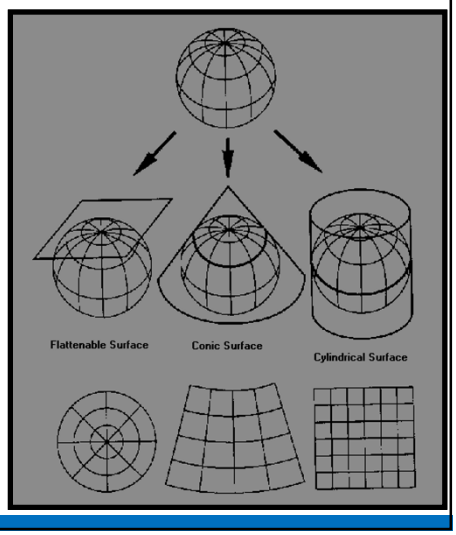
A New Didactical Mechanism to Understand Map Projection

M. Elayachi, Laboratoire LERGET, IAV Hassan2, Rabat, Maroc*

INTRODUCTION:

- **Projection**: transform the ***globular*** **3D** shape of the **Earth** into the **2D** form of the **map** ,
- Process: use an intermediate forms :
  - Conical projections
  - Cylindrical projections
  - Azimuthal projections



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CHALLENGE :

In Map Projection Process:

- Theoretical approach to teach map projections,
- Complicated steps in terms of mathematics (transformation) and analysis (distorsions)
- Conception needs imagination and theoretical functions

OBJECTIVES :

- Explain practically the phenomenon of projection ?
- Enable understanding the theoretical steps ?
- Clarify the transformation process from 3D to 2D representation ?

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MECHANISM TOOL

✓**Labeling:** ISQAT :

✓**Component**:

- Enlighten globe: Light Bulb (7W, 230 V, 55 mA, 50 Hz)
- A support of the bulb,
- Power cable,
- Grid lines : parallels & meridians
- A transparent sheet.

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STEPS

1.Use transparent sheet to build : Cylindric, conical , and azimuthal forms

2. The globe should fit within the three forms,

3.Draw parallels with a span of 30° : 6 intervalles;

4.Draw meridians with a span of 45° : 8 intervalles ;

5.Turn on the globe – ISQAT -

6.Draw the corresponding images of the grid lines

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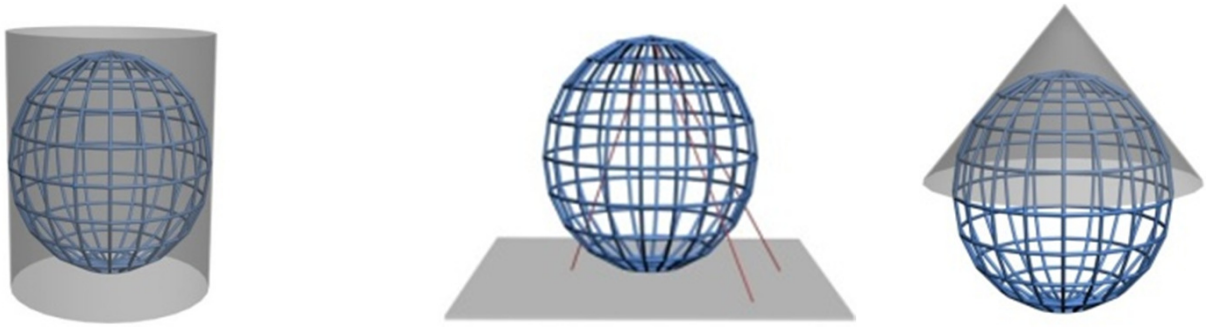
3.Project the globe -ISQAT- to the plan surface :

- Wrap the globe ISQAT by one transparent surface, cone, cylinder or plane,



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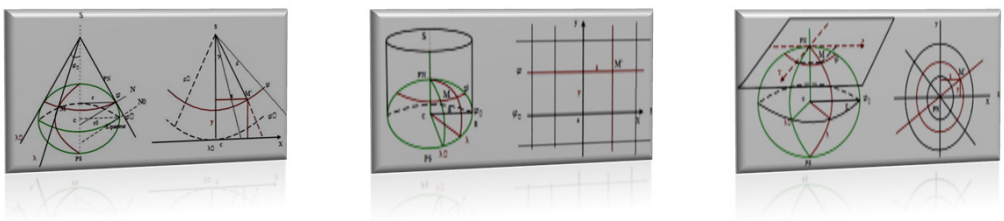
5. Project the globe -ISQAT- to the plan surface :

- Draw the corresponding images of the grid lines
- Perform the projection by developing the area .



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4. Study of the distortions

- Measure a linear feature along a meridian ($S=ds_{\varphi}$) on the globe and its corresponding (Sp) on the projected surface in 3 projections,
- calculate the scale factor Sp/S for each case;
-
- Measure a linear feature along a parallel ($s=ds_{\lambda}$) on the globe and its corresponding (Sm) on the projected surface in 3 projections,
- Calculate the factor scale Sm/S for each case;
- calculate the Radius of the globe using the mean radius of the earth (6400 km)
- calculate the factor scale of the transformation from the Earth to the globe (ISQAT).

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CONCLUSION

The advantages of the mechanism :

- ✓ Better understanding of the meaning of Map Projections of a 3D form to 2D;
- ✓ The distortions are concretely identified,
- ✓ The nature of the obtained image of a projected feature according to the kind of the projection,
- ✓ Understand the principle of the scale of the transformation;
- ✓ Save time (6 hours) in teaching the map projections,
- ✓ This has enabled scheduling the map projections in GIS softwares as added value in the classroom.