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A soccer school field sundial with 20 arcseconds accuracy to study the ecliptic

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The shadow of a 10 meters wall casted on the soccer field of the Technical Institute Galileo Ferraris in Rome, 41.878415° N, 12.454662° E coordinates WGS84 of the gnomon, is used to perform daily measure with an accuracy within a millimeter.

The gnomon's shadow, measured from the bottom and from the side of the field with a tape meter, in the best sets of measurements, presented rms below 1 mm.

The hyperbolae drawn by the Sun through these shadows change their aperture coefficient from winter to summer, passing to zero at the equinox.

The students learn "on field" what means accuracy to the millimeter level, during several months. They learn how to do linear interpolations and extrapolations to predict the positions of the shadows in the next 10 minutes...or in the day without data. The changing curvature radius of the hyperbola is also measurable with three points along 20 minutes, repeated 3 times in a hour lesson. All these achievements are possible during a single hour of lesson, owing to the memory of the students of past situations, that are practical, so easier to remember, even for the most distracted students. The experience presented here with 14 and 15 years old students, started on 15 february 2021 and is still ongoing in may 2021, already with the spring equinox phenomenon detected by interpolation of aperture's parameters and all the ecliptic's projections in these months. The activity in open air and the use of the chalk on the field to mark the shadows' limits, the use of the meter and the care for the zero positions, are appreciated alternatives to the normal indoor teaching.

References:

Equinox and osculating parabolae

Tracing a meridian line with zodiacal signs

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