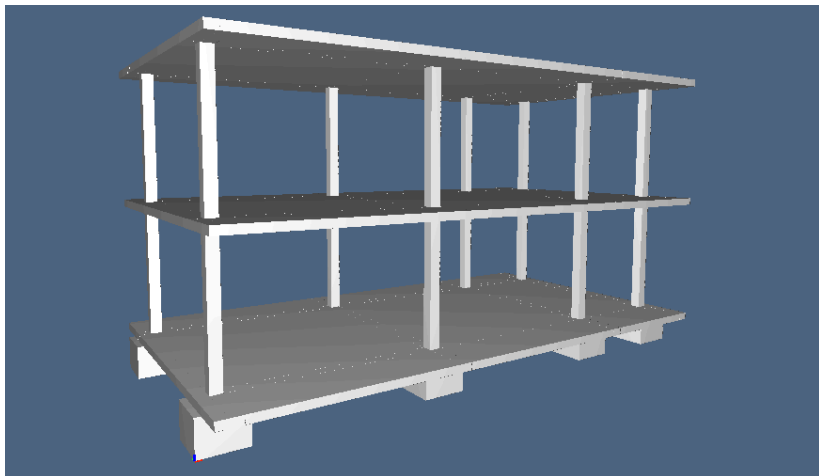
```
pillars = GRID([[-3,2,-36,2,-36,2,-18,2], [-3,2,-36,2],  
               [-7.4,23.6,1.4,23.6,1.4]])  
building = STRUCT([foundations,pillars])  
VIEW(building)
```





# Horizontal enclosures and partitions

```
horiz_partitions = GRID([[-1,2,2,36,2,36,2,18,2,2],[9,2,36,2,9],  
                        [-6,1.4,-23.6,1.4,-23.6,1.4]])  
building = STRUCT([foundations,pillars,T(2)(-6)(horiz_partitions)])  
VIEW(building)
```

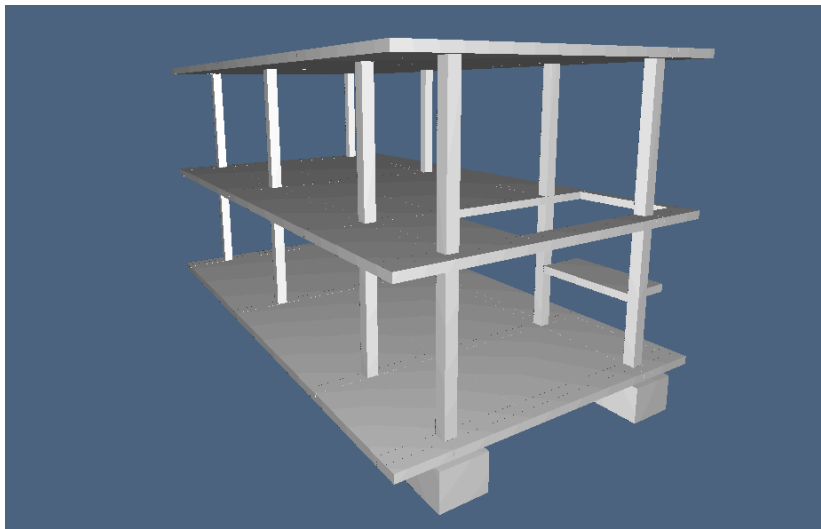


# Horizontal enclosures and partitions

```
hpartition1 = GRID([[-1,2,2,36,2,36,2,-18,2,2],[9,2,12,24,2,9],  
[-6,1.4,-23.6,1.4,-23.6,1.4]])  
hpartition2 = GRID([[-1-2-2-36-2-36-2,18],[9,2,12,-24,-9,2],  
[-6,1.4,-23.6,1.4,-23.6,1.4]])  
hpartition3 = GRID([[-1-2-2-36-2-36-2,18],[9,2,12,24,2,9],  
[-6,1.4,-23.6,-1.4,-23.6,1.4]])  
hpartition4 = GRID([[-1-2-2-36-2-36-2,18],[-9,-2,-12,-24,9],  
[-6,1.4,-23.6/2 +1.25,1.4]])  
horiz_partitions = STRUCT([ hpartition1, hpartition2,  
hpartition3, hpartition4 ])  
building = STRUCT([foundations,pillars,T(2)(-6)(horiz_partitions)])  
VIEW(building)
```

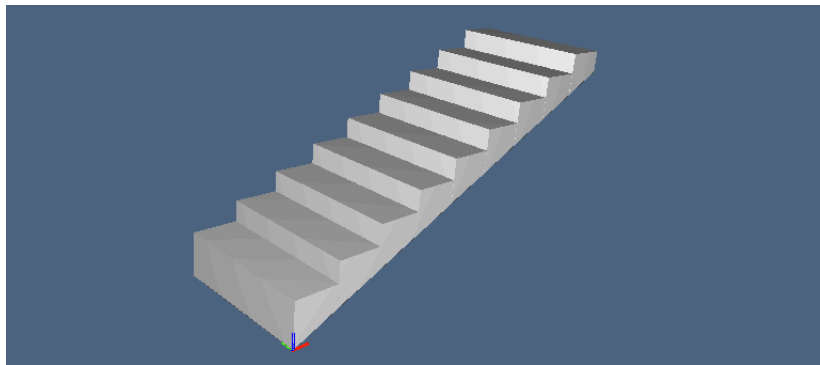


# Horizontal enclosures and partitions



# Staircases

```
step2D = MKPOL([ [0,0], [0,2.65], [2.66,2.5/2], [2.66,2.65]],  
               [[1,2,3,4]], None)  
step3D = MAP([S1,S3,S2]) (PROD([step2D,Q(9)]))  
ramp = STRUCT(NN(9) ([step3D,T([1,3]) ([2.66,2.5/2])]))  
VIEW(ramp)
```



