Selecting automation techniques of lighting and air conditioning for inner enclosures considering warm tropical climate: a case study

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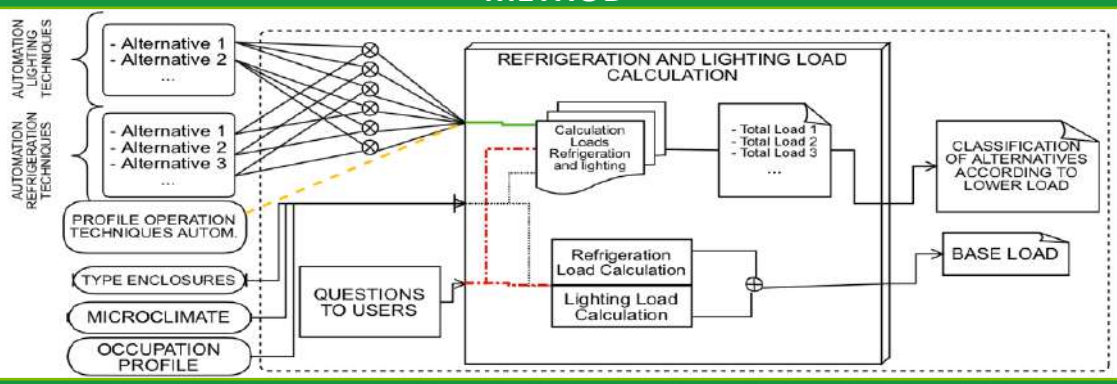
INTRODUCTION

- BAS provides advanced functionality control and monitoring of mechanical and electrical systems of a building. These systems reduce energy consumption without affecting the functionality and comfort of the inhabitants
- The comfort of the inhabitants in buildings is determined by three factors: thermal comfort, visual comfort, and indoor air quality
- the university campus suffer from the following:
    1) lack of RUE criteria for design automation lighting and air conditioning,
    2) few or no means to adjust automatically the lighting and temperature according to each space,
    3) exclusive use of efficient devices as an energy management strategy,
    4) failure to take advantage of natural conditions of the enclosure, as daylighting and natural air stream.

This work proposes a tool developed on Visual Basic for Microsoft Excel®, a functional tool for implementing a method for sorting automation and control techniques for lighting and air conditioning systems on campuses, focusing on energy consumption

METHOD



REQUIREMENTS

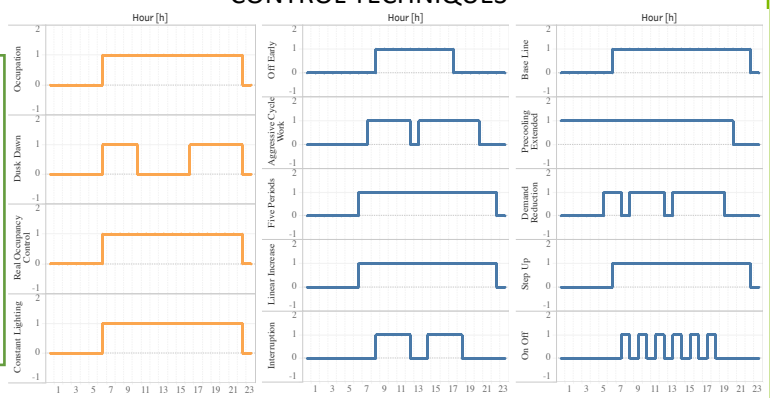
A/C

- Heat sensitive -> solar radiation through windows
- Heat sensitive -> radiation and transmission through windows
- Heat sensitive -> radiation and transmission through ceilings
- Sensible heat transmission through walls because no external
- Heat sensitive due to air infiltration
- Sensible heat generated by people
- Sensible heat generated by lighting
- Latent heat generated by people
- Latent heat due to infiltration air
- Sensible heat from ventilation air
- Latent heat from ventilation air

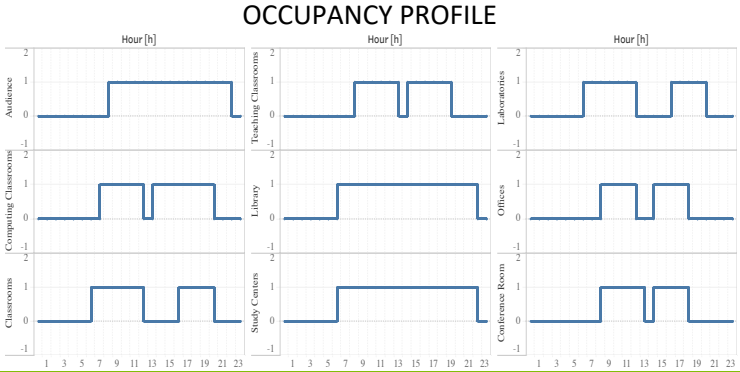
Illumination

- Lighting power
- Lighting constant factor
- Load factor
- Natural light dependency factor
- Parasitic energy

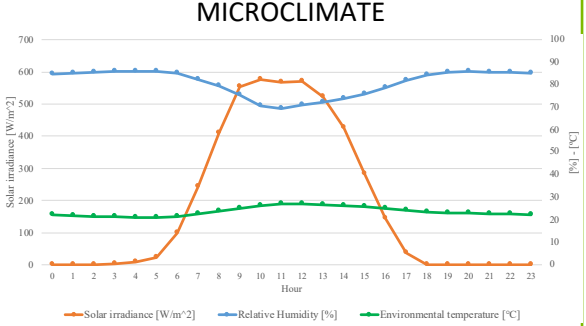
CONTROL TECHNIQUES



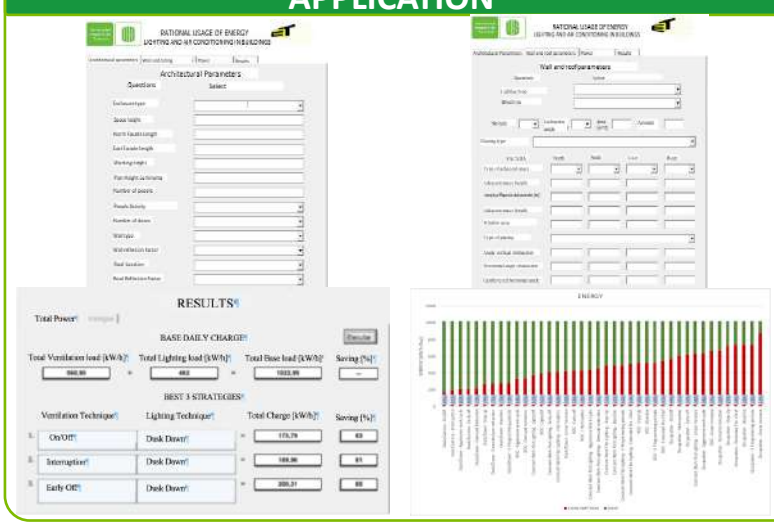
OCCUPANCY PROFILE



MICROCLIMATE



APPLICATION



CONCLUSIONS

- The application presented in this article is a useful design tool to identify and quantify the effects produced by the implementation of RUE techniques on university campuses.
- the application facilitates the development of sensitivity studies on the total electrical charge of a room, the adjustment of architectural design parameters, the variation of control and automation techniques, the change in the room's microclimate and the application of new technology for the RUE.
- Implementation of control and automation techniques allows generating energy savings of over 50%. Likewise, factors like place, area, envelope, and orientation of the enclosure represent the greatest contribution to total energy consumption.