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Journal Name:	**Advances in Research**
Manuscript Number:	**Ms_AIR_20223**
Title of the Manuscript:	**The Significance of Time Step Size in Simulating the Thermal Performance of Buildings**
Type of the Article	**Original Research Article**

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This journal's peer review policy states that **NO** manuscript should be rejected only on the basis of '**lack of Novelty'**, provided the manuscript is scientifically robust and technically sound.
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PART 1: Review Comments

	Reviewer's comment	**Author's comment** *(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*
Compulsory REVISION comments	**Changes which must be made before publication** **1- The authors should provide the novel ideas of their work.**	***These great comments are very much appreciated.*** The reviewer's comment was addressed as outlined below. **This was revised and amended in the Introduction Section.** The CFD analysis can be used to find the internal air temperature at any point within the building space. In general, the CFD requires a small time-step to get high accuracy of simulation; however it leads to the excessive computing time [8, 9, 10, and 11] and it has been impractical to apply this approach for a complex applications. Furthermore, Building Energy Simulation (BES), very popular in thermal modelling simulations, may handle the long-term analysis [3, 4, 5, 6, and 7] but the accuracy of the analysis is sometimes questionable. This paper explores the larger time-step effects under dynamic conditions of real

	2- In the state-of-the-art review, no numerical works in the subject were mentioned. However, some works could be useful, even for comparison purposes	environment to accurately predict air temperature inside the modules using the CFD. **These have been added in the Introduction Section.** The CFD analysis has been playing an increasingly vital role in building design applications to accomplish the healthy, energy-efficient and comfortable building. The CFD analysis can assist in optimising building design by calculating temperature, humidity, air speed and pollutant concentration inside and outside a building [3]. The CFD analysis can simulate indoor and outdoor airflows to reach optimum natural ventilation [4]. It can also be used for the air-conditioning system design and air quality valuation to examine the influence of a specific flow parameter (such as air temperature and/or air speed) [5]. The main challenge in using CFD in building design is the long computing time as a result of the enormous amount of mesh grids essential to cover whole building site and this becomes more significant when dynamic wind conditions were applied [6].

	3- Discussion part needs to be improved with comparisons of the results with previous studies.	**Further details were also added in the Introduction Section.** For the best of our knowledge, this is the first paper which reports the effect of larger time step-size and the magnitude of temperature fluctuation range using the CFD analysis in entire building simulations. The paper compares the CFD results with the real internal air temperature for all modules and ensured the high accuracy of CFD simulations (see Figures 10, 11, 12, 13 and 14). **More details were added in the discussion section** **In section 3.1.** The fluctuations ranges during a diurnal cycle were less than 4.6 ºC and the hourly changes were less than 0.5 ºC for the InsCB module during summer and winter weeks. This indicates there were no rapid changes in temperature recorded inside the module. In general, the temperature variations were changed in slower rate compared to the other parameters analysed by the CFD (e.g. air movement). **In section 3.2** In the real diurnal temperature cycle, the peak temperature inside the building depends on the outside weather conditions and does not occur at the same time every day (fluctuating even 5 hours within the analysed period). In this analysis, the daily peak temperature time

	4- Conclusions should be more detailed and should give new ideas for further studies, nstead of using repeating sentences in the body of the technical paper.	was also changed with different time steps for summer and winter weeks. For example, the highest discrepancies in peak temperature time occurred for a 15 minutes time step with the time lag between 150 - 330 minutes compared with the real internal air temperature (see Figure 12). Note: the time lag is defined here as a difference in time between simulated and real internal air temperature. **In section 3.3** Smaller time steps provided a lower temperature fluctuation range. The fluctuation range increased gradually and consistently (except for 30 minutes time step) using the larger time steps. The closest temperature fluctuation ranges occurred at 60 minutes time interval for summer week and 100 minutes for winter week when compared to the real data. **The Conclusion Section was amended as following.** This technique, using larger time steps, accelerated the simulations and reproduced the real fluctuation range. This was confirmed for four modules (with a different walling system) for different weather conditions (summer and winter weeks). The external air temperature for different time intervals was also replicated with high accuracy of less than 2% error between maximum and minimum temperatures for any given time intervals.

		Larger time steps also accelerated the simulation process due to the reduction of computing time. For instance, a 100 minute time step reduced the computing time by more than 99% compared to a 1 minute time step. This facilitates the use of desktop PC's to run the CFD simulations for long periods. Furthermore, the numerical method used by CFD, accurately simulated the temperature inside the building using larger time steps and this promising results may facilitate the use of CFD to simulate longer periods (e.g. seasons or years) assuring fast and accurate results. This suggests that the procedures presented in the paper can be successfully applied to different building types in different locations. The effect of CFD analysis using larger time steps on discrepancies in daily peak temperature time compared to the real internal air temperature would be also useful.
Minor REVISION comments		
Optional/General comments		