Omnithermal Restructurable Metasurfaces for Both Infrared-Light Illusion and Visible-Light Similarity

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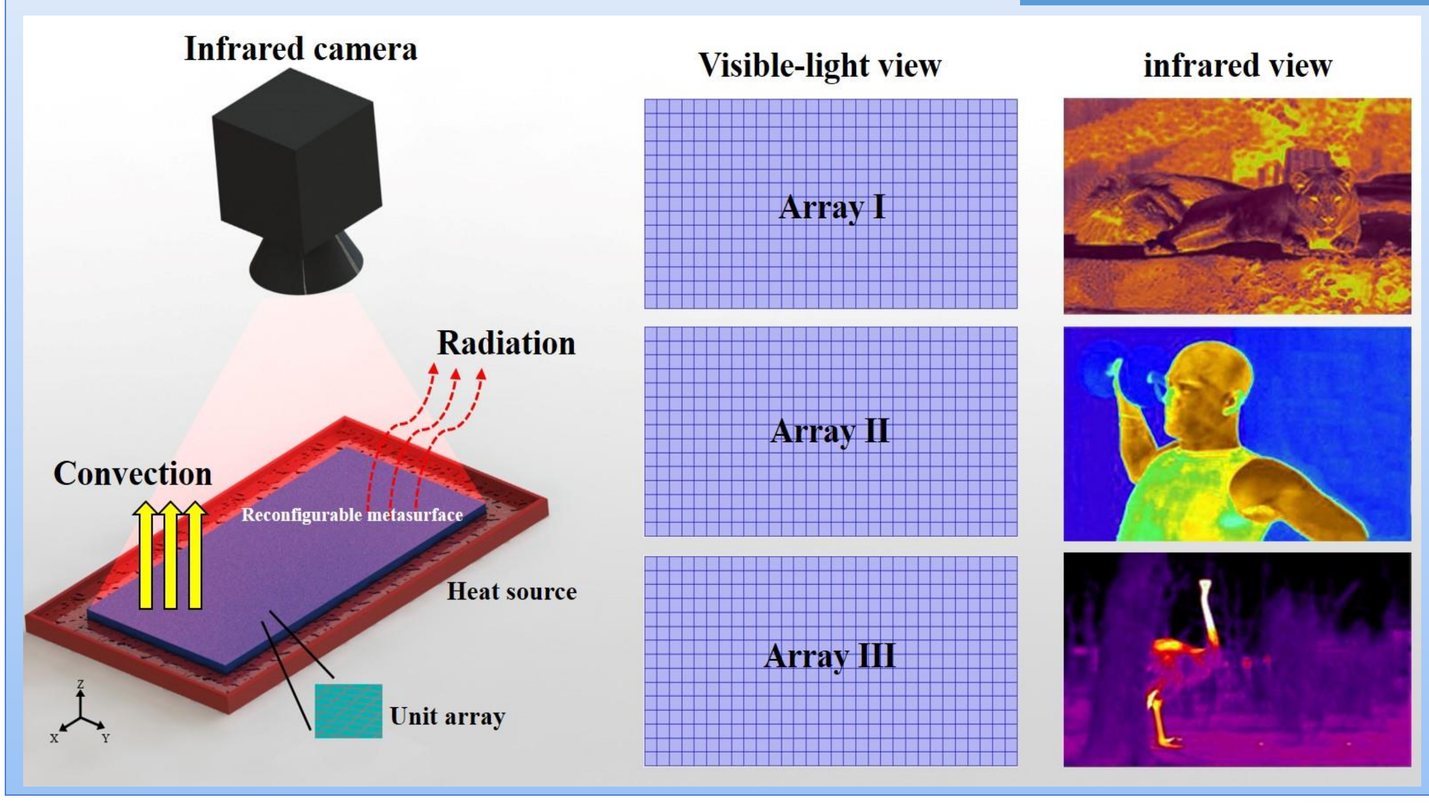
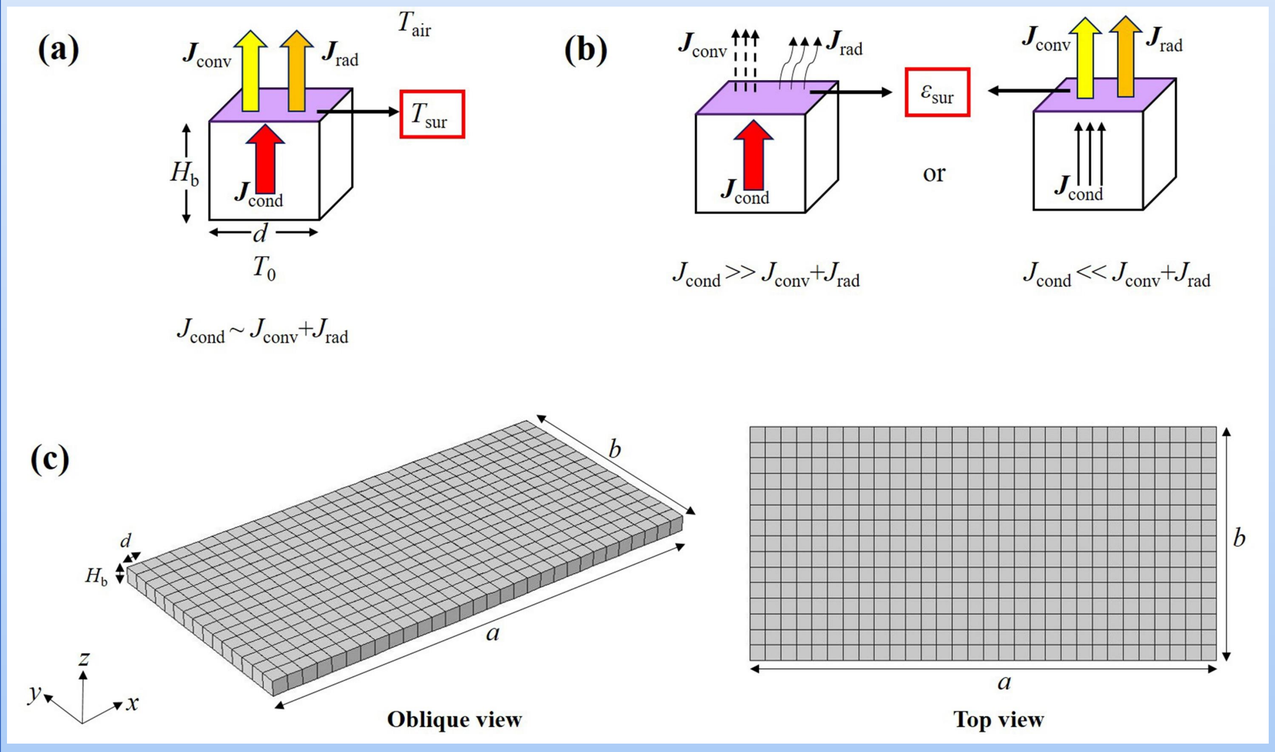
I. Introduction



