

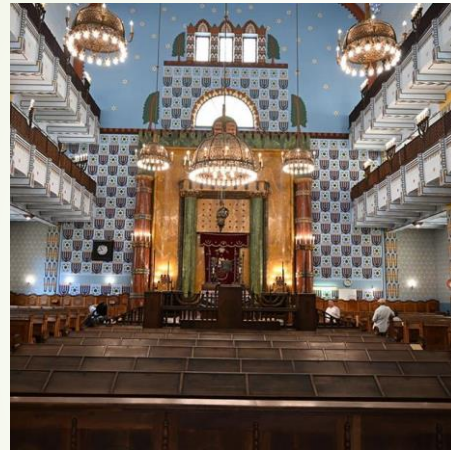
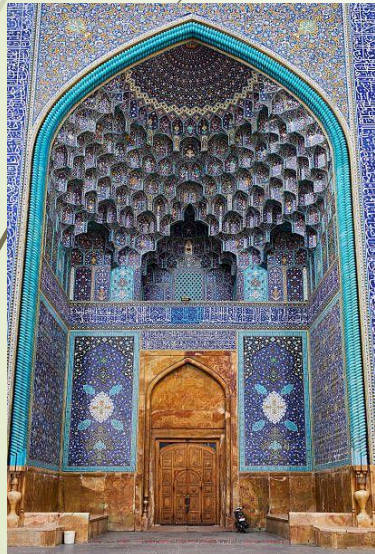


STEAM EDUCATION BASED ON THE STUDENTS CULTURAL BACKGROUND: OCTAGONAL MONUMENTS AND DIGITAL TOOLS

Thierry (Noah) Dana-Picard and Sara Hershkovitz

Geometric features of monuments: tessellations and symmetries

Isfahan
Mosque,
Iran



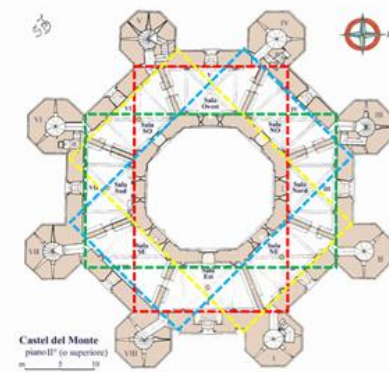
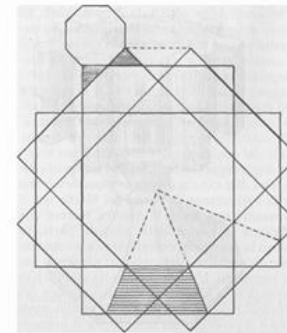
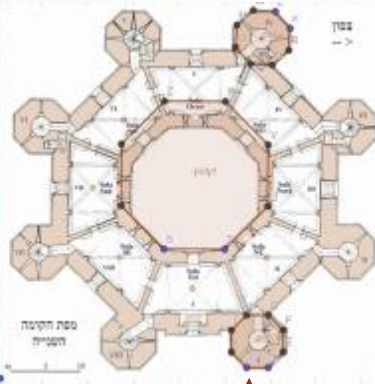
Kazinczky Utca
Synagogue
Budapest,
Hungary

Kadoorie Synagogue, Porto, Portugal



Octagonal monuments: fortifications

Castelo del Monte, Italy



Augmented reality

Reconstitution using DGS

Geometrical analysis and DGS assisted synthesis performed by students

Castel del Monte
plano II (o superiore)
1:100

File Edit View Options Tools Window Help

Algebra

- q = 1.31
- r = 1.31
- phi = 1.62
- c: $(x - 0.5)^2 + (y - 1.21)^2 = 0.6$
- I = (0.19, 0.46)
- J = (0.81, 0.46)
- s = 0.62
- a = 1.62
- t = 0.62
- poly2 = 1.84
- k: $y = 1.21$
- l: $x = 0.5$
- j: $y = 0.46$
- m: $x = -0.71$
- R = (-0.71, 0.46)
- R' = (-0.71, 1.95)
- n: $y = 1.95$
- p: $x = 1.71$
- S = (1.71, 1.95)
- T = (1.71, 0.46)
- o = 1.62
- q: $0.44x - 0.44y = -1.16$
- r: $-0.44x - 0.44y = -1.6$
- s: $-0.44x + 0.44y = -0.54$
- t: $0.44x + 0.44y = -0.11$
- a: $-0.71x - 0.71y = -1.21$
- R'' = (-0.25, 2.41)
- R''' = (1.25, 2.41)
- U = (1.25, 0)
- U' = (-0.25, 0)
- u' = 2.41
- u = 1.49
- r'' = 2.41
- r''' = 1.49
- q1 = 3.6
- b: 0.65

Graphics

Octagonal monuments: fortifications



Neuf-Brisach, France

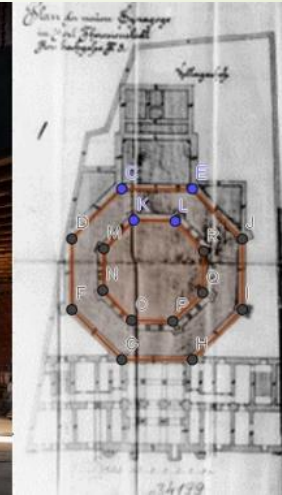
Augmented reality →

GeoGebra Classic 5
File Edit View Options Tools Window Help

Algebra Graphics

- A = (2.55, -10.15)
- B = (19.32, -10.15)
- C = (9.16, -2.02)
- D = (10.26, -4.78)
- f = 2.97
- poly1 = 42.62
- K = (7.52, -2.08)
- L = (9.14, -5.88)
- n = 4.13
- poly2 = 82.39
- S = (9.86, -2.06)
- T = (15.16, 0.16)
- U = (15.94, -1.94)
- V = (10.7, -4.2)
- v = 2.3
- u = 5.71
- t = 2.24
- s = 5.75
- q1 = 12.99
- c: $-2.22x + 5.3y = -32.81$
- d: $-2.22x + 5.3y = -46.01$

Octagonal monuments: Rumbach Synagogue, Budapest



↑
Reconstitution
Verification of proportions
Octagonal towers

←
Octagonal decorative elements
Tesselations and symmetries

and golden ratio, etc.

Usage of technology – augmented reality

Dohany Ut. Synagogue, Budapest



Regular polygons, Symmetries, Tessellations,
Number theory (Fibonacci sequence)



A student explains to his classmates the design of the rosette using DGS and analytic geometry



Conclusions

- The usage of elements from the cultural background of the students reinforces their interest for the mathematics
- Development of technological skills, as integral part of the new mathematical knowledge
- Application (both by hand and with DGS) of fundamental notions in mathematics
- Other topics and objects can be included: crystals, paintings, etc.
- Multidisciplinary is the name of the game in 21st century : STEAM!!!!



Thank you
Merci
Gracias
Grazas
Gràcies
Obregado
Grazie
Vielen Dank

Köszönöm
Χβαλα вам
Mulțumesc
Dziękuję Ci
Děkuju
Ďakujem
Ευχαριστώ
شكرا جزيلا

Hvala vam
ขอบคุณ
Þakka þér fyrir
teşekkür ederim
cảm ơn bạn
धन्यवाद
תודה רבה

NEXT YEAR at JCT IN JERUSALEM FOR CADGME 2020-21

