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Since this was written and needs must be
My whole heart rises up to bless
Your name in pride and thankfulness!

– Robert Browning∗

∗ Poem by Robert Browning “The Last Ride Together,” lines 5-7, (1855); Arthur Quiller-Couch, ed. 1919.
ABSTRACT

Daylight-artificial light integrated schemes encompassing soft computing models have been perceived as a lucrative option for lighting energy conservation. This thesis exploits the quintessence of design and real time implementation of adaptive predictive control strategy for robust control of daylight-artificial light integrated scheme. To elicit daylight variations, occupancy detections, and user preferences an online self adaptive predictive control algorithm is structured for real time control of artificial lights and window blinds. The developed model resolves the constraints of: (i) supplementing the daylight with artificial light to meet the set point illuminance, (ii) minimizing the energy consumption, (iii) maximizing the visual comfort by controlling daylight glare, and (iv) retaining the illuminance uniformity in the interior. In this perspective, the adaptive predictive model entails integration of: (a) An online Adaptive Neuro Fuzzy Inference Scheme (ANFIS) daylight illuminance predictor in conjunction with artificial light intensity control algorithm for interior illuminance regulation, and (b) Fuzzy logic based window blind control algorithm to eliminate glare and solar heat gain. Control algorithm modeled with real time sensor information administers an online process identification, prediction and parameter adaptation. The devised prototype controller is successfully implemented in a test chamber (4m×4m×2.3m). A real time user friendly simulator provides an online visualization of illuminance performance indicators and control of the process. The anticipated synergetic effects of online control algorithm validated in the test chamber highlights the benefits of the scheme in terms of glare control, illuminance uniformity and energy efficiency. Nevertheless, the scheme is proved to be economically feasible for large centralized installations. The concept presented in this thesis contributes to the advances in Building Light Management Systems for commercial buildings.