

Progress Report

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SOFIA Project

SAN-Group

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

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- “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.
- <http://www.phidgets.com/>

Two type of phidget components:

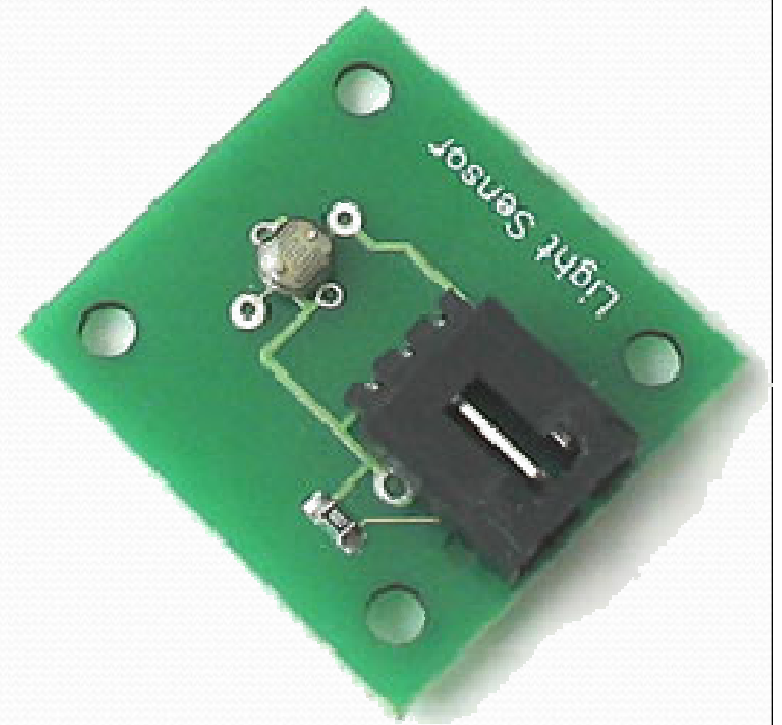
- Standalone control boards (USB port)
- Extensions that connect to a PhidgetInterface board: sensors, actuators.

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, relays, lights... and by using notebook our PDA connected to the phidget also video, sound, etc.

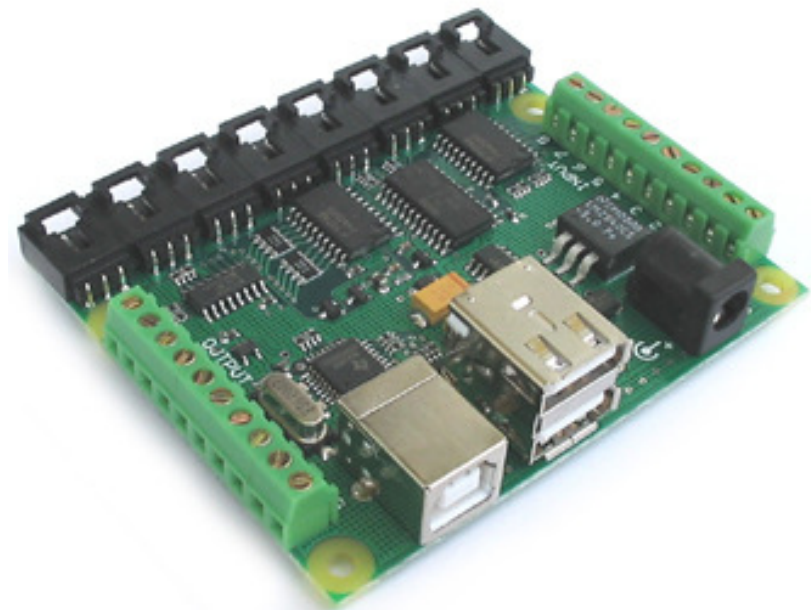
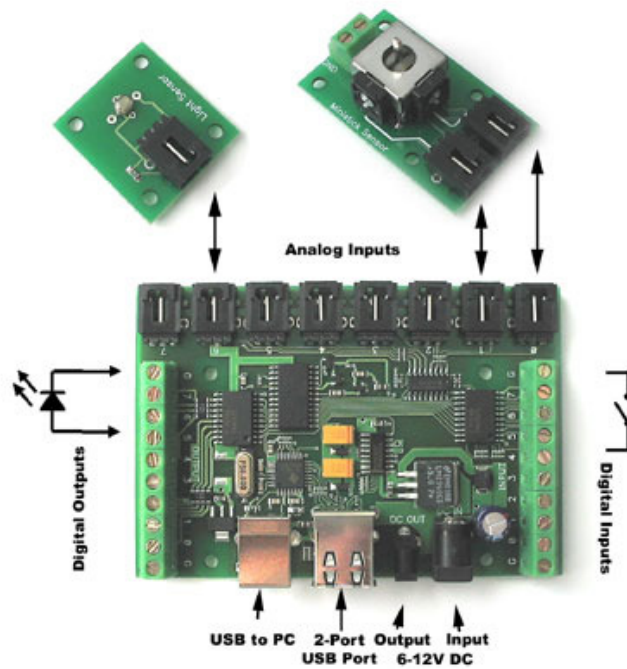
Light Sensor