The existing challenges in designing infrared illusion are related to **complex working environments**, **multifold heat-transfer modes**, and **fabrication difficulties**. Here, we consider them synthetically and propose a class of restructurable metasurfaces to show both illusion viewed in infrared light and similarity viewed in visible light.

II. Design

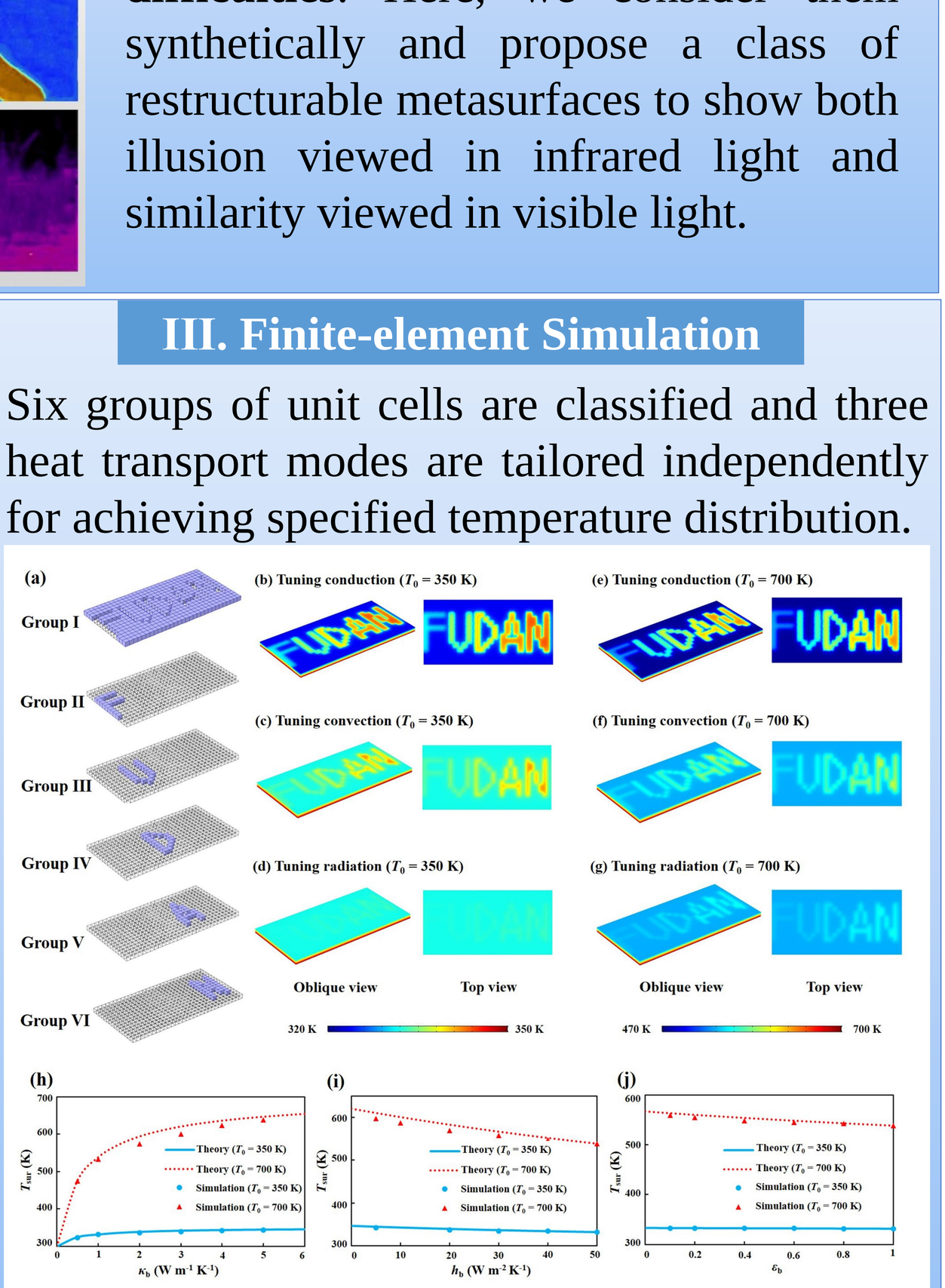
The emissivity and temperature jointly decide the reading temperature, described by the Kirchhoff's law.



