

HUMAN BODY INTERACTION WITH THE INDOOR THERMAL ENVIRONMENT AND DROPLETS DISTRIBUTION

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NELSON RODRIGUES[†], SENHORINHA F. TEIXEIRA^{*}, INÊS TEIXEIRA^{*†}, JOSÉ C. TEIXEIRA^{†*}

[†]MEtRICs and ALGORITMI, Campus de Azurém, University of Minho
4800-058
nelson.rodrigues@dps.uminho.pt

^{*}ALGORITMI, Campus de Azurém, University of Minho
4800-058
st@dps.uminho.pt

^{*†}ALGORITMI and MEtRICs, Campus de Azurém, University of Minho
4800-058
a80255@alunos.uminho.pt

^{†*}MEtRICs, Campus de Azurém, University of Minho
4800-058
jt@dem.uminho.pt

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ABSTRACT

The study of the human body always sparked an interest. In part to understand how it works, but also to protect our health and improve our quality of life. As our understanding of it grew, we became more aware of its complexity, and that the body reacts to several factors and interacts with the surrounding environment. A subject that has been addressed by several authors is related to the thermal behaviour of the human body and its interaction with the environment [1]. Adding to the reasons previously referred, the thermal environment studies also allow to optimize the energy consumption of HVAC (Heating Ventilation and Air Conditioning) systems, avoiding that they work in over operating conditions [2,3]. In the present day, with the emergence of SARS-CoV-2, the studies of ventilation and the environment surrounding the human body have gained relevance [4].

Commonly, the relation between the human body and its environment has been approximated through regressions of experimental data, such as in the case of the PMV (Predicted Mean Vote) index for thermal comfort [5]. However, with the development of computational power and numerical methods, the human body-environment interaction has been elaborated with the use of computational simulation. In this regard, there are two main approaches to the subject. The first approach, which is more common, regards the thermal environment that people are

exposed, simulating the environment outside of the human body [6]. These studies have indicated a good agreement with experimental data [7]. Additionally, numerical models also provide a way to study particles behaviour and predict the propagation of saliva droplets that carry viruses [8]. The second approach addresses the thermal phenomena regarding the human body. Here, the human body is simulated with its thermal physiological system, responsible to maintain the body temperature, such as perspirations and vasoconstriction [9]. Heat is then transported from the body to the exterior, generally, through a system of layers, each one mimicking the different tissues of the body. These two individual approaches can also be connected into one, creating a more accurate model to simulate the thermal and droplet's interaction between the human body and its environment.

This mini-symposium is envisioned to exchange knowledge and share the last innovations and work developed in the area, regarding the thermal simulation of the human body, its surrounding environment and the propagation of water droplets that are expelled from the mouth and nose.

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