- 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

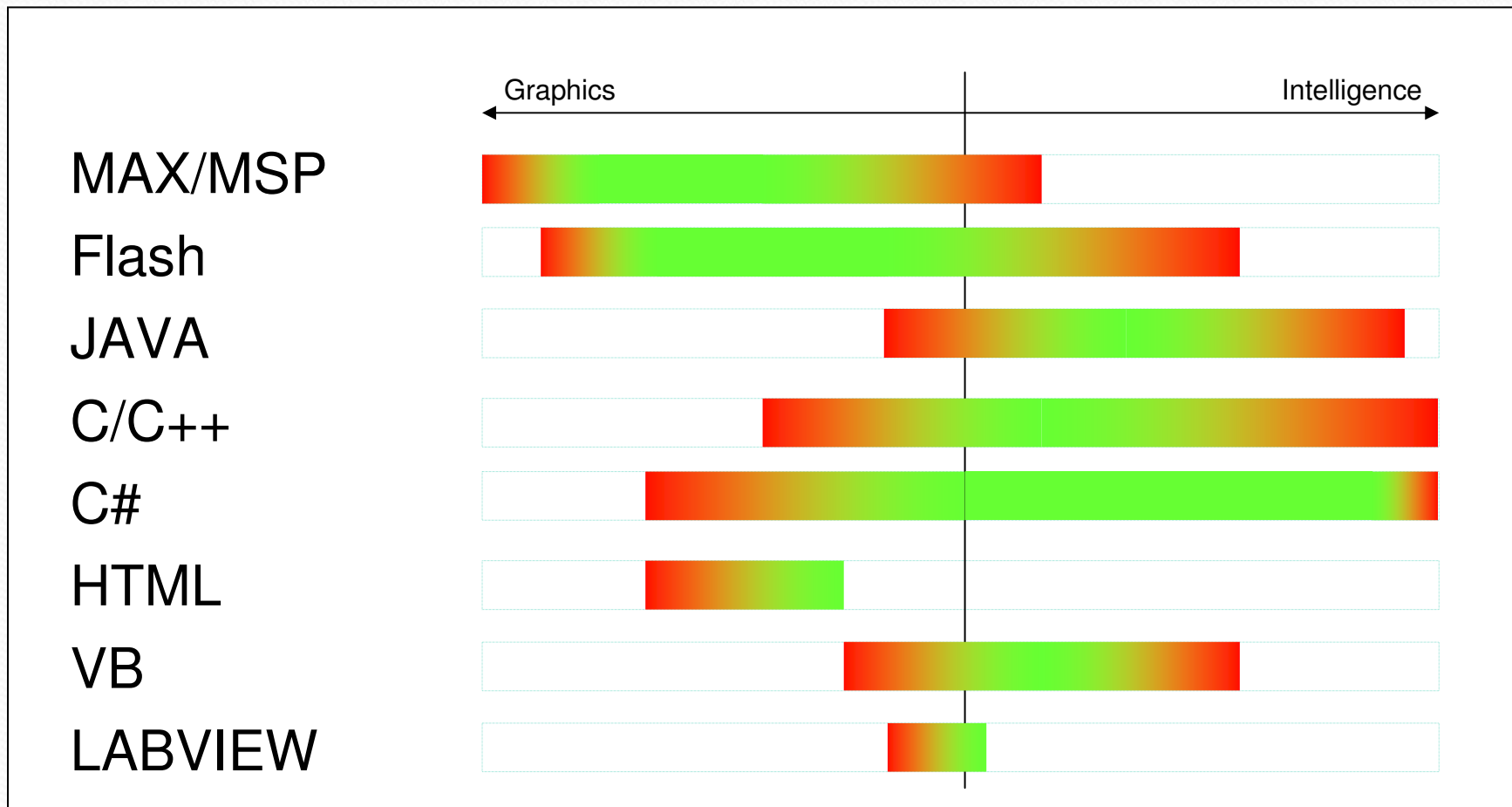
Phidget Interface kit 8/8/8

- 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



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



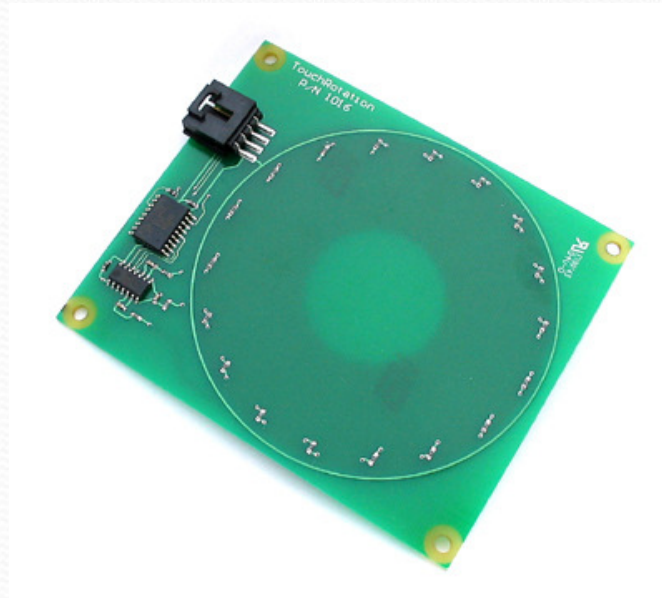
Application – Accelerometer

- Tangible interaction
- Menu navigation
