Solar cooking on the Solbosch campus

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Description:

Context: Cooking with fossil fuels or wood raises a series of concerns in terms of energy supply and its environmental impact, energy of greenhouse gas, and public health (emission of particulate matter or NO_2, promoting asthma as recently reported by TNO 2022 R12249). Solar cooking offers an alternative in sunny regions and for domestic use. However, recent initiatives back solar cooking for collective restaurants (the restaurant Le Présage at Aix-Marseille University or bakery and grains torrefaction at https://neoloco.fr, Normandy).

Objective: The goal is to design and model a prototype of solar oven which could be used on the Solbosch campus by the collective restaurants (e.g. Turbean). A (possibly downscaled) model will be built, scientifically characterized and benchmarked with existing solutions, and finally gastronomically tested. The context will be also integrated in the engineering design process: how should such an oven be operated in Brussels, also known for its rainy days? Which yearly fraction of meals could be solar-cooked? What about safety issues?

Methods: Literature review (models, designs, usages), understanding the SOlbosch context, thermal and sun tracking model, design and fabrication, characterization, tests. The topic must be treated scientifically, and follow a design methology.

Prerequisites: Mechanics (to build it and understand the daily and yearly sun trajectory), physics and thermic (to model it), digital fabrication skills (to build it in the Fablab), control and Arduino electronics (to implement sun tracking).

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References:

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[3] Design and experimental characterization of a solar cooker with a prismatic cooking chamber and adjustable panel reflectors https://doi.org/10.1016/j.renene.2022.11.083

[4] Climatoligical data in Ixelles, https://www.meteo.be/resources/climatology/climateCity/pdf/climate_INS21009_9120_fr.pdf