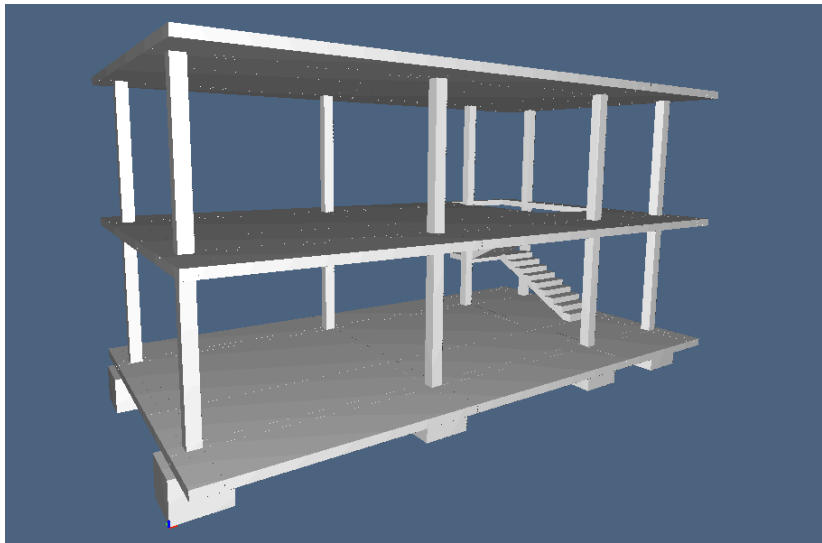
# Staircases

```
ramp1 = T([1,2,3])([3+2+36+2+36+2+18,3+2+12,6])(R([1,2])(PI/2)(ramp))  
ramp2 = T([1,2,3])([3+2+36+2+36+2,3+2+12+24,6+25/2])(  
    R([1,2])(-PI/2)(ramp))
```

```
building = STRUCT([foundations,pillars,T(2)(-6)(horiz_partitions),  
    S(3)(1.05),ramp1,ramp2])  
VIEW(building)
```



# Staircases

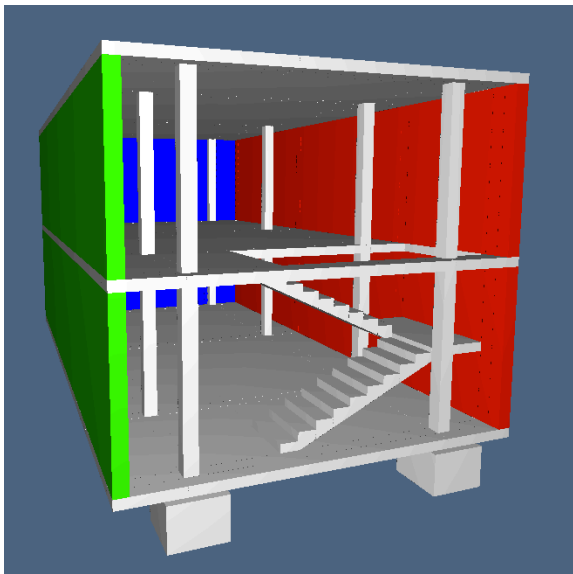


# Vertical enclosures

```
enclosure_north = COLOR(RED) (GRID ([ [-1,2,2,36,2,36,2,18,2,2],  
    [-5,-2,-12,-24,-7,2], [-6,-1.4,23.6,-1.4,23.6,-1.4]]))  
enclosure_south = COLOR(GREEN) (GRID ([ [-1,2+2+36+2+36+2+18+2+2],  
    [2], [-6,-1.4,23.6,-1.4,23.6,-1.4]]))  
enclosure_west = COLOR(BLUE) (GRID ([ [-1,2], [-2,4,2,36,2,4,6],  
    [-6,-1.4,23.6,-1.4,23.6,-1.4]]))  
building = STRUCT([foundations,pillars,T(2) (-6) (horiz_partitions),  
    ramp1,ramp2,enclosure_north,  
    T(2) (-6) (enclosure_south),T(2) (-6) (enclosure_west)])  
VIEW(building)
```



# Vertical enclosures





# Internal partitions

```
wall01 = COLOR(YELLOW) (T([1,2]) ([3+2+36+2+36+1, 3+2+12]) (  
    GRID([ [1], [24,-2,7], [-6,-1.4,23.6,-1.4,23.6] ])) )  
building = STRUCT([foundations,pillars,T(2)(-6)(horiz_partitions),  
    ramp1,ramp2, enclosure_north,T(2)(-6)(enclosure_south),  
    T(2)(-6)(enclosure_west), wall01])  
VIEW(building)
```



# Internal partitions

