Progress Report

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SOFIA Project
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TU/e
Outlines

- Light Control
  - Introduction
  - Equipment/Technology
- Phidget
  - Introduction/ Light sensor
  - Phidget Interface Kit 8/8/8
  - Programming Languages
  - Pros/Cons and Applications
- Discussion
- Future Plans
Introduction to Lighting Control

- Lighting control system consist of a device, typically embedded processor or industrial computer, that’s control electric light of a building or residence.
- One or more keypads or touch panel interfaces
- To control any device from any interface
  - Ex: master touch panel might allow the users the ability to control all lighting in a building, not just a single room. In fact any light might be controlled from any location.
In addition

- Chronological time (time of day)
- Astronomical time (sunrise/sunset)
- Room occupancy
- Events
- Alarm condition
- Program logic
Why Use a Lighting Control

- Energy Savings
- Flexibility
- Comfort
- Control of scene and sequences
- RGB Control and Dynamic Lighting
Equip./Tech. for Control & Dimming

- Functional Lighting
  - Switching -> On/off
  - Adjustment of intensity -> Diming (up/down)
- RGB lighting
  - switching -> On/off
  - Adjustment of intensity -> Diming of all R+G+B channels together
  - Color variation -> Diming of individual R,G,B, channels
- Dynamic lighting
  - Switching -> On/off
  - Adjustment of intensity -> Diming of all WW+CW channels together
  - Variation of color temperature -> Diming of individual WW+CW channels
Equipment/Technology

- 1/10V analogue
- DALI digital (Digital Addressable Lighting Interface)
  - Low-speed digital protocol for controlling a maximum of 64 addresses
- DMX digital (Digital Multiplex Signal)
  - High speed digital protocol based on the DMX512 standard – control of over 512 addresses

- System integration technology
  - LonWorks Protocol
    - Standard protocol for integrating different systems (BMS)
Motion Detector

- Indicates whether the area is occupied
- Lowers or completely switches off the light when the area is not being used
- There is always a delay (timeout) from the moment when the area is no longer being used and lowering/switching off the lights
- Lights can be lowered before being switched off
- Coverage area – office: 8*6m (h= 3m)
- Various types of coverage available: for hallway, corridor, factory, etc
- Average energy saving of 30%- max 60%
DALI compared to DMX

- Digital addressable lighting interface
- Digital Communication protocol
- Low speed
- Bi-directional communication (sends command and read equipment status)
- Max 64 addresses
- Max 16 groups
- 1 address for each unit/channel -> max 64 units/channels
- Dedicated to light control

- Digital Multiplex Signal
- Digital Communication protocol (standard DMX512)
- High speed
- Unidirectional communication (only sends commands)
- Max 512 addresses
- Unlimited number of groups
- Use of same address for several channels -> unlimited no. of units
- Use for other types of control, not only for lighting
• “Unless we understand how a particular light source works, we cannot appreciate how to control it”.

• “Lighting Control Technology and applications”, by Robert S. Simpson, Oxford Press. (if recommended)
  • Foundation
  • Lamps
  • Lighting Components
  • Dimmer and Control system
  • Application
Phidgets
What is Phidgets

- Phidgets are a system of low-cost electronic components and sensors that are controlled by a personal computer.
- Phidgets are used to interface through USB connections.

Two type of phidget components:
- Standalone control boards (USB port)
- Extensions that connect to a PhyidgetInterface board: sensors, actuators.
Extensions

- **User Interface Controls:**
  mini joystick, toggle switches, push-buttons, touch controls, sliders, rotary buttons

- **Sensors:**
  motion sensor, capacitive touch controls, RFID, pressure sensor, light sensor, vibration

- **Actuators:**
  LCD Screen, motor, servo, relais, lights... and by using notebook our PDA connected to the phidget also video, sound, etc.
Light Sensor

- Light sensor, a standard Cadmium Sulfide (CdS) photocell resistance varies with light. Comes with 60cm sensor cable.

- With no light the resistance of this sensor is 500 k ohm. At 10lux the resistance falls to between 10 k and 5 k ohm. The resistance is in a voltage divider with a 7.5 ohm resistor.
Phidget Interface kit 8/8/8

- It has 8 analog inputs, 8 digital inputs, and 8 digital outputs
- The kit comes with a variety of sensors, switches, and LEDs
Phidget Interface kit 8/8/8

- have 5 boards
- need external power in some USB connectors
- surely need external power when other phidgets are connected to the board
- 8 digital inputs, basically reading the state of a switch
- 8 digital outputs
  - basically turns a switch on and off
  - simple and frequent example: LEDs
  - a LED is a diode, will let current pass in only one direction
  - shorter pin to the ground (cathode), the longer one (anode) to the digital output
  - to avoid short, 300 Ohm resistor included in the phidget output
Phidget Interface kit 8/8/8

- 8 analog inputs
  - can connect a number of packaged sensors
  - but any other sensor that can be fed with 5V and produce voltage between 0 and 5V will work.
- always disconnect the USB to the computer before modifying the interface kit circuit! (attaching analog inputs, digital inputs or outputs)
Programming Languages

- Phidgets can be programmed in many different programming languages
  - VB, VBA
  - C, C++
  - Java
  - .Net
  - Flash
Languages

MAX/MSP
Flash
JAVA
C/C++
C#
HTML
VB
LABVIEW

Graphics
Intelligence

Effort: Low / High
Pros and Cons

Pros
- USB interface
- Many programming languages

Cons
- Documentation not very helpful
- Different versions introduce major changes to the way the phidget runs
- Device speed slow
Applications – RFID

- Elise’s memory browser
Application – LCD

- Stephan’s alarm clock ( sliders connected to Phidget InterfaceKit 8/8/8)
Application – Servo

- Loe’s 4D prototyping and Tom’s semotion.
Application – LED Board

- Philip’s lighting experiments
Application – Accelerometer

- Tangible interaction
- Menu navigation
- Children’s play
Application – Circular Touch

- iPod
- Andres’s moodboard project
Getting Phidget running

- Must install phidgets21.msi and download the Phidget21 C# Library
- Both are found in Downloads > Phidget21
- This will require that you have the current .Net framework installed, which in turn may require updates to service packs and windows installer
Use Case Scenario Discussion

- Ideal Room Brightness for Video Conferencing
  - For a given video profile/level, subject selects light parameters:
    - Color
    - Intensity
    - Contrast
  - Desired function
    - Achieving ideal brightness in room
System Architecture

SOFIA Architecture

802.11

GATEWAY

802.15.4

OSAS Architecture

Phidets
Light

Phidets
Light

Light Sensor

Light Sensor
Future Plans

- Develop API for Phidgetkit using C# (if SOFIA-SAN members agreed).
- Ideal Room Brightness for Video Conferencing
  - Light control system according to the video streaming
Thank you very much for your Kind attention!