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AVIS DE SOUTENANCE DE THÈSE DE DOCTORAT

Madame Ghezlane HALHOUL MERABET

soutiendra publiquement sa thèse de Doctorat en Informatique

le Mercredi 04 Mars 2020 à 15h00 au Grand Amphi à l'ENSIAS

Intitulé de la thèse

A CONTRIBUTION TO MODELING DYNAMIC THERMAL COMFORT OF HUMAN SUBJECTS IN INDOOR ENVIRONMENTS

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A CONTRIBUTION TO MODELING DYNAMIC THERMAL COMFORT OF HUMAN SUBJECTS IN INDOOR ENVIRONMENTS

Abstract: Thermal comfort is closely related to the evaluation of heating, ventilation and air conditioning systems. It can be seen as the result of the perception of the occupants of a given environment and it is the product of the interaction of a number of personal and environmental factors. Otherwise, comfort issues still do not play an important role in the daily operation of commercial buildings. However, in the workplace, local quality effects, in addition to the well-being, the productivity that has a significant impact on the performance of the activities. In this regard, researchers have conducted, for decades, investigations related to thermal comfort and indoor environments, which includes developing models and indices through experimentations in order to establish standards to evaluate comfort and factors and set-up parameters for the heating, ventilation and air conditioning systems. However, to our best knowledge, most of the research work reported in the literature deals only with parameters that are not dynamically tracked. To address this gap, we developed human comfort model taking into consideration the human body shape in order to infer the adequate comfort level, by comparing the most adapted machine learning models to classification problems (Linear Discriminant Analysis, Support Vector Machine and Random Forest) applied in a field study data in order to select the most significant model to assess the impact of the anthropometric variables such as age, gender, and body mass index as well as the air temperature as an environmental variable on a variable that presents multiclass singularities.

The developed model can be used to set up an HVAC system to meet the expected comfort level. In particular, the obtained results show that there is a strong correlation between users' comfort and variables such as air age, gender, and body mass index as a function of height and waist.

Keywords: Human Thermal Comfort; HVAC; Indoor Environment; Predictive Model; Subjective Variables; Linear Discriminant Analysis, Support Vector Machine and Random Forest.