- Children's play



Application – Circular Touch

- iPod
- Andres's moodboard project



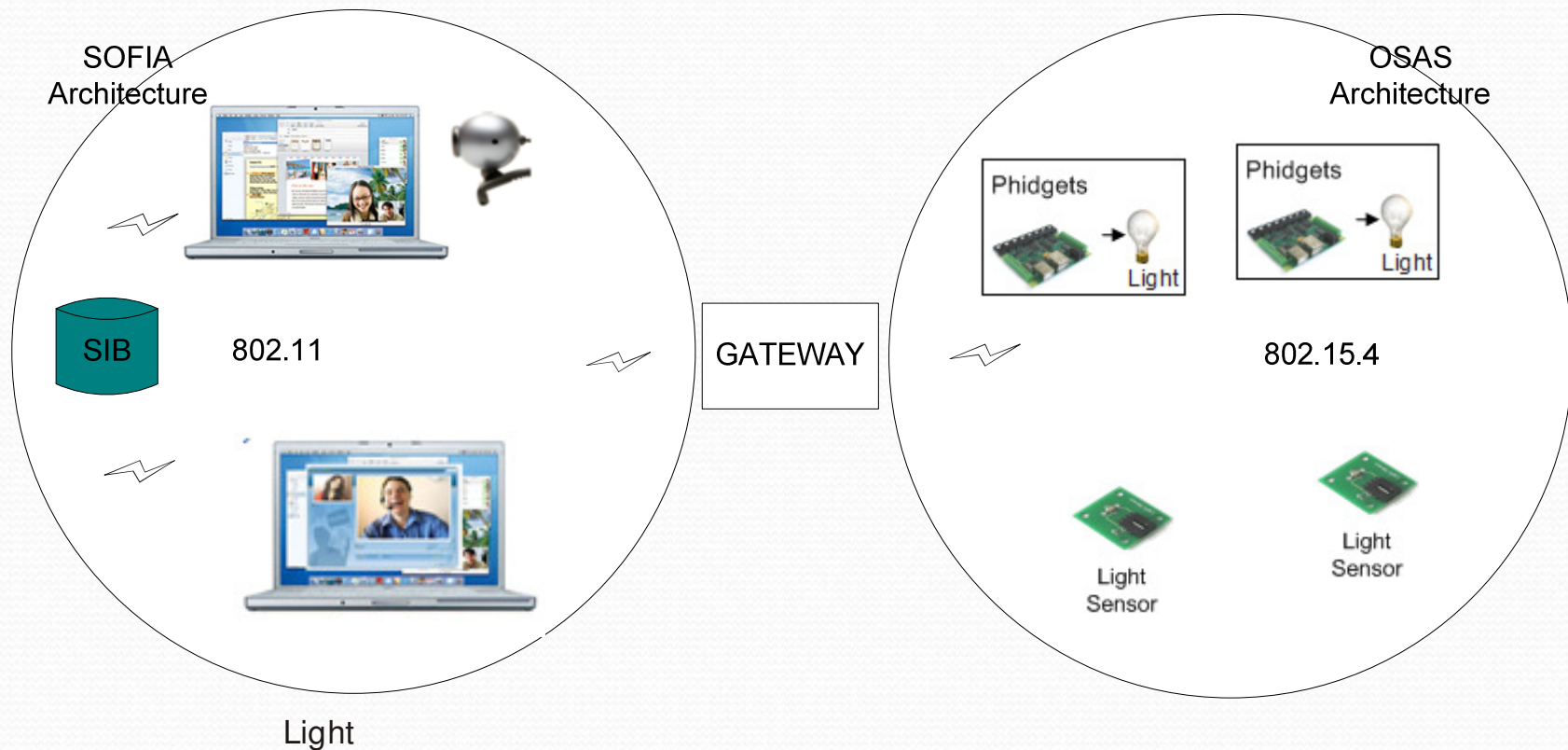
Getting Phidget running

- 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



Future Plans

- “Lighting Control Technology and applications”, by Robert S. Simpson, Oxford Press.
- 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!