

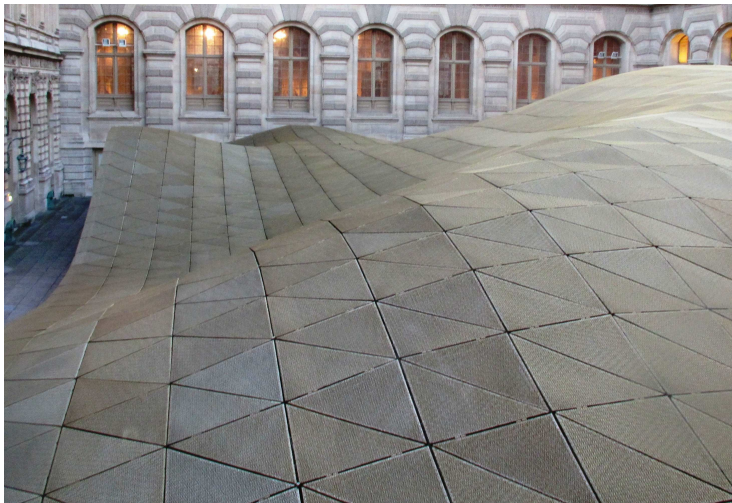
Hexagonal geodesic 3-webs

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9th October, 2018, Trieste

Freeform Architecture



Museum of Islamic Arts at Louvre

Equations for Metric

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$$ds^2 = E(u, v)du^2 + 2F(u, v)dudv + G(u, v)dv^2$$

$$2EF_u - FE_u - EE_v = 0,$$

$$2GF_v - FG_v - GG_u = 0,$$

$$GE_u + EG_v - 2F(F_u + F_v) + (3F - 2G)E_v + (3F - 2E)G_u = 0.$$

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Lie Symmetry Algebra

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On **invariant** solutions, $\exp(tX)$ acts as **projective** map.

If $\exp(tX)$ is not **isometry** then it is **homothety**.

-  B.Deng, H.Pottmann, J.Wallner, Functional webs for freeform architecture ('11).
-  S.Finsterwalder, Mechanische Beziehungen bei der Flächendeformation (1899).
-  P.Stäckel, Lineare Scharen geodätischer Linien (1903).
-  R.Sauer, Flächen mit drei ausgezeichneten Systemen geodätischer Linien, die sich zu einem Dreiecksnetz verknüpfen lassen (1926).
-  K.Mayrhofer, Über Sechseckgewebe aus Geodätischen (1931).
-  M.Bialy, A.Mironov, Rich quasi-linear system for integrable geodesic flows on 2-torus (2011).
-  G.Manno, M.Pavlov, Hydrodynamic-type systems describing 2-dimensional polynomially integrable geodesic flows ('17).
-  B.Kruglikov, Invariant characterization of Liouville metrics and polynomial integrals ('08).
-  H.Graf, R.Sauer, Über dreifache Geradensysteme in der Ebene, welche Dreiecksnetze bilden, (1924).
-  S.Agafonov, Hexagonal geodesic 3-webs, arXiv: 1806.03072 [math.DG] ('18)