APPLICATION GROUP

應用組

A9-130

作品名稱	**以無線感測器網路為基礎之智慧型節能燈光調控系統** A WSN-Based Energy Saving Intelligent Light Control System
隊伍名稱	**星光幫 SuperStar**
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作品摘要

在未來的居家環境中，可預想的是家中所有電器皆能自動化運作。而在一個家庭中部署一自動化運行之系統，第一件重要的問題為「系統該如何運作？」，系統中的裝置能否溝通協同運作，裝置該透過什麼介面來控制，裝置控制後對環境產生了什麼影響。然而有了運作模式後，另一更重要問題為「怎樣之運作模式能夠滿足使用者之需求」，令使用者可在環境中從事各種不同之活動。

本專案提出了一套「以無線感測器網路為基礎之智慧型燈光調控系統」。此系統分為兩大項，一項為適用於局部照明的智慧型檯燈，而另一項為適用於全區照明的智慧型燈光調節系統。(1)智慧型檯燈系統(iLamp)：此智慧型檯燈系統主要用於局部照明，如閱讀時桌面所需之照明，此系統包含兩項元件，智慧型檯燈與攜帶式無線感測器，使用者可於使用前設定偏好之光度值於攜帶式無線感測器，它可將即時之光度資訊，以無線方式回傳至智慧型檯燈，智慧型檯燈可自動調整照射角度與光度值，以滿足使用者閱讀之光度需求；(2)智慧型燈光調控系統(iLight)：此系統主要用於全區照明，如辦公室內天花板之照明系統，此系統包含三項元件，攜帶式無線感測器、決策單元與執行機構。攜帶式無線感測器可將即時之光度資訊以無線傳輸方式回報至決策單元，而決策單元搜集環境中所有人所在位置之即時光度資訊，來做一項最佳決策，而此決策可分為兩項，以節約能源為目標或以最大化所有人滿意度為目標。

本系統並非第一套自動化調光系統，但本系統做了幾項重大改良，有別於前人之系統，其特點有三項：(1)本系統考量了個人化因素，系統可同時滿足所有人對於光度之不同偏好；(2)一般光度調控系統於系統架設前，需測量不同位置對於光度的影響，並予以記錄，但本系統不必做此測量，大大減低系統佈建之人力與時間；(3)一般調光系統需利用其他額外媒介來定位出使用者所在位置，系統才能開啟其所在位置之燈源，增加系統的成本與複雜性，但本系統之定位方式，為使用『光度差異』來定位出每位使用者或閱讀面之精確位置，故可在原先提供照明之光度系統下，也能夠附帶有定位之效果。

整體來說，本專案提出一套智慧型節能燈光調控系統，包含全區照明(iLight)與局部照明(iLamp)，不僅能同時滿足所有不同使用者之光度偏好，且能以最省電之方式來開啟。

指導教授

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- He is Professor (2000~present), Chairman (2005-present), and Associate Dean (2007-present) at the Department of Computer Science, National Chiao-Tung University, Taiwan. He is also Adjunct Chair Professor at the Chung Yuan Christian University (2006-present).
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Abstract

In the future, every kind of appliances can be operated automatically. The most important problem of automatic system is how to cooperate with them. Here, we propose "A WSN-Based Energy Saving Intelligent Light Control System". Our system can be divided into two parts. The first one is the local lighting system: iLamp system. The iLamp system contains two components: iLamp and electric bookmark. The user can set up his lighting preference into the electric bookmark. The current light intensity sensed by electric bookmark can be transmitted to iLamp by wireless media. According to current light intensity and user's preference, the iLamp can adjust the light intensity and illumination angle to satisfy user's lighting requirement. The second one is the global lighting system: iLight system. The iLight system contains three components: electric bookmark, decision center, and actuators. The electric bookmark senses current light intensity and transmits to decision center. The decision center does a suitable decision to turn on the global light. The suitable decision can be divided into two kinds of goal: minimizing energy consumption or maximizing all users' preference.

Moreover, although our system is not the first one for adjusting light intensity automatically, we have made some significant improvements on it. There are three parts:(1)our system have took the personal preference into account. Hence, it can satisfy all users' preferences of light intensity simultaneously. (2)Our system need not measure the influence of light strength for different positions. It can reduce a lot of cost about deployment and time.(3)We don't need any positioning devices to associate with our light control system since it can increase the cost and complexity. In our approach, we can just make use of photometric differences to calculate the exact position of each users or reading surface. We can deal with it by using our lighting system. Thus, our system not only can provide light strength according to the users' preference, but also the positions of users.

In short, we have invented an intelligent and efficient lighting control system. It includes iLight for global lighting system and iLamp for local lighting system. The most important of our invention is that it not only can satisfy all different personal preferences of light intensity for all users simultaneously, but also can switch on the lighting system in power saving way.