(1) We consider the three basic modes of heat transfer synthetically and formulate a theoretical omnithermal framework.
(2) Discretization with identical unit cells is applied on the metasurface.

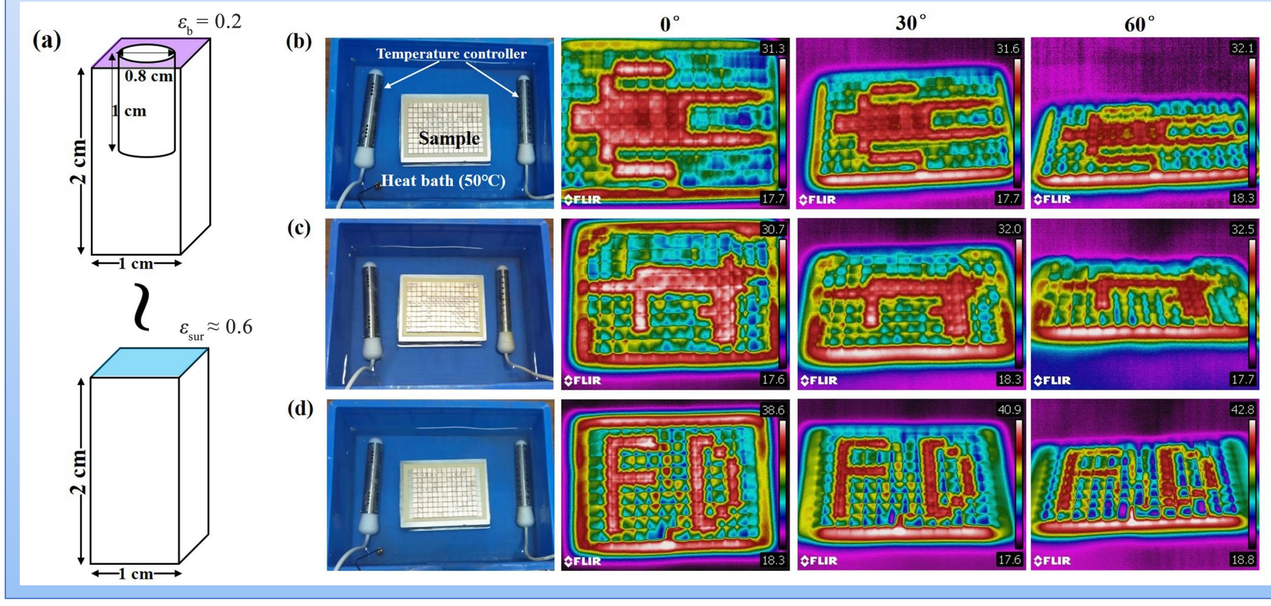
III. Finite-element Simulation

Six groups of unit cells are classified and three heat transport modes are tailored independently for achieving specified temperature distribution.



IV. Laboratory Experiment

We demonstrate the experiments by radiation-cavity effects, say, the dependence of effective emissivity on the sizes, shapes, and proportion of surface cavities.



V. Conclusion

In summary, we integrate the tuning of the surface temperature and emissivity on one platform, which are studied as two independent methods for tailoring thermal illusion in existing literatures. Combining with reconfigurability, the flexibility of manipulating infrared illusion may reach a further level.

Reference

[1] Jun Wang, Fubao Yang, Liujun Xu, and Jiping Huang, ***Phys. Rev. Appl***. 14, 014008 